

ONCOLITES AND CATAGRAPHS FROM THE PRECAMBRIAN OF ZAIRE (LOWER ZAIRE, SHABA AND EASTERN KASAI)¹

by

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(4 plates and 1 table)

RESUME.- Des Oncolites et des Catagrapes du Précambrien du Zaïre (Bas-Zaïre, Shaba, Kasai oriental) sont décrits.

Les formes suivantes ont été observées : *Asterosphaeroides*, *Ambigolamellatus*, *Volvatella*, *Osagia* et *Vesicularites*.

ABSTRACT.- Oncolites and catagraphs from the Precambrian of Zaïre (Lower Zaïre, Shaba, and eastern Kasai) are described.

The recorded forms are *Asterosphaeroides*, *Ambigolamellatus*, *Volvatella*, *Osagia* and *Vesicularites*.

INTRODUCTION

"Oncolites" are small variously shaped (often spheroidal), concentrically laminated calcareous sedimentary structures, resembling an oolith and formed by the accretion of successive layered masses of gelatinous sheaths of blue-green algae. They are smaller than stromatolites and generally do not exceed 10 cm in diameter.

CAYEUX (1930, 1931) reported the presence of algal structure from the "Système Schisto-Calcaire" from Zaïre. CHOUBERT (1931, 1932) recorded the presence of algae from "Calcaire rose Oolithique" from the Kundelungu superior of Belgian Congo. The records are as follows :

Sycidium panderi f. minor Karpinsky

Sycidium dubosi sp. nov.

and *Robertia katangae sp. nov.*

HACQUAERT (1931a, 1931b) reported the presence of algal remains from the "Calcaire Rose" and limestone of the Kundelungu system of Katanga. A discussion on the distribution of algal remains in the Kundelungu system of Katanga was published by HACQUAERT (1932a,b). Later, the same author (1933) reported the existence of algae in the Oolith de Kisantu. HACQUAERT (1943) reported *Girvanella* from the "Mwaysa Oolite" of Katanga.

BERTRAND-SARFATI (1972) studied stromatolites from the Precambrian of Zaïre. Along with these,

remains of catagraphs viz. *Vesicularites* were also reported.

Catagraph is a complex structure made up of traces of canals and cavities, thought to be the result of the activity of Cyanophytes and bacteria in the Late Precambrian and Lower Cambrian.

SYSTEMATIC DESCRIPTIONS

I.- ONCOLITES & CATAGRAPHS FROM LOWER ZAIRE

Specimens RG 10881, 10884, 11249, 11430, 11615, 40370 and 211105 contain oncolites and catagraph. The six specimens belong to the Schisto-calcaire Group of the West Congolian Supergroup- using the new terminology of Cahen (in press) which replaces the former "faisceaux" (see LEPERSONNE, 1974) by "group" or "subgroup" -.

Specimens n° RG 11249 and 11430 were collected by J. LEPERSONNE.

N° RG 11249 is the well-known oolithic limestone, often silicified, known as the "Oolith de Kisantu". This specimen comes from the type locality, Kisantu, on the Inkisi river (5°07'30"S; 15°05'E). (Observation n° 752).

N° RG 11430 is another specimen of the "Oolith de Kisantu" from the Bongolo river, where it is crossed by the Ngidinga-Kinshasa road (5°22'S; 15°21'45"E). (observation n° 441).

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The "Oolithe de Kisantu" belong to the Bangu Subgroup (CIII). This subgroup corresponds approximately to the subdivision designated C 5 by DELHAYE & SLUYS (1929) and the base of the "Oolithe de Kisantu" is 20 to 40 m above the base of this subgroup. (LEPERSONNE, 1974). This horizon is often described as C 5B or C IIIb; it has yielded microfossils which were formerly described by CAYEUX (1930, 1931) and by HACQUAERT (1933).

Specimen n^o RG 40370 is a pseudo-oolithic rock, poor in carbonate, with carbonaceous joints. This is a core from drillhole GM Id from Bamba-Kilends (4°57'S; 15°30'E) (core nos 1122 to 1120, base at 69 m depth). The entire boring is described by L. CAHEN and J. LEPERSONNE in unpublished reports in the archives of the Geological Department of the Musee royal de l'Afrique centrale.

