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A NEW PROBLEMATIC MICROFOSSIL FROM THE EOCENE OF  
WESTERN EUROPE

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A new problematic microfossil named *Aubertianella keiji* gen. et sp.n. is described from the Lower Eocene (Ilerdian) of Spain and Lower Eocene (Ypresian) of Belgium. It is compared with other problematics, often considered as tintinnids; the systematic position of the discussed forms is revised.

Key words: Paleogene, Problematica, taxonomy, W. Europe.

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## INTRODUCTION

In samples from the Lower Eocene of Belgium and Spain the author has found monothalamous, calcareous microfossil, named *Aubertianella keiji* gen. et sp.n., referred to here as the so called problematica.

*Aubertianella* is similar to some of the microfossils assigned by Tappan and Loeblich (1968), Loeblich and Tappan (1969), Loeblich and Tappan (in: Hedley and Adams 1974) to tintinnids i.e. planktic, ciliate Protozoa. Forms grouped by the above mentioned authors into tintinnids are morphologically greatly diversified. They differ in general appearance as well as in the number and distribution of openings, and wall ornamentation. According to the present author they hardly may be considered related to each other.

*Aubertianella* in its most general appearance resembles particularly *Yvonniellina*, *Pseudoarcella* and other similar forms discussed in the following part of this paper. The shape and morphology of the test belonging to the listed genera, as well as the state of preservation of the singular representative of *Aubertianella* from the Spanish Eocene, seem to prove that they do not represent planktic organisms.

The described material is housed at the Institute of Paleobiology of the Polish Academy of Sciences in Warsaw (ZPAL).

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Dr. A. Nowakowski (Warsaw University) performed the analysis of the test structure in the thin sections.

SEM-photographs were made in the Electron Microscopy Laboratory of the Nencki Institute of Experimental Biology in Warsaw.

## CHARACTER OF THE GEOLOGICAL SAMPLES

The sample from Spain comes from the geological profile in the Tremp region (The Middle Pyrenaican Depression), from the lower part of the Ager Formation, from the uppermost beds with *Lucina corbarica*, referred to Ilerdian (type section). The sample was taken by H. Górka during the XIII European Micropaleontological Colloquium in 1973; in the guide book, the illustrated profile containing Ager Formation is marked as "stop 2".

The mentioned beds represent nearshore, transgressive deposits consisting of lagoon to bay sediments intercalated by muddy sandy skeletal limestone and fine grained muddy sandstone. Microfossils occurring there contain large- and microforaminifera (without planktic forms), ostracodes and calcareous nannoplankton. Listed from here *Yvoniellina* (*recte Yvonniellina*) sp. aff. *feugueuri* is referred by Ferrer *et al.* (*in*: Luterbacher 1973) to microforaminifera.

In the sample studied by the author, representatives of *Yvonniellina* are lacking, there are, however, numerous specimens belonging to *Pseudarcella* cf. *rhumbleri* Spandel (see pl. 14: 1, 2).

Details concerning the mentioned profile and its faunal content are given in the guide book to the XIII European Microp. Coll., Spain 1973, on pp. 113—140.

The sample from Belgium comes from the sandy sediments of the Ypresian age and was taken from Saint Aubert (known as Mont de la Trinité) by Prof. W. Pożaryski during the VIIth European Micropaleontological Colloquium in Holland and Belgium, in 1961. Sampled outcrop is marked as "point 16" in the guide book to the colloquium.

Microfossils occurring there, as stated by the present author, belong to the large- and microforaminifera (including planktic forms), ostra-

codes, and the above mentioned *Pseudoarcella*, as well as, *Voorthuyse-niella* Szczechura, 1969, and *Bignotella* Willems, 1975.

The type of sediment, as well as the occurring microfossils suggest that it was deposited in a shallow, neritic sea, however relatively deeper, or more open one than the collecting beds with *Lucina corbarica*, in the Tremp profile, in Spain.

#### SYSTEMATIC DESCRIPTION

##### *Aubertianella* gen.n.

*Type species:* *Aubertianella keiji* gen. et sp.n.

*Derivation of name:* *Aubertianella* — after Mont Saint Aubert, where the type species was found.

*Diagnosis.* — As for the type species.

*Aubertianella* is a monotypic genus, established to include *A.keiji* sp.n.

