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INDOMARSSONELLA, A NEW GENUS FROM THE JURASSIC ROCKS OF JHURIO HILL, KACHCHH, INDIA

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ABSTRACT

A new foraminiferal genus *Indomarssonella* with three species is described from the Bathonian sediments of Jhurio Hill. Kachchh, India. This new genus is placed into the subfamily Paravalvulininae of the family Chrysalidinidae in view of its close resemblance with *Pseudomarssonella* Redmond in test morphology. The creation of a new genus is based on the presence of apertural pores scattered on all the chambers of the last whorl.

INTRODUCTION

The Jurassic sediments belonging to Patcham and Chari Formations of Jhurio Hill, Kachchh (figs. 1 & 2), have yielded a rich foraminiferal assemblage consisting of cosmopolitan and endemic species (Mandwal & Singh, 1989, 1993). The endemicity is exhibited by *Pseudomarssonella* Redmond (1965), *Riyadhella* Redmond (1965) so far known from Saudi Arabia and Western India, "Rajasthan and Kachchh". (Redmond, 1965; Garg & Singh, 1983; Mandwal & Singh, 1989), the region described by Hallam (1971) as "Ethiopian Gulf". A species of *Pseudomarssonella, P. bipartita,* is also known from Bathonian of Nivernais, France, East Loire (Delance & Ruget, 1989); however Banner *et al.* doubted the identification of the forms due to poor preservation.

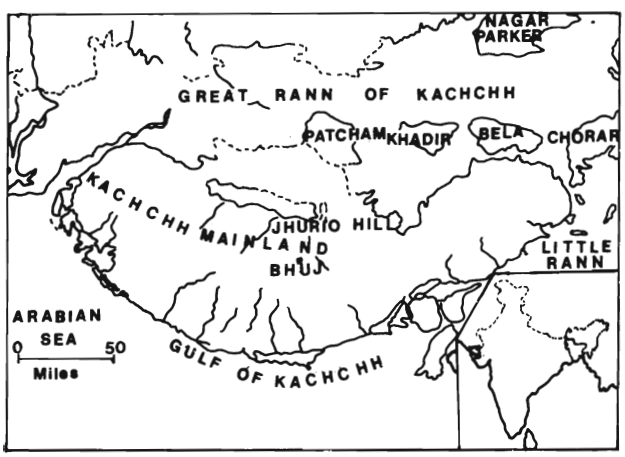

Fig.1. Location Map showing area of investigation

Redmond (1965) created the new genus *Pseudomarssonella* on the basis of its cribrate aperture, with closely spaced small pores on a flap that extends from the inner margin of the final chamber across the test and covering the umbilical region.

Later Banner *et al.* (1991) restudied and reillustrated the collection of Redmond and established a new genus *Redmondoides* to include some of the species of *Pseudomarssonella* having a much narrower apertural flap (or lips) and unimpeded interiomarginal aperture. The authors after thorough re-examination of specimens of *Pseudomarssonella* from Kachchh did not find any form with characteristics of the genus *Redmondoides* (Banner *et al.*, 1991), however, the authors came across the forms showing morphological similarities with *Pseudomarssonella* but differing in the presence of a groove running across the umbilical area filled with an irregular calcareous mass and cribrate aperture scattered on the entire surface of chambers of the last whorl.

The above characteristics have been confirmed under Scanning Electron Microscope, as well as by the study of axial sections (Pl. IV, figs. 5-8). Thus the creation of a new genus *Indomarssonella* is necessitated.

In their latest classification, Loeblich & Tappan (1988) have included *Pseudomarssonella* in the subfamily Minouxinae of family Eggerellidae, on the basis of presence of canaliculate wall structure. They have considered the presence of canaliculi in the walls of Textulariids with calcite cement as a characteristic feature. However, Banner & Desai (1985) and Desai & Banner (1987) have pointed out that canaliculi evolved independently at different times in the Mesozoic and Palaeogene and superfamilies can not be distinguished by this one morphocharacter alone. Based on detailed work on the wall structure of *Pseudomarssonella* and related forms, Banner *et al.* (1991) placed the genus *Pseudomarssonella, Redmondoides, Riyadhella* and *Riyadhoides* in the subfamily *Paravalvulininae* of the family Chrysalidinidae. They further discussed the taxonomic 'significance of canaliculi

and concluded that the development of canaliculation is gradational from an initially random pattern of calcareous microgranules, and that the canaliculi might develop at various late ontogenic stages, while their presence or absence cannot be used to define supraspecific differences. After careful re-examination of the wall structure of the genus *Indomarssonella* (n.gen.) and *Pseudomarssonella* from Kachchh is found to be non-canaliculate (Pl. I. fig. 8; Pl. IV, figs. 9, 10) and hence the genera are placed in the subfamily Paravalvulininae.