This rock belongs to the Bangu Subgroup (C III) it most probably belongs to the "Oolithe de Kisantu" formation but may also be a little higher up in the sequence.

Specimens n^{os} RG 10881 and 10884 were collected by A. de MONTPELLIER, in the immediate vicinity of Luozi, Lower Zaïre (4°57'S; 14°08'E).

N^o RG 10881 (collector's number D 228) is a pisolithic limestone which has been called the "Conglomerat du Luozi" (DELHAYE and SLUYS, 1929, p.68). It outcrops in Luozi township and has been the subject of a disproved palaeontological interpretation, the pisoliths having been mistaken for *Lepidotus* scales. (Priem, in DELHAYE & SLUYS, 1929, p. 69; HACQUAERT, 1944).

N^o RG 10884 (collector's number D 231/232) is a bluish-grey limestone with breccoid texture and a distinct fetid smell due to abundance of organic matter. It outcrops in the river Luozi, in the village near the township itself.

On the most recent maps (GERARDS, DELMOITIE - NICOLAI & LADMIRANT, 1969) it is seen that these rocks outcrop, near an important fault, in a narrow area marked C III/C II, e.g. undifferentiated Bangu subgroup (C III) and Lukunga Subgroup (C II). The abundance of organic matter is more typical of the former Subgroup than of the latter.

It is thus possible that RG 10881 at least, belongs to the "Oolithe de Kisantu". If this is not the case, it belongs to a not very much older horizon.

Specimen RG 11615 is an oolitic limestone belonging to the Lukunga Subgroup (C II, former C 4) and

was collected at Kinganga (5°18'S; 13°44'E) by J. LEPERSONNE, (Collection number 1133).

This specimen is certainly older than n^{os} RG 40370, 11249 and 11430 and probably older than RG 10881 and 10884.

The West Congolian Supergroup was folded during two successive fold phases : the first of these phases occurred just before 750 m.y. and the second at a later date, presumably earlier than 612 m.y. and certainly earlier than 564 m.y. (CAHEN, DELHAL, LEDENT, 1976). The entire West Congolian Supergroup rests disconformably or unconformably on granites c 1020 m.y. old. (TACK, 1973; CAHEN, DELHAL, LEDENT, 1976). The beds under study are thus comprised between these two extremes c 1020 m.y. - 750 m.y.

This interval can be considerably narrowed for the first six specimens by the following considerations.

The Lukunga Subgroup (C II) contains stromatolites which have been studied by BERTRAND-SARFATI (1972) who underlines their similarity to stromatolites found in the I 12 subdivision of the Atar Group, in the Adrar of Mauritania (west Africa). The Mauritanian beds have been dated by CLAUER, CAHEN (1973) on the basis of these ages and of BERTRAND-SARFATI's indications has concluded that the Lukunga Subgroup (C II) is c 800 m.y. old.

It is thus extremely probable that the first six specimens belong in the range : c 800 m.y. to c 750 m.y.

The seventh specimen, n^o 21105 is a chert clast derived from the Sansikwa Group of the West Congolian Supergroup, found in the Lower Mixtite of Bas Zaïre (CAHEN and LEPERSONNE, 1976) by J. LEPERSONNE, in the Massif of Sansikwa-Lungezi (5°43'S; 14°17'E). The collectors number is L 1014.

This specimen is younger than c 1020 m.y. and much older than 800 m.y., it is probably in the 1020-900 m.y. time range.

As far as one can make sure, the positive specimens (to-date) are : Bas-Zaïre : R.G. 10881, 10884, 11249, 11430, 40370, 11615, 21105. The stratigraphical order is from top to bottom :

(5) 40370

(4) 11249 - 11430

(3) 10884 - 10881

(2) 11615

(1) 21105

5), 4), 3) and 2) are not stratigraphically very distant from each other :

- (5) & (4) are classified low down in C III
 (3) is uncertain C III/C II
 (2) is C II.

All are between c 800 m.y. and 750 m.y. and in the Schisto-calcaire Group.

Only 11249 and 11430 belong to the "Oolithe de Kisantu" 40370 and 10881 may belong to it.