*Geographical and stratigraphical distribution.* — Lower Eocene (Ilerdian) of Spain and Lower Eocene (Ypresian) of Belgium.

##### *Aubertianella keiji* gen.et. sp.n.

(pl. 11: 1, 2; pl. 12: 1; pl. 13: 1—4; pl. 14: 3; pl. 15: 2—4; pl. 16: 1ab (b))

*Holotype:* ZPAL V.VIII/1; pl. 11: 1.

*Type horizon:* Lower Eocene (Ypresian).

*Type locality:* hill named Mont Saint Aubert (Mont de la Trinité) near the village Mont Saint Aubert, Belgium.

*Derivation of the name:* *keiji* — named in honour of the known micropaleontologist Dr. A. J. Keij, of Holland.

*Diagnosis.* — The general appearance of the test is cone-shaped. It consists of the main, oral part, which is more or less globulous and aboral part, elongated to a different degree, and centric in position. Oral part of the test has a circum-oral disc, which is flat and covered to a different degree by irregular pillars concentrically arranged around the oral opening. Distal part of the circum-oral disc is rounded and armored by 4—9 spines, which are in most cases bifurcated. Aboral end is pierced by a straight canal and most probably ended by a tiny opening. Test surface is smooth or weakly ornamented. Average breadth—0.200 mm; average height—0.250 mm.

*Material.* — 83 specimens (including 72 from Spain and 11 from Belgium) in different states of preservation.

Dimensions (in mm) of 30 specimens from Spain: ZPAL V.VIII/12—41.

|                    |       |
|--------------------|-------|
| Maximum breadth *) | 0.246 |
| Minimum breadth    | 0.195 |
| Maximum height *)  | 0.340 |
| Minimum height     | 0.170 |

\*) without spines

Dimension (in mm) of 6 specimens from Belgium:

|                  | Form A        |           |           |
|------------------|---------------|-----------|-----------|
|                  | ZPAL V.VIII/2 | V.VIII/42 | V.VIII/43 |
| Breadth          | 0.166         | 0.180     | 0.170     |
| Height           | 0.233         | 0.240     | 0.210     |
| Number of spines | 6             | 7         | 7         |

|                  | Form B        |          |           |
|------------------|---------------|----------|-----------|
|                  | ZPAL V.VIII/1 | V.VIII/3 | V.VIII/10 |
| Breadth          | 0.200         | 0.200    | 0.190     |
| Height           | 0.166         | 0.150    | 0.170     |
| Number of spines | 8             | 8        | 9         |

*Description.*—The test cone-shaped in general appearance, having a more or less cup-shaped upper part (enlarging upwards) and a stem-like lower part (narrowing downwards). The cup-shaped part may be widened to a different degree. The axis of the test is straight or slightly arched; sometimes only the lower part of the test is somewhat deviate from the straight axis of the upper part of the test. In all cases, however, the stem is subcentrally situated in relation to the cup-shaped part of the test. Upper part of the test is covered by a flat disc, which sometimes is obliquely situated in relation to the test-wall. The disc has an oral opening in its middle, the radius of which is 1/5 of the radius of the entire disc. The entire surface of the disc or only the surface around the oral opening is covered by sharp, elongated pillars, oriented in one direction (it may be supposed that they are biocrystals). These are perpendicular to the disc surface (see pl. 12: 1b, 1c) and are concentrically and tightly arranged around the opening. The distal part of the disc i.e. the ridge of the aboral part of the test is rounded and armored by 4–9 generally bifurcated spines. Spines are oriented outside the test, however their branches are distinctly turned towards the oral opening. The length of the entirely preserved spines is no more than 1/5 of the length of the test. The stem, which generally seem to be damaged (?) is pierced by a straight, narrow canal and appears to be ended by a small opening. It is not excluded, however, that the mentioned opening is a secondary feature. The test surface is smooth or partially covered by a weak reticulation.

Thin section of the test, observed in polarized light, reveals wavy extinction of the light, suggesting that the wall of the test is fibrous in structure and its structural units are parallel to the test-surface. Observation made in transmitted light (see pl. 15: 4) as well as in reflected light (in scanning electron microscope) (see pl. 15: 2) do not reveal fibrous structure of the wall.