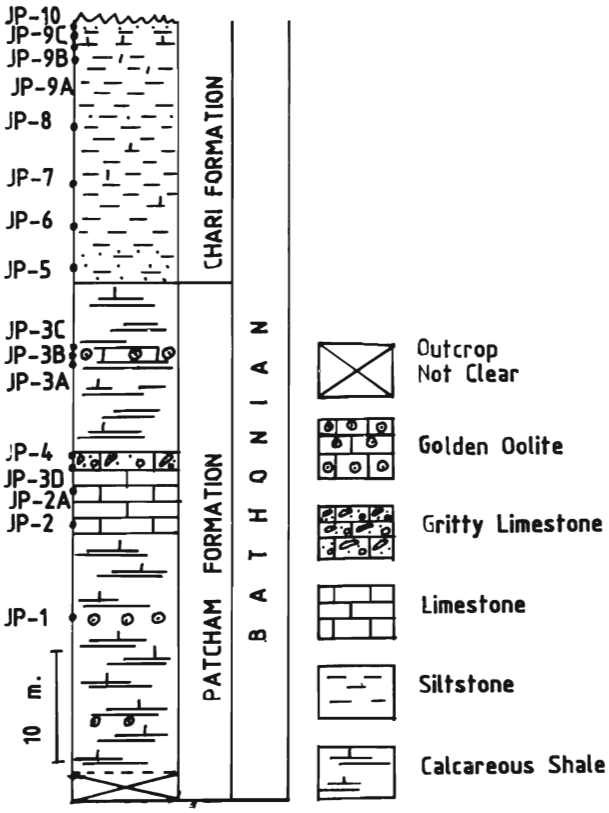

Fig.2. Simplified lithologic column of lower part of Jhurio Hill, Kachchh.

In Kachchh *Indomarssonella* n. gen. is confined to the calcareous shale and calcareous siltstone (JP-1, JP-5 to JP-10; fig. 2) which have been assigned a Bathonian age (Early to Late Bathonian) by Mandwal and Singh (1989) on the basis of presence of foraminiferal assemblage consisting of *Garantella ornata, G. cf. G. stellata, Epistomina turgidula, E. nuda, E. regularis, Pseudomarssonella inflata, P. primitiva, P. reflexa, P. biangulata, Riyadhella elongata, Singhamina rajasthanensis, S. jaisalmerensis* and *Tandonina paula* (Table 1).

Three species of *Indomarssonella* have been identified on the basis of the development of chambers in successive growth stages and shape of peripheral margin formed by the inflation of chambers of last whorl.

SYSTEMATIC MICROPALAEONTOLOGY

Superfamily Textulariacea Ehrenberg, 1838
Family Chrysalidinidae Neagu, 1968
Subfamily Paravalvulininae Banner, Simmons & Whittaker, 1991.
Genus *Indomarssonella* n. gen.
Type species *Indomarssonella eucona* n. sp.

(Pl. I, Figs. 1-8)

Diagnosis — Test conical, initially trochoid, rounded in cross-section with four to five chambers to a whorl; later portion rounded to subtriangular in cross-section with three to five chambers to a whorl. The size of chamber either increases gradually as added or it shows two distinct growth stages. Chamber surface generally smooth, flat to slightly inflated, chambers of the last whorl much inflated sometimes globular; periferal margin rounded to bluntly angled; sutures straight to arched, flush to distinctly depressed. Wall finely agglutinated with calcareous matrix. An elongate groove present at the

Table1: Distribution of *Indomarssonella* and associated marker species in Jhurio Hill, Kachchh.

AGE	BATHONIAN														
SAMPLE NO. / SPECIES	JP-1	JP-2	JP-2A	JP-3B	JP-3A	JP-3B	JP-3C	JP-4	JP-5	JP-6	JP-7	JP-8	JP-9A	JP-9B	JP-9C	JP-10
Garantella ornata	--															
Garantella cf.G.stellata	--															
Epistomina turgidula	—															
Epistomina nuda	—															
Epistomina regularis																
Pseudomarssonella reflexa	--														--	
Indomarsonella eucona												—	—	—	—	
Tandonina paula										--	--				—	--
Indomarssonella acrolimba	--									--	--	—		--	—	
Riyadhella elongata										--				--		
Indomarssonella goniata										--	--	—			—	--
Singhamina jaisalmerensis											--	--	--	--	--	
Pseudomarssonella inflata												--	--	--	--	
Singhamina rajasthanensis													--	--	—	--
Pseudomarssonella primitiva														--	--	
Pseudomarssonella biangulata														--	--	--

— 20 Specimens — 6-20 Specimens -- 6 Specimens

base of last formed chamber and running across the basal surface is filled with an irregular calcareous mass. Aperture cribrate, apertural pores scattered on the chambers of the last whorl.

Remarks — The grooved depression of *Indomarssonella* with calcareous filling removed, does not exhibit any apertural slit as seen in *Marssonella* Cushman (1933) or multiple aperture as seen on the chambers of the last whorl. The thin section shows an absence of an apertural flap in earlier whorls (Pl. III, figs. 5,6). Some variations are seen in the form of more inflated chambers, sometimes becoming more globular in the last whorl, peripheral margin rounded to bluntly angled and basal surface concave to flat.