- (1) is a clast derived from the top of the San-sikwa Group, found in the Lower mixtite of Bas-Zaire.

A.- ONCOLITES

ASTEROSPHAEROIDES (REITLER)

Asterosphaeroides asymmetricus f. nov.

Pl. 1 : 1, 2.

Diagnosis : Tumour oval or irregular form of different size, membrane absent; around central nucleus several fine concentric rings are found, rings closely arranged, these rings are transversally cut by several divergent rays like structures radiating from the central point, and running towards the periphery of tumour. The transverse structures are more pronounced than the radial structures.

Size Range :

Dimensions : 2 mm to 12 mm

Common forms : 4 mm

Comparison : *Asterosphaeroides serratus*. ZHURAVLEVA (1968, Pl. III : 2) differs in possessing circular shape, with concentric rings arranged in regular pattern.

AMBIGOLAMELLATUS (ZHURAVLEVA)

Ambigolamellatus zonatus f. nov.

Pl. 1 : 1, 3.

Diagnosis : Tumour circular to oval in outline, commonly circular, a thin membrane is present all round, distinct lamellate zones are present, commonly four zones marked, inner central nucleus zone encircled by three narrow zones.

Size Range :

Dimensions : 0.5 mm - 1.5 mm

Common : 0.5 mm

Comparison : *Ambigolamellatus horridus*, ZHURAVLEVA (1968) recorded from the Riphean section of

South Urals has much higher number of lamellations in comparison to the present specimen.

Ambigolamellatus ovatus f. nov.

Pls. 1, 2 : 5, 8-9.

Tumour oval in outline, tumour either solitary or 2 or 3 tumours grouped together in a common many layered enveloped sheath. Each tumour has central oval nucleus encircled by lamellate rings 1, 2 or 3 in number.

Size Range :

Single tumour : Size 1-2 mm (common 1 mm)

Enclosing 2 tumour : Size 1-2 mm (common 2 mm)

Enclosing 3 tumour : Size 2 mm.

Comparison : The present form differs from the previous known species in its characteristic oval shape. Moreover, it shows the presence of more than one tumour in common enveloping sheath. However, such conditions are not seen in *Ambigolamellatus horridus*, ZHURAVLEVA (1968) and *Ambigolamellatus zonatus sp. nov.*

VOLVATELALA (NAROZHYNCH)

Volvatella marginata f. nov.

Pls. 1, 2 : 5, 7.

Diagnosis : Tumour oval to circular in cross section, commonly oval in outline, Tumour surrounded by a thin margin, lamellae, 3 μ m thick.

Size Range :

Dimensions : 1-5 mm

Common : 2-3 mm

Comparison : *Volvatella zonalis*, NAROZHYNCH (1967) differ from *Volvatella marginata* in the presence of distinct zone. *Volvatella vadosa*, ZHURAVLEVA (1968) differs in the presence of distinct marginal zone.

Volvatella vadosa (ZHURAVLEVA)

Pl. 2 : 10.

Description : Tumour distinctly oval in cross section, tumour surrounded by a distinct marginal lamellae 65 μ m thick.

Size Range :

Dimensions : 0.5 - 3 mm

Common : 0.5 - 1 mm.

Comparison : The specimens compare closely to *Volvatella vadosa* ZHURAVLEVA (1968) from the Riphean section of South Ural.

OSAGIA (TWHOFEL)

Osagia zairensis f. nov.

Pl. 2 : 11.

Diagnosis : Tumour circular in outline, shows obscure circular concentric rings right from centre towards the margin, the rings are regularly arranged at a distance of 20 μ m. The marginal concentric ring is darker.

Size Range :

Dimensions : 0.5 - 2 mm

Common : 0.5 mm.

Comparison : *Osagia crispa* ZHURAVLEVA (1968), *O. monolamellosa* ZHURAVLEVA (1968) and *O. senala* ZHURAVLEVA (1968) recorded from the Riphean section of south Urals differs due to oval shape and loosely arranged concentric rings. *Osagia tenuilamelata* REITLINGER (See KLINGER, 1968) differs due to compact concentric rings in comparison to *O. zairensis*.

Osagia sp.

Pl. 2 : 12.