Dimensions of tests differ from 0.166 mm to 0.246 mm in the width and from 0.166 mm to 0.340 mm in the length.

*Variation.*—Variation of the described specimens depends on the origin of the material. It also results from the state of preservation of the material. Specimens from Spain are milky, dull, with damaged spines and obscured ornamentation of the peri-oral disc. Specimens from Belgium are glossy, transparent, with well preserved, distinctly bifurcated spines and finely ornamented adoral side. At the same time specimens from Spain are larger than those from Belgium and sometimes a little compressed laterally. Within specimens representing *Aubertianella keiji* the number of spines differs from 4 to 9 (not counting their branches). In the case of the Spanish material this difference applies to the specimens which are only weakly differentiated in their general appearance, while in the case of the Belgian material, where the specimens are widened to a different degree in their upper part, the smaller number of spines is attributed to the narrower specimens (cf. pl. 11: 1 and pl. 11: 2). It seems reasonable to distinguish at least two morphotypes within the studied population of *Aubertianella keiji* from Spain: A for forms with a narrow cup-shaped

part of the test and a small number of spines and—B for forms with a wide cup-shaped part of the test and more numerous spines. Specimens from Spain are close to form A, of Belgium.

*Occurrence.*—Lower Eocene (Ilerdian) of Spain and Lower Eocene (Ypresian) of Belgium.

*Remarks.*—The general appearance and size of the test, as well as the composition of the test wall of *Aubertianella* are similar to those features in calcareous microfossils called *Tytthocorys*, *Remanellina*, *Yvonnellina* (all described by Tappan and Loeblich 1968, from the Lower Tertiary deposits of Europe and USA); they are also similar to those specimens referred to as *Conicarcella* and *Spinarcella* (both described by Keiji, 1968, from the Lower Tertiary sediments of Europe) and *Pseudoarcella* s.l. (described by Spandel 1909, emended by Lindenberg 1965, known from the Tertiary of Europe and USA, Caribbean region). Of these *Conicarcella* is regarded by Loeblich and Tappan (*in*: Hedley and Adams 1974) as a junior synonym of *Yvonnellina*, whereas Willems (1975) describes *Conicarcella* as a subgenus of *Yvonnellina*.

The common feature of the mentioned forms is the monothalamous, cup-shaped, imperforate, calcite test, in which the stem is developed to a different degree, being situated ex-or centrally in relation to the rest of the test. The stem is pierced by a canal and seems to be ended—at least in most cases—by an opening. An additional, common feature of the discussed forms is also the circum-oral disc, bordering the oral opening; this latter is of a different diameter but generally relatively small.

Differences between the compared forms i.e. *Aubertianella* gen.n. and others mentioned above, apply to their morphology. *Aubertianella* bears bifurcated spines, bordering the adoral side of the test, having at the same time morphologically diversified surface of the circum-oral disc i.e. with pillars around the oral opening. No one of these features is known in the mentioned forms except *Aubertianella*.

The structure of the test of the analysed forms is not very different. In *Aubertianella* it is fibrous and the structural units of the test-wall are parallel to its surface. In the compared forms it is more or less complicated—sometimes tripartite—but generally hyaline, radial, cryptocrystalline etc. Specimens of *Pseudoarcella* from the Ager formation, from Spain (pl. 15: 1), observed by the present author in thin section, in polarized light, reveal radial structure of the test-wall i.e. the same as observed in the representatives of that genus by the other authors, e.g. Tappan and Loeblich (1968). It is probable that the structure of the test-wall is a diagnostic feature of the genus, within the group of the discussed microfossils.

#### DISCUSSION ON THE SYSTEMATIC POSITION OF AUBERTIANELLA AND FORMS PROBABLY RELATED TO IT

Summarizing the classification of the discussed forms i.e. *Tytthocorys*, *Remanellina*, *Yvonnellina*, *Pseudoarcella* and *Conicarcella*—it would be said, that earlier some of them e.g. *Pseudoarcella*, were affiliated with foraminifera (see: Le Calvez 1959; Loeblich and Tappan (*in*: Moore 1964)). Also *Yvonnellina* (*recte* *Yvonnellina*) was referred to foraminifera by Ferrer *et al.* (*in*: Luterbacher 1973). In 1965 Lindenberg determined *Pseudoarcella* as "Problematica" and his opinion was accepted by Keiji (1969) who distinguished within the so-called *Pseudoarcella* two new

genera i.e. *Conicarcella* and *Spinarcella*. Also Szczuchura (1969) excluded *Pseudoarcella* (recte *Yvonniellina*) *feugueuri* and *P.*(recte *Yvonniellina*) *glabra* (both from the Eocene of Poland) of foraminifera, assigning them to problematica.