Etymology — The name has been derived from the general similarity of the present form to the genus *Pseudomarssonella* and the prefix relates to the occurrence in India.

Indomarssonella eucona n. sp.

(Pl. II, Figs. 6-9; Pl. III, Figs. 1-6)

Material - 463 specimens.

Dimensions —

		Max. Length	Max. diameter
Holotype -	LUGM CF 24/01	0.30 mm.	0.18 mm.
Paratype -	LUGM CF 80/03	0.18 mm.	0.15 mm.
	LUGM CF 24/02	0.30 mm.	0.18 mm.
	LUGM CF 23/01	0.23 mm.	0.20 mm.

Diagnosis — Test elongate, broad cone, initially trochoid with 4-5 chambers. Chambers numerous, slightly inflated arranged in 5-9 whorls, gradually increasing in size as added and forming uniform profile. 3-5 chambers in final whorl, globular in shape, basal surface concave, peripheral margin rounded, sutures distinct, depressed. Wall finely agglutinated with calcareous matrix. An irregular calcareous mass filling up the grooved depression at the base of last-formed chamber. Aperture cribrate, with pores scattered on the chambers of the last whorl.

Variations — The forms having three chambers in the last whorl are always initially four chambered. The globularity of the chambers of the last whorl is more in the form having three chambers finally. On the basis of length breadth ratio of the test the species *Indomarssonella eucona* shows two distinct variations:

Variation 'A'— A long broad conical test consisting 6-9 whorls and 3-4 chambers in their final whorl (Pl. II, figs. 6-9). (293 specimens)

Variations 'B' — A short broad conical test consisting 5-6 whorls and 3-5 chambers in their final whorl (Pl. III, figs. 1-6). (170 specimens)

The scatter diagram of these two variations is given in fig. 3.

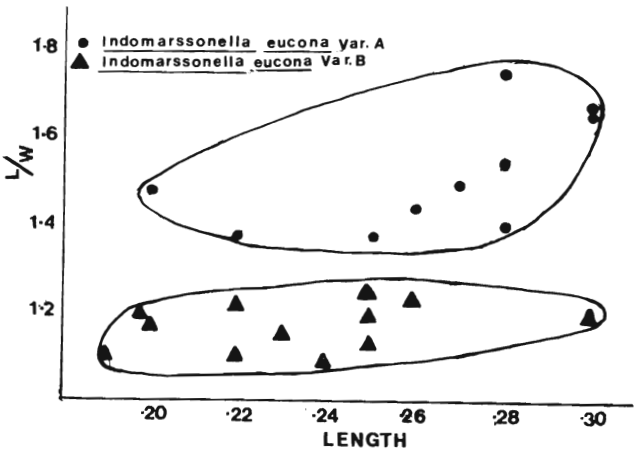

Fig. 3: Scatter diagram showing variation in *Indomarssonella eucona*. n. gen.

Occurrence and age — Yellowish calcareous shale/siltstone (JP-1), siltstone (JP-5 - JP-10); Patcham Formation, Chari Formation, Bathonian.

Type Locality — Jhurio Hill, Kachchh.

Respository — Museum of the Geology Department, Lucknow University, Lucknow.

Etymology — The prefix of the specific name has been derived from its regular length (Eu-normal) and suffix refers to its conical test.

Indomarssonella acrolimba n. sp.

(Pl. II, Figs. 1-5)

Material - 139 specimens.

Dimensions —

		Max. Length	Max. diameter
Holotype -	LUGM CF 19/01	0.35 mm.	0.18 mm.
Paratype -	LUGM CF 19/03	0.30 mm.	0.23 mm.
	LUGM CF 19/04	0.35 mm.	0.22 mm.
	LUGM CF 19/05	0.38 mm.	0.20 mm.
	LUGM CF 19/06	0.30 mm.	0.23 mm.

Diagnosis — Test elongate narrow to broad cone, initially trochoid with 4-5 chambers. Chambers flat, arranged in 7-9 whorls increasing rapidly in size as added, thus resulting in uniform profile. 4-5 slightly inflated chambers in their final whorl; basal surface nearly flat to concave; peripheral margin bluntly angled; sutures distinct, limbate, flush. Wall finely agglutinated with calcareous matrix. Irregular calcareous mass filling up the grooved depression at the base of the last-formed chamber. Aperture cribrate, apertural pores scattered on chambers of last whorl.

Variations— The forms having five chambers in their final whorl are broader than those having four chambers.

Remarks - In the number of whorls, uniform profile and degree of growth of chamber, the present forms resemble *Indomarssonella eucona* n. sp. However, *Indomarssonella acrolimba* differs from *I. eucona* in having much narrower cone, less inflated chambers, bluntly angled peripheral margin and flush limbate sutures as against rounded peripheral margin and distinctly depressed sutures of *I. eucona.*

Occurrence and Age - Yellowish calcareous shale/siltstone (JP-1), siltstone (JP-6 - JP - 9c); Patcham Formation, Chari Formation; Bathonian.

Type locality : Jhurio Hill, Kachchh.