Description : Tumour circular in outline, rings obscure due to ill preservation. The central region is marked by a distinct nucleus.

Size Range :

Dimensions : 1 - 3 mm

Common : 1 mm.

Comparison : Due to ill preservation a detail comparison with known *Osagia* is not possible.

B.- CATAGRAPHIA (MASLOW)
VESICULARITES (REITLINGER,
Vesicularites parvus (ZABRODIN,

Pl. 1 : 4.

Circular canal like structure, circular in appearance in transverse section, a circular lumen is preserved in the centre. The margin is encircled by narrow border, the border is composed of rectangular cells.

Comparison : The present material morphologically agrees to *Vesicularites parvus* ZABRODIN (1968).

RECORD OF ONCOLITES AND CATAGRAPHS FROM DIFFERENT SAMPLES OF LOWER ZAIRE

Different types of Oncolite and Catagraph biota are known from one samples. The biota from different beds are recorded here :

Specimen n° 10881

Asterosphaeroides asymmetricus f. nov.

Ambigolamellatus zonatus f. nov.

Specimen n° 10884

Vesicularites parvus (ZABRODIN)

Specimen n° 11249

Volvatella marginatus f. nov.

Ambigolamellatus ovatus f. nov.

Specimen n° 11430

Volvatella marginata f. nov.

Ambigolamellatus ovatus f. nov.

Specimen n° 11615

Osagia zairensis f. nov.

Specimen n° 40370

Volvatella vadosa (ZHURAVLEVA)

Specimen n° 21105

Osagia sp.

II.- ONCOLITES FROM SHABA

Specimen n° RG 7339, 7575 and 74307 contain oncolites

Specimen n° RG 7339 and 74307 are oolitic limestone both belonging to the "Calcaire oolithique des Cimenteries de Lubundi" (oolithic limestone of the Lubundi cement works) which is a distinctive formation of the lower part of the Upper Kundelungu Group (CAHEN, 1974; LEPERSONNE, 1974). Specimen n° RG 7339 comes from the Cement works (9°57'S; 25°57'E), collector : Comité spécial du Katangu, n° RG 91; Specimen n° RG 74307, collected by L. CAHEN comes from a locality in the Sampwe degree map, at 9°08'S - 27°12'E.

The age of these two specimens is certainly older than 670 m.y. and certainly younger than 940 m.y.

(CAHEN, 1974). It may well be about the same age as the first six specimens from Lower Zaire.

Specimen n° RG 7575 is the "Mwashya silicified oolite" from the type locality, the salina of Mwashya in Shaba (formerly Katanga) Zaire (10°42'30"S; 27°20'E). Coll. Comité Spécial du Katanga, n° P 1931-10.

This distinctive rock occurs near the top of the Roan Super-group (Lower Katangan) of Shaba and belongs to a group now called Kansuki Group (CAHEN, 1974) which has formerly been called "Faisceau de Mofya" (LEPERSONNE, 1974) and is also known as "Lower Mwashya" or R. 4.1. by the geologists of the GECAMINES Company.

This group is not radiometrically dated; according to the most recent geological knowledge (see CAHEN, 1974) it is correlated with beds about 940 m.y. old.

A specimen from presumably the same horizon, much to the North, in Central Shaba, yielded microfossils described by HACQUERT (1943) as *Girvanella roberti*.

The Kibaran Supergroup is overlain unconformably by the Roan Supergroup to which n° RG 7575 belongs.

The Kibaran metamorphism and folding is dated at c 1300 m.y. (CAHEN, DELHAL, DEUTSCH, 1967).

DESCRIPTION

Ambigolamellatus horridus (ZHURAVLEVA)

Pl. 3 : 13, 16, 17.

Tumour circular in outline, distinct lamellate zone are present around central nucleus, central nucleus circular in outline, commonly 5-6 lamellate zones are present.

Dimensions : 1 - 3.5 mm
Common : 2 - 2.5 mm.

Comparison : *Ambigolamellatus horridus*, ZHURAVLEVA (1968) shows close comparison to this specimen.

Asterosphaeroides serratus (ZHURAVLEVA)

Pl. 3 : 18.