Tappan and Loeblich (1968), erecting new genera i.e. *Tytthocorys*, *Remanellina* and *Yvonniellina*, together with the other ones, mentioned above, attributed them to Tintinnida. Their opinion on the systematic position — of at least some of the discussed forms — was maintained later by Keij (1971) and Willems (1972, 1975).

It must be added, however, that Loeblich and Tappan (*in*: Hedley and Adams 1974) assigned to the fossil tintinnids — except those already mentioned forms also *Urnulella* and *Spinophenia*, both described by Szczuchura (1969) from the Eocene of Poland. These latter forms, greatly differ from the former in their general appearance, as well as, in the details of the morphology of the test and in the present author's opinion hardly may be compared with each other. Willems (1975), moreover, also assigned *Bignotella* to tintinnids, a form described by him from the Lower Tertiary of Belgium. According to the present author this form cannot be considered as related to *Aubertianella*.

Tappan and Loeblich (1968) and Loeblich and Tappan (1969), including all the mentioned above microfossils to tintinnids based mostly on their morphologic character and the nature of their test, especially in comparison with the analogous features of recent tintinnids. According to these authors (*l.c.*) the convergence of these features within the compared forms is so close that they should be referred to the common order i.e. Tintinnida.

According to the present author, however, morphological features of the recent tintinnids and the true, fossil ones i.e. calpionellas do not exactly correspond with those characteristic of the supposed tintinnids from the Tertiary. Also these latter may hardly be identified at the order level. *Spinophenia* e.g. bears numerous, patent spines and a narrow, sometimes (functionally?) modified oral opening. On the other hand *Urnulella* has a triangular oral opening and distinctly (functionally?) differentiated ornamentation of the lateral side of the test; additional remarks see Szczuchura (1969). All these features are unknown in the true tintinnids.

The true tintinnids generally have large, round "oral opening", generally as large as the main part of the test, which may be the result of the planktic life of these organisms. A large oral opening probably facilitates the movement of the peristome surrounding organelles, being the organelles of locomotion, and seems to be helpful during reproduction.

In recent Tintinnida reproduction is realized by budding; the descendant individual is almost completely formed by the maternal organism, within its test. At the time it is ready to leave the maternal test, it almost fills up its entire width (see Biernacka 1952).

The Tertiary "tintinnids" have a small oral opening, often situated in the middle of the lid-like, compressed side of the test, suggesting the tendency of these organisms to narrow the oral opening thus simplifying (?) its function. Small oral opening in the test may be seen in *Pseudoarcella*, *Conicarcella*, *Yvonniellina*, *Tythocorys* etc.

In *Aubertianella*, moreover, which seems to be related with these forms, there occur spines, limiting free area around the oral opening. Such spines are absent from living and fossil, so far known tintinnids, while are known in recent, sessile, softbody Ciliata. Also in some, only periodically mobile Ciliata, representing parasite forms, there occur, small oral opening and reduced membranellas.

An additional observation, provoking the present discussion on the systematic position of the mentioned Tertiary forms, is supplied by specimens from the Lower Eocene of Spain. It concerns a representative of *Pseudoarcella*, being attached to the test of *Aubertianella* (see pl. 16: 1). Undoubtedly the mutually subordinate shapes of both specimens seem to prove, that at least *Pseudoarcella* was sessile, and that its attachment to *Aubertianella* must have take place during the life of these both animals. The observed and illustrated phenomenon is the only one in the studied material, however, it does not seem to be an artefact.

All the above made comparisons and represented observations suggest prudence in the systematic classification of the Tertiary problematica, regarded by some authors as tintinnids.