Repository — Museum of the Geology Department, Lucknow University, Lucknow.

Etymology — The prefix of the specific name has been derived from its shape of peripheral margin (acro-sharp) and later part refers to its peripheral margin (limb-edge, border).

Indomarssonella goniata n. sp.

(Pl. II, Figs. 10-12; Pl. III, Figs. 7-9; Pl. IV, Figs. 1-4)

Material — 80 specimens.

Dimensions —

		Max. Length	Max. diameter
Holotype -	LUGM CF 25/01	0.30 mm.	0.18 mm.
Paratype -	LUGM CF 18/01	0.20 mm.	0.15 mm.
	LUGM CF 17/01	0.25 mm.	0.20 mm.
	LUGM CF 22/01	0.33 mm.	0.20 mm.

Diagnosis — Test elongate, narrow to broad conical, having two distinct stages of coiling. Initially trochoid with 4 chambers. Chambers of first stage arranged in 5-6 whorls, increasing slowly in size as added forming an elongate narrow cone, covering one-third to half of the length of the test; those of later stage, inflated, arranged in 2-4 whorls, suddenly increasing in size forming a distinct angle between successive growth stages. Last whorl has 3-5 globular or inflated chambers. Basal surface concave; peripheral margin rounded; sutures distinct, flush to depressed. Wall finely agglutinated with calcareous matrix. Irregular calcareous mass filling up the grooved depression at the base of the last form chambers. Aperture cribrate, apertural pores scattered on the chambers of the last whorl.

Variations — On the basis of the development of the chambers in their second stage, *Indomarssonella goniata* n. sp. can be divided into two variations:

Variation 'A' — The chambers increase more in height than in breadth as added, resulting in an elongate, narrow cone (Pl. III, figs. 7-9 & Pl. IV, figs. 1-2). (45 specimens)

Variation 'B' — The chambers increase more in breadth than in height as added, giving a broad conical shape to the test (Pl. IV, figs. 3-4). (35 specimens)

Remarks — *Indomarssonella goniata* differs from *Indomarssonella eucona* and *Indomarssonella acrolimba* in its diagnostic character of two distinct stages of development of chambers.

Occurrence and Age — Siltstone (JP-6, JP-8 - JP-9c), Chari Formation: Bathonian.

Type Locality — Jhurio Hill, Kachchh.

Repository — Museum of the Geology Department, Lucknow University, Lucknow.

Etymology — (Gonio-Angle). The name is derived from its distinctive angle at the junction of the two growth stages.

ACKNOWLEDGEMENTS

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EXPLANATION OF PLATE

Plate I

1-8 *Indomarssonella n.gen. (I. eucona)*

1. View showing arrangement of chambers. LUGM CF 90/01 x 410.
2. Side view, LUGM CF 90/02 x 300.
3. Tilted view, showing filling of secondary matrix within groove, LUGM CF 90/02 x 406
4. Umbilical view, showing cribrate aperture pores scattered in all chambers of the last whorl, LUGM CF 90/04 x 335.
5. Side view, showing nature of sutures, LUGM CF 90/05 x 232
6. Umbilical view, showing apertural pores, LUGM CF 90/06 x 140
7. Top view, at high manification showign apertural pores, LUGM CF 90/07 x 953.
8. View, showing wall structure, LUGM CF 90/08 x 1800.

Plate II

1-5. *Indomarssonella acrolimba* n.sp.

1 side view, LUGM CF 19/03 x140

2 Apertural view, LUGM CF 19/03 X 145 (showing apertural pores)

3 Apertural view, LUGM CF 19/03 x 190 (showing five chambers)

4 Side view, LUGM CF 19/01 (Holotype) x 137

5 Oblique apertural view, LUGM CF 19/01 (Holotype) x 266

6-9 *Indomarssonella eucona* n.sp.

6 Side view, LUGM CF 24/01(Holotype) x 186

7 Apertural view, LUGM CF 24/01 x 200

8 Side view, LUGM CF 21/03 x 179

9 Oblique apertural view, LUGM CF 21/03 x 208

10-12 *Indomarssonella goniata* n.sp.