Tumour circular in outline, shows several thin radial thickening radiating from the centre to the margin, the thickening are narrower towards centre and wider towards the margin.

Dimensions : 0.5 - 1 mm
Common : 0.5 mm.

Comparison : *Asterosphaeroides serratus*, ZHURAVLEVA (1968) agrees morphologically to present specimen.

OSAGIA (TWHENHOFEL)

Osagia nucleata f. nov.

Pl. 3 : 14, 15.

Diagnosis : Tumour oval in outline, a distinct central oval nucleus is preserved which is surrounded by oval concentric rings of broad dimensions.

Dimensions : 2-4 mm
Common : 3 mm.

Comparison : *Osagia zairensis f. nov.* differs in the absence of nucleus and oval shape. *Osagia crispa*, ZHURAVLEVA (1968) differs due to crisped and wavy concentric rings. *Osagia senata* ZHURAVLEVA (1968) shows several closed concentric rings on the margin. *O. pulla*, ZHURAVLEVA (1968) is ovalish in outline but the central nucleus is absent.

RECORD OF ONCOLITES FROM DIFFERENT SAMPLES OF SHABA

The following assemblages are recorded from the different samples from Shaba.

- a) Sample n° RG 7339
Ambigolamellatus horridus (ZHURAVLEVA)
- b) Sample n° RG 74307
Ambigolamellatus horridus (ZHURAVLEVA)
Asterosphaeroides serratus (ZHURAVLEVA)
- c) Sample n° RG 7575
Osagia nucleata f. nov.

III.- ONCOLITES FROM EASTERN KASAI

In the northwestern Shaba (formerly Katanga) and eastern Kasai a thick sedimentary Supergroup, the Mbujimayi (formerly Bushimayi), crops out and has been studied in some detail in an area extending from about Long. 26°E to Long 22°E and from Latitude 5°S to Lat. 9°S. These beds are equivalent to the Lower Katangan of Shaba (CAHEN, 1973, 1974). The first studies on the Mbujimayi Supergroup were made by CORNET in 1897, MATHIEU in 1912, KOSTKA in 1913 and RICHET in 1919. The present state of knowledge is based on the work of RAUCQ (1957, 1970),

TABLEAU I. - COMPARISON OF ONCOLITES AND CATAGRAPHS FROM THE SOUTH OF ZAIRE.

Lower Zaïre	Shaba	Eastern Kasai
<p>Schisto-Calcaire Group CIII. Bangu Subgroup CIIIb <i>Volvatella vadosa</i> Zhuravleva <i>Volvatella marginatus</i> f. nov. <i>Ambigolamellatus ovatus</i> f. nov. <i>Ambigolamellatus zonatus</i> f. nov. <i>Asterosphaeroïdes asymetricus</i> f. nov. <i>Vesicularites parvus</i> Zabrodin (*)</p>	<p>Upper Kundelungu Group "Calcaire des cimenteries de Lubudi" <i>Ambigolamellatus horridus</i> Zhuravleva <i>Asterosphaeroïdes serratus</i> Zhuravleva</p>	
<p>CII. Lukunga Subgroup <i>Osagia zaïrensis</i> f. nov. <i>Vesicularites</i> aff. <i>parvus</i> Zabrodin (**) <i>Vesicularites</i> cf. <i>bothrydioformis</i> Krasn. (**) <i>Vermiculites</i> cf. <i>tortuosus</i> Reitlinger (**)</p>		
<p>Sansikwa Group <i>Osagia</i> sp.</p>	<p>Kansuki Group of Roan Supergroup "oolithe de Mwashia" <i>Osagia nucleata</i> f. nov.</p>	<p>BII Group of Mbujimayi Supergroup BIIId <i>Osagia tenuilamellata</i> Reitlinger</p>
<p>(*) This specimen might belong to the top of CII.</p>		
<p>(**) These forms are mentioned by J. BERTRAND-SARFATI (1972, pp. 31-32).</p>		

CAHEN & MORTELMANS (1947), DUMONT (1971), BERTRAND-SARFATI (1972), CAHEN (1973, 1974) and LEPERSONNE (1973).

The material containing the oncolite is earlier than 940 m.y. and later than c 1000 m.y. From this region and time interval microbiota have already been described (MAITHY, 1975).