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JANINA SZCZUCHURA

## NOWA PROBLEMATYCZNA MIKROSKAMIENIAŁOŚĆ Z EOCENU ZACHODNIEJ EUROPY

### Streszczenie

Z morskich, płytkowodnych osadów dolnego eocenu Belgii (Mont St. Aubert) i Hiszpanii (Trempe) autorka opisała mikroskamieniałość *Aubertianella keiji* gen. et sp. n., o nieznanym przynależności systematycznej.

Wapienna, jednokomorowa skorupka *A. keiji* ma postać kieliszka (max. wys. 0.340 mm), z wyraźnie zaznaczoną nóżką (pl. 11: 1; 2; pl. 12: 1; pl. 13: 1—4; pl. 14: 3; pl. 15: 2—4; pl. 16: 1 (b)). Rozszerzoną część skorupki przykrywa wieczko z otworem oralnym w środku, a jej krawędź obrzeżają rozdławiające się kolce. Nóżka wydaje się drożna. Ze względu na kształt i ilość kolców wyróżniono formę A i B.

Pod względem ogólnego planu budowy skorupki i jej struktury *A. keiji* przypomina niektóre mikroskamieniałości trzecieorzędowe obecnie przez większość autorów zaliczane do orzęsków planktonicznych, Tintinnida; w szczególności są to: *Yvonnellina*, *Pseudoarcella*, *Spinarcella*, *Conicarcella*, *Tythocorys*, *Remanellina* etc. Zasadnicza różnica pomiędzy wymienionymi formami i *Aubertianella* polega na tym, że tylko u *Aubertianella* występują kolce, a nadto ma ona zróżnicowaną morfologię wieczka przyoralnego. Zdaniem autorki różnice te nie wykluczają jednak pokrewieństwa wymienionych form, conajmniej na poziomie rzędu.

Porównanie diskutowanych form z niewątpliwymi tintinnidami kopalnymi i z współczesnymi i uwzględnienie, zapewne pierwotnego, stanu zachowania okazów *Pseudoarcella* i *Aubertianella* pozwalają kwestionować sugerowaną przynależność wyżej wymienionych, trzecieorzędowych „tintinnidów” (w tym *Aubertianella*) do orzęsków planktonicznych, nie przeczą jednak ich przynależności do orzęsków w ogóle.

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## EXPLANATION TO THE PLATES 11—16

## Plate 11

*Aubertianella keiji* gen.et. sp.n.

1. Forma B, holotype, ZPAL V.VIII/1,  $\times 180$ ; a oral view, b side view.
2. Forma A, ZPAL, V.VIII/2,  $\times 200$ ; a greatly oblique, side view, b oblique, side view.

Mont Saint Aubert, Belgium, Lower Eocene (Ypresian)

## Plate 12

*Aubertianella keiji* gen.et sp.n.

1. Forma B, ZPAL V.VIII/3; a side view,  $\times 190$ , b oral view,  $\times 200$ , c side view of the aboral end,  $\times 600$ , d details of the ornamentation of the circum-oral disc,  $\times 600$ .

Mont Saint Aubert, Belgium, Lower Eocene (Ypresian)

## Plate 13

*Aubertianella keiji* gen.et sp.n.

- 1—4. ZPAL V.VIII/4—7; a, b, c, d more or less oblique, side views.

Tremp, Spain, Lower Eocene (Ilerdian)

## Plate 14

*Pseudoarcella* cf. *rhumbleri* Spandel

1. ZPAL V.VIII/45,  $\times 140$ ; a oblique, side view, b side view.
2. ZPAL V.VIII/44,  $\times 140$ ; side view.

*Aubertianella keiji* gen.et sp.n.

3. ZPAL V.VIII/8,  $\times 140$ ; side view.

Tremp, Spain, Lower Eocene (Ilerdian)

## Plate 15

*Pseudoarcella* cf. *rhumbleri* Spandel

1. Frontal thin section seen in the polarized light, ZPAL V.VIII/47,  $\times 200$ .

*Aubertianella keiji* gen.et sp.n.

2. Transverse section of the crushed test to show microstructure of the wall, ZPAL V.VIII/9; a general view,  $\times 300$ , b enlarged fragment of the same section,  $\times 900$ .
3. Form B, ZPAL V.VIII/10,  $\times 133$ , a side view, b oral view.
4. Frontal thin section seen in the transmitted light, ZPAL V.VIII/11,  $\times 200$ .