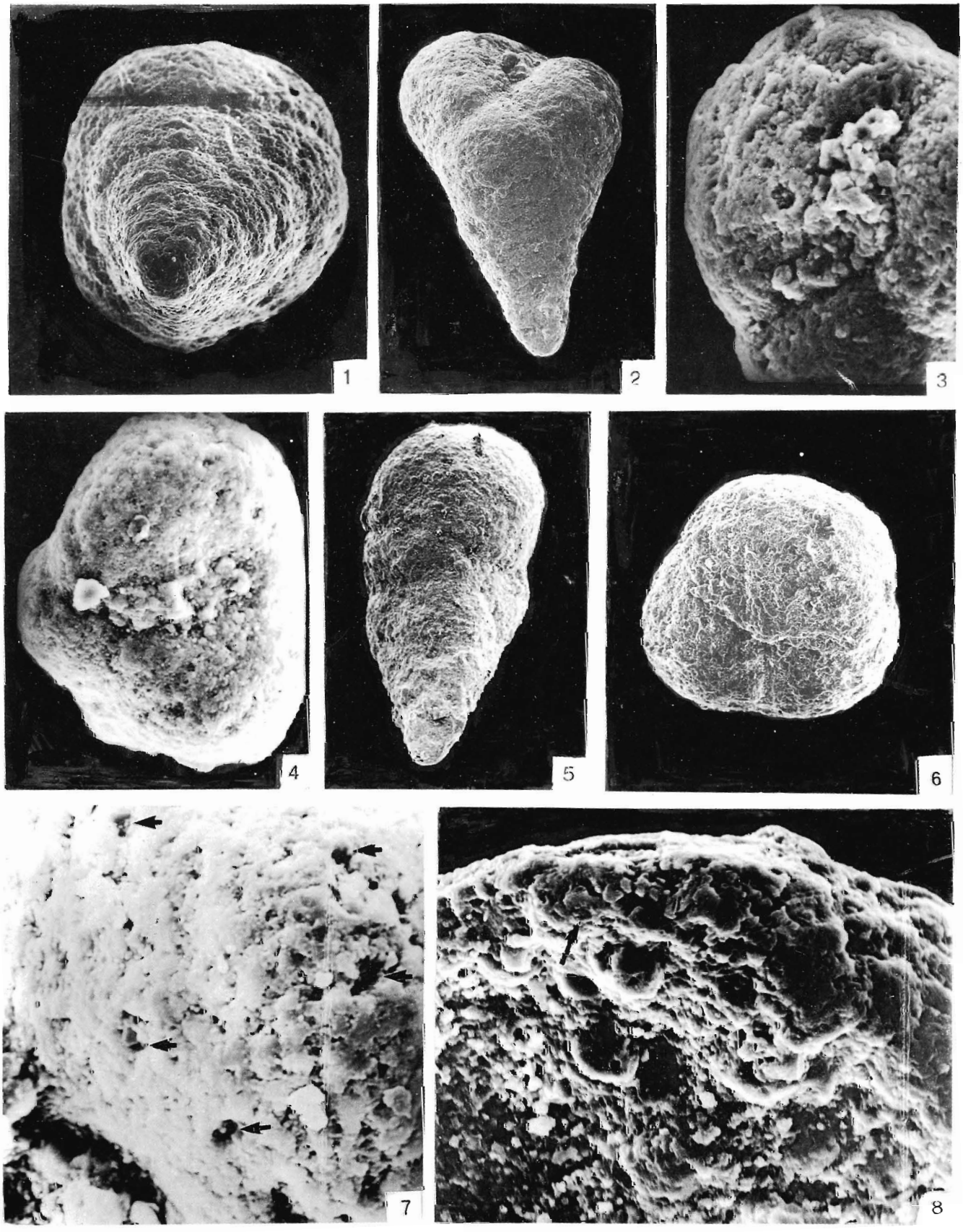
10. Side view, LUGM CF17/01 x 176
11. Oblique apertural view, LUGM CF 17/04 x 238
12. Side view, LUGM CF 17/04 x 193

Plate III

1-6. *Indomarssonella eucona* n.sp.
1 Side view, LUGM CF 23/04 x 186
2. Oblique apertural view, LUGM CF 23/04 x 169
3. Side view, LUGM CF 80/02 x 318
4. Apertural view, LUGM CF 80/02 X 319
5. Side view, LUGM CF 80/03 x 181
6. Oblique apertural view, LUGM CF 80/03 X 263
7-9. *Indomarssonella goniata* n.sp.
7. Side view, LUGM CF 22/04 x 140
8. Side view, LUGM CF 22/01 x 185
9. Apertural view, LUGM CF 22/04 X 189