Only a solitary specimen 12079 has Oncolites.

OSAGIA (TWHENHOFEL)

Osagia tenuilamellata (REITLINGER)

Pl. 4 : 19-20.

Diagnosis : Tumour circular to oval in outline, Several fine regular concentric rings are found around nucleus, the concentric rings are closely spaced; occasionally the central nucleus is divided into two.

Dimensions : 0.5 - 2 mm.

Common : 1.5 mm.

Comparison : The specimen recorded from B II d, Mbujimayi Supergroup, compares closely to *O. tenuilamellata*, REITLINGER (1959) recorded from Riphean of Siberia.

RECORD OF ONCOLITE FROM EASTERN KASAI

The solitary sample from Mbujimayi has yielded **Oncolite**. It contains only one type *Osagia tenuilamellata*.

CONCLUDING REMARKS

Precambrian deposits contain many layered carbonate forms - Stromatolites, Oncolites and massive microscopic, questionable organic remains, Catagraphs which can be regarded as result of activity of algae and bacteria. Repeated attempts were made to use these organic remains for stratigraphic purposes, by ZHURAVLEVA (1964, 1968), KLINGER (1968) and ZABRODIN (1968) in the Russian platform. Attempts have been made to utilize oncolites and catagraphs to subdivide and correlate Riphean deposits, ZHURAVLEVA (1964) has utilized the data very well in eastern Siberia on basis of Oncolites and Catagraphs. Eight distinct zones were recognised. These zones correspond well on the one hand, with the limits of Stromatolite complexes of the Turukhan and Uchar - Maya, areas and the area on the west side of Anabar Massif. On the other hand the

west side of Anabar Massif. On the other hand the limits also coincide broadly with zones demarcated by means of trilobites. Similarly ZHURAVLEVA (1968) recognized four distinct zones of Oncolites and catagraphs in the Southern Urals. In comparison to the Russian study, my study of Oncolites and catagraphs is still of preliminary type. Although the assemblages are known from rather well dated rocks, the stratigraphic implications on the basis of oncolites are yet to be established, though different composition of assemblages are known from different samples. The stratigraphic significance may well be established later by detailed study of different biota found in the rocks. Meanwhile, table 1 is suggestive.

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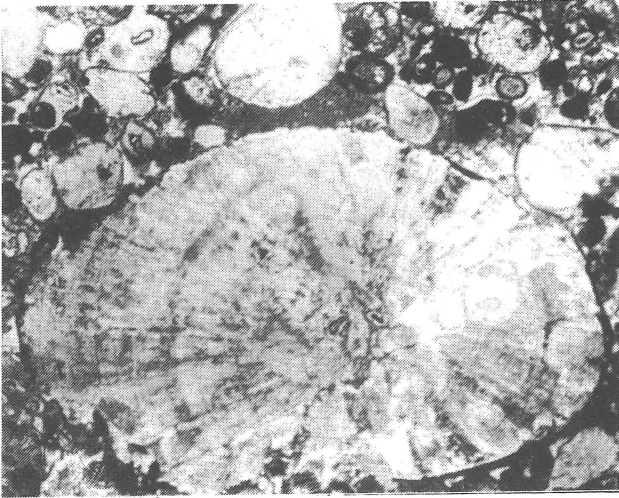
ACKNOWLEDGEMENTS

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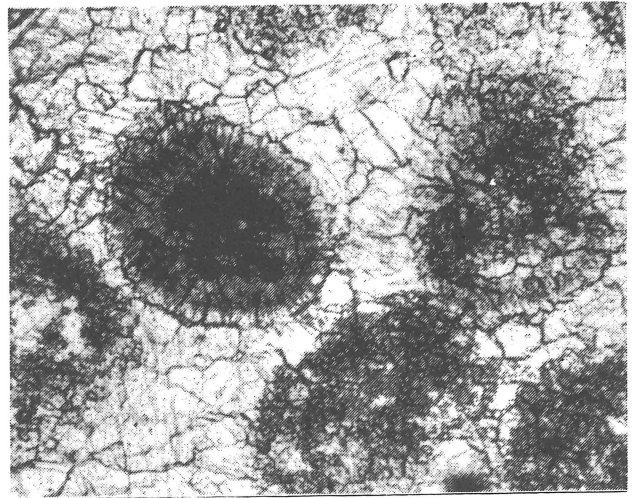
All specimens are in the collections of the Department of Geology and Mineralogy of the Musée Royal de l'Afrique Centrale, at Tervuren.