1,4 Tremp, Spain, Lower Eocene (Ilerdian)

2,3 Mont Saint Aubert, Belgium, Lower Eocene (Ypresian)

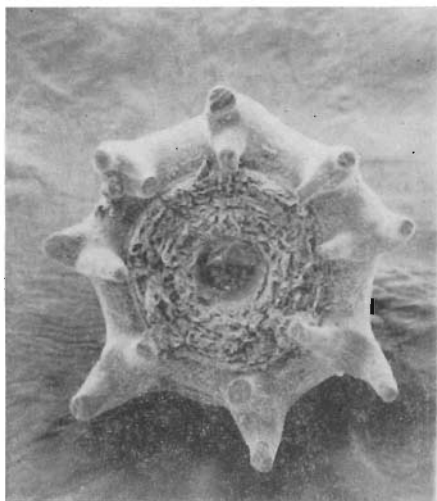
## Plate 16

*Pseudoarcella* cf. *rhumbleri* Spandel (a) attached to the test-wall of *Aubertianella keiji* gen.et sp.n. (b), ZPAL V.VIII/46,  $\times 250$ .

Tremp, Spain, Lower Eocene (Ilerdian)

All specimens except those on pl. 15: 1, 3, 4 are photographed in SEM

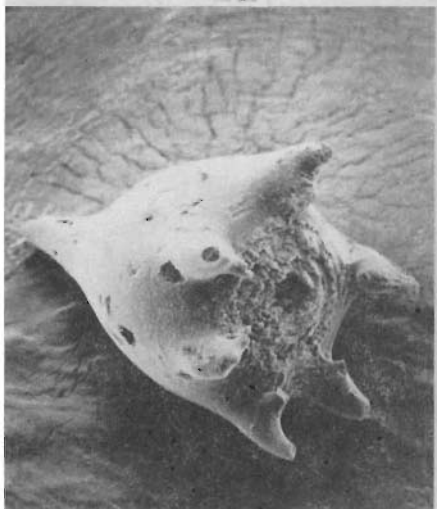
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1a



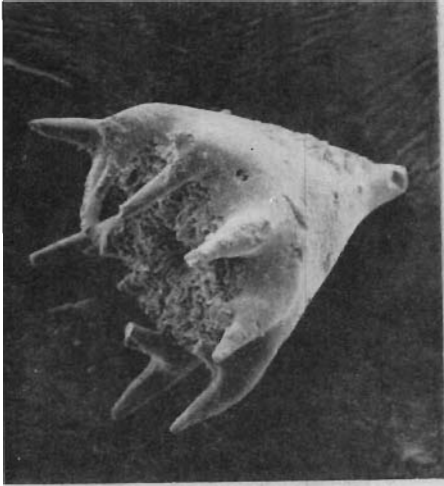
1b



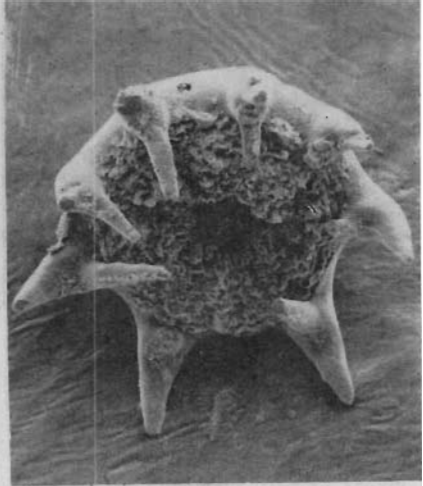
2a



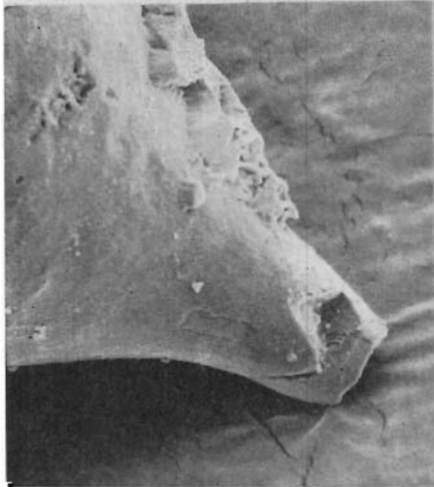
2b



1a



1b



1d



1c



1



2

3



4