Plate IV

1-4 *Indomarssonella goniata* n.sp.
1. Side view, 25/01 (Holotype) x 175
2. Oblique apertural view, LUGM CF 25/01 (Holotype) x 206
3. Side view, LUGM CF 18/01 x 211
4. Oblique apertural view, LUGM CF 18/01 x 260
5-6 *Indomarssonella eucona* n. sp.
5 Vertical section under crossed Nicol x 357
6. Vertical section under polarised light x 238
7-8 *Pseudomarssonella inflata* Redmond
7. Vertical section under crossed Nicol x 205
8. Vertical section under polarised light x 205
9. *Indomarssonella* n.gen. Wall structure x 1733
10. *Pseudomarssonella* Redmond Wall structure x 184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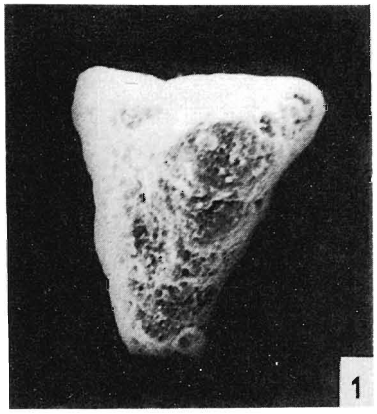
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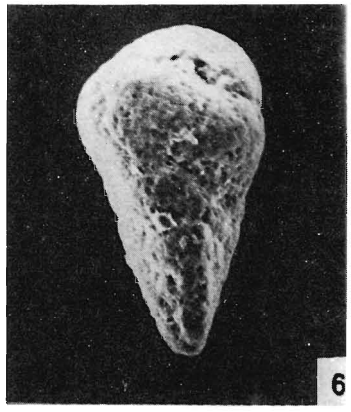
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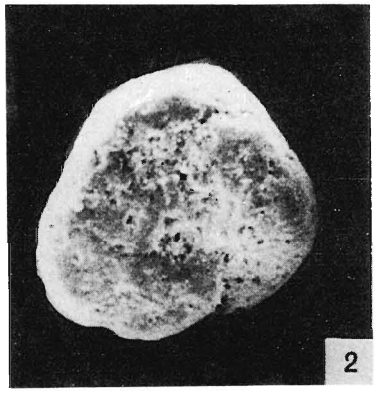
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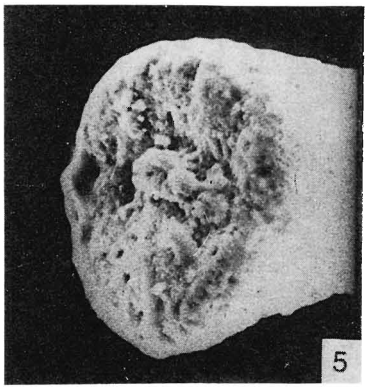
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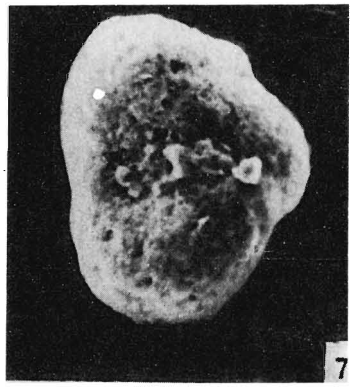
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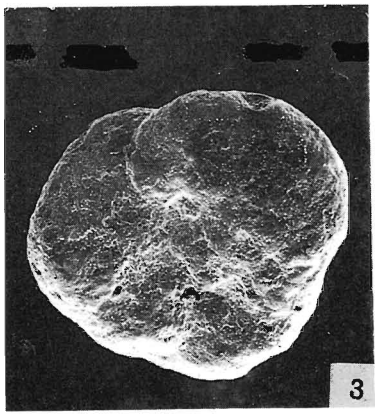
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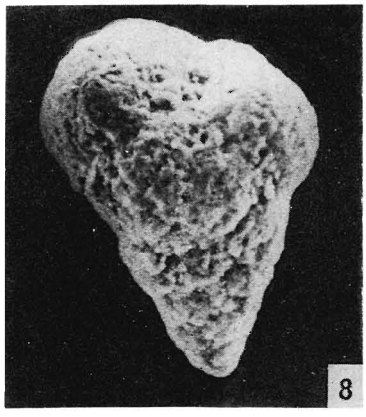
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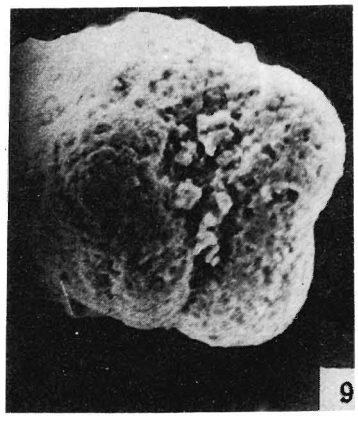
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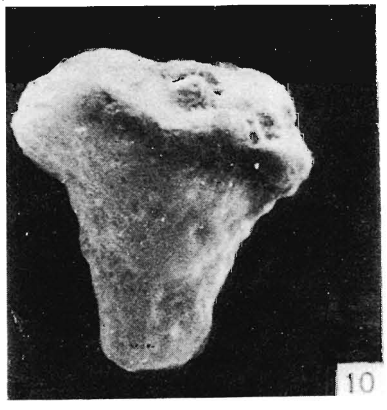
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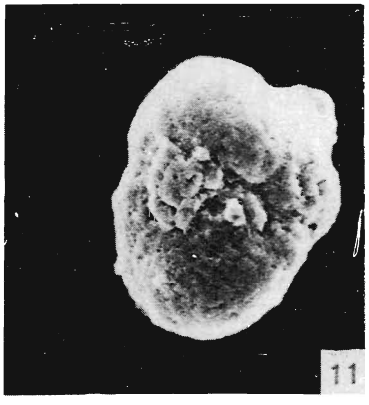
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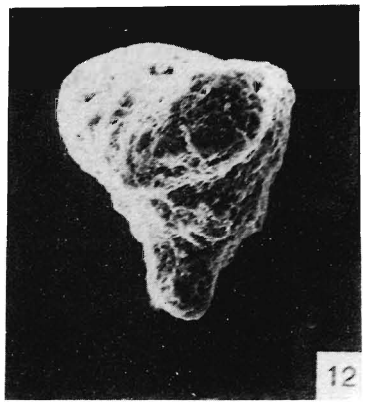
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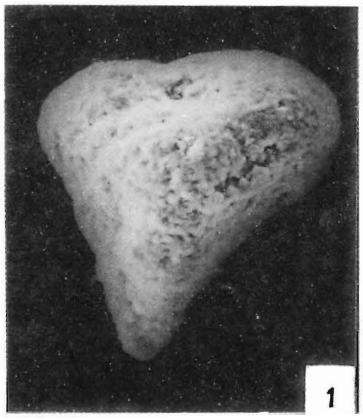
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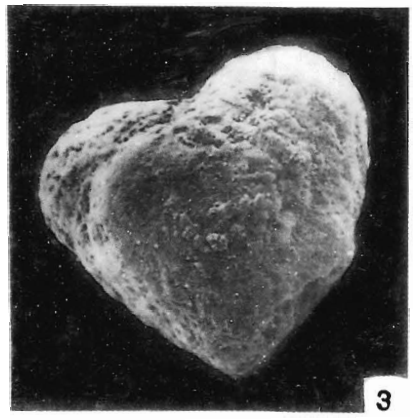
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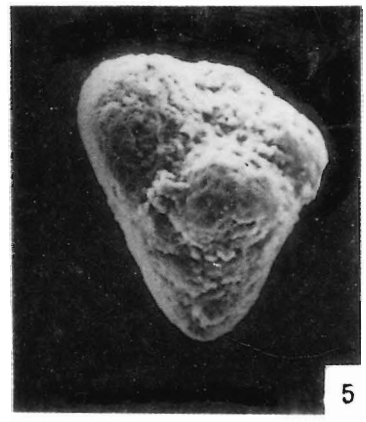
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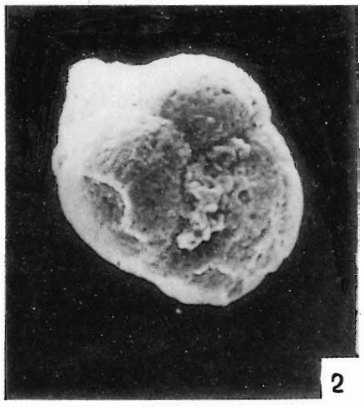
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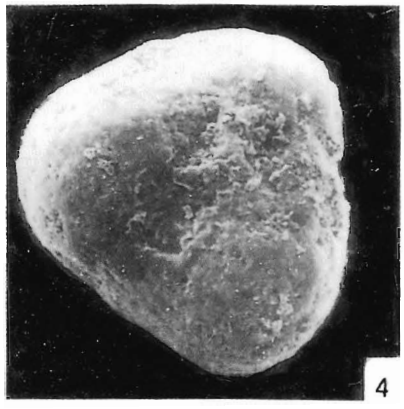
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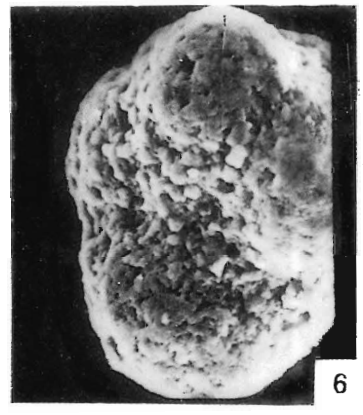
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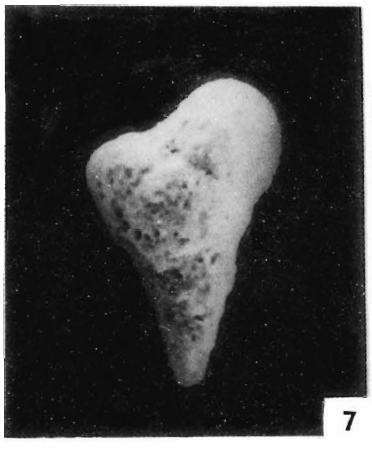
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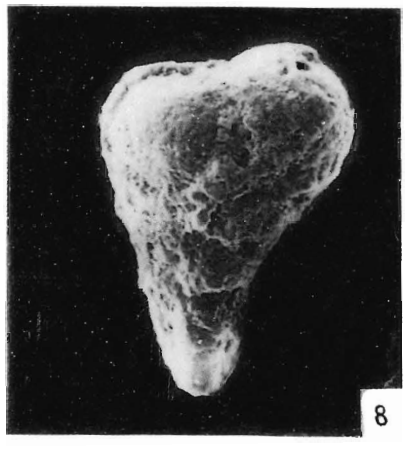
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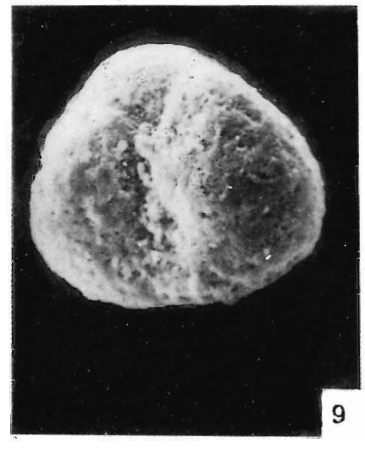
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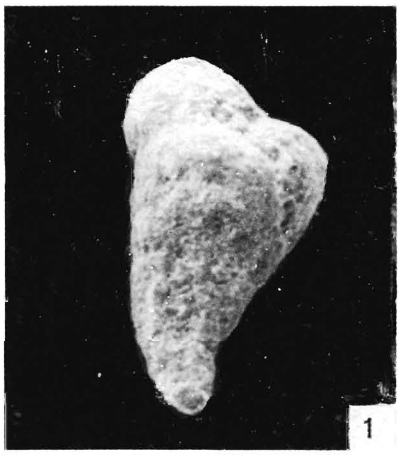
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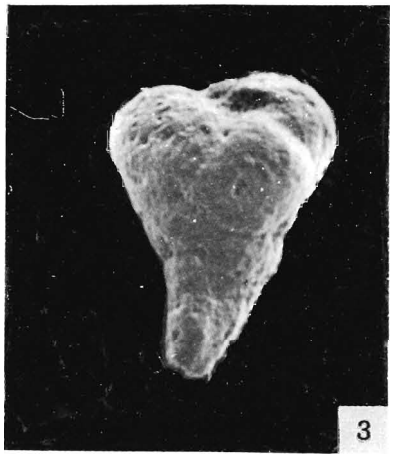
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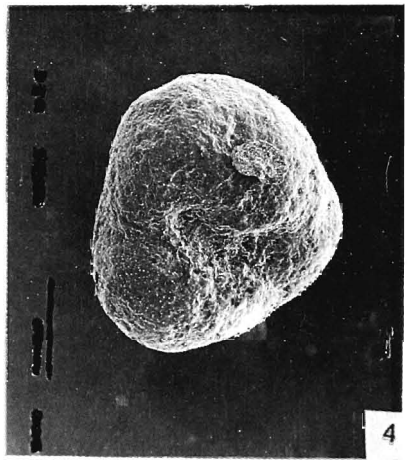
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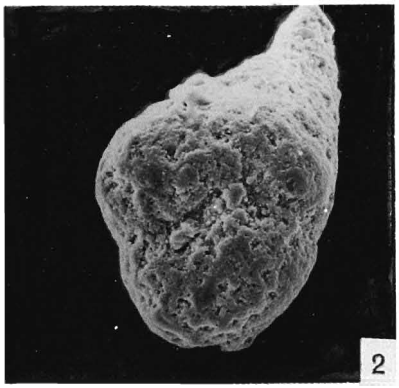
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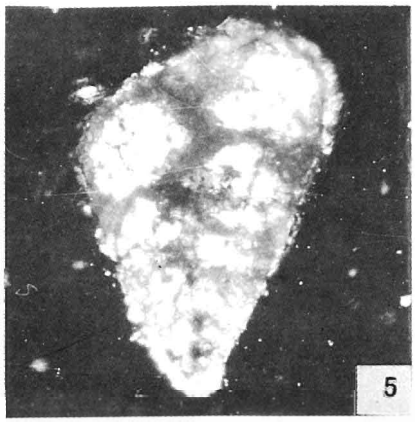
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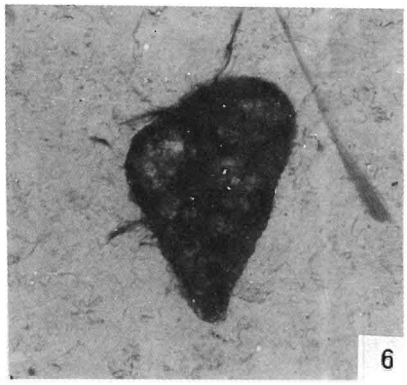
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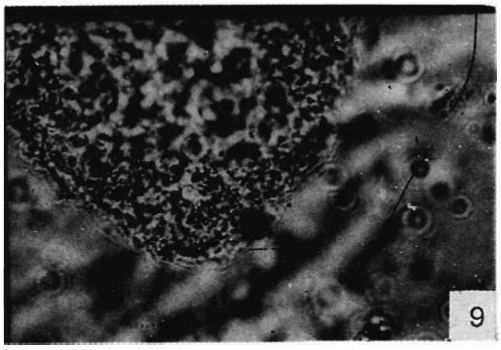
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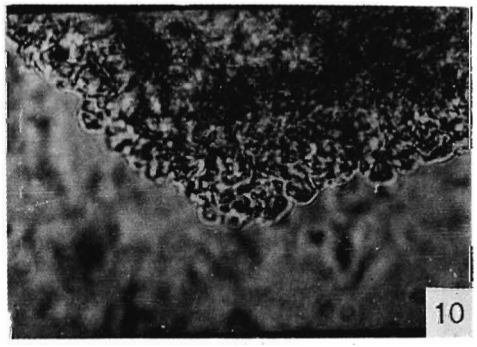
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