PLATE 1

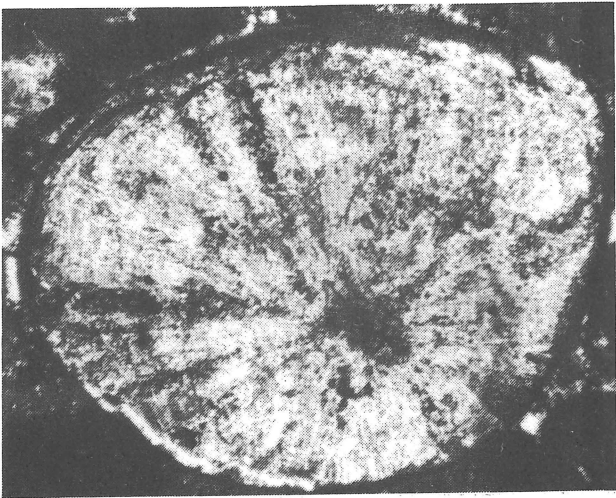
- 1 : General view of rock section.
10881 containing *Asterosphaeroides asymmetricus f. nov.*
and *Ambigolamellatus zonatus f. nov.* x 8.
- 2 : *Asterosphaeroides asymmetricus f. nov.* x 45.
- 3 : *Ambigolamellatus zonatus f. nov.* x 80.
- 4 : *Vesicularites parvus* Zabrodin, specimen n^o 10884, x 125.
- 5 : General view of rock section.
11249 containing *Volvatella marginata f. nov.* and
Ambigolamellatus ovatus f. nov. x 8.
- 6 : General view of rock Section.
11430 containing the above mentioned Oncolites x 8.



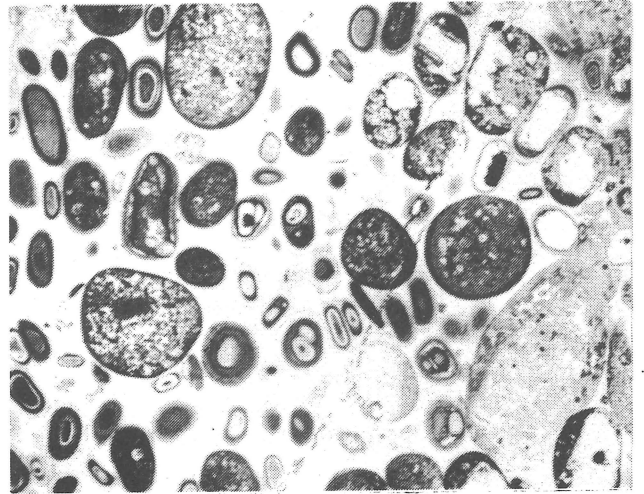
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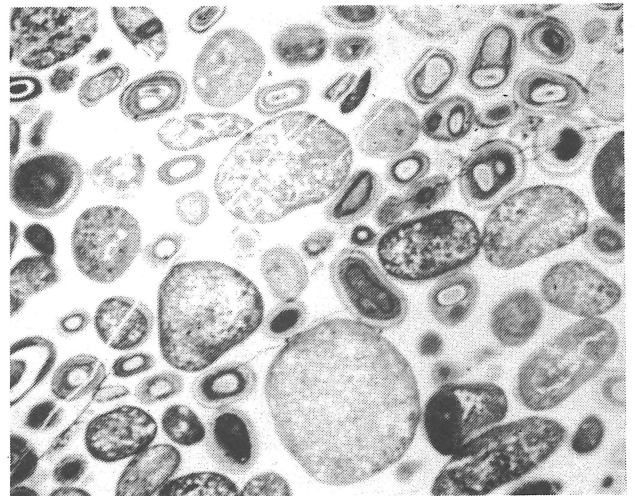
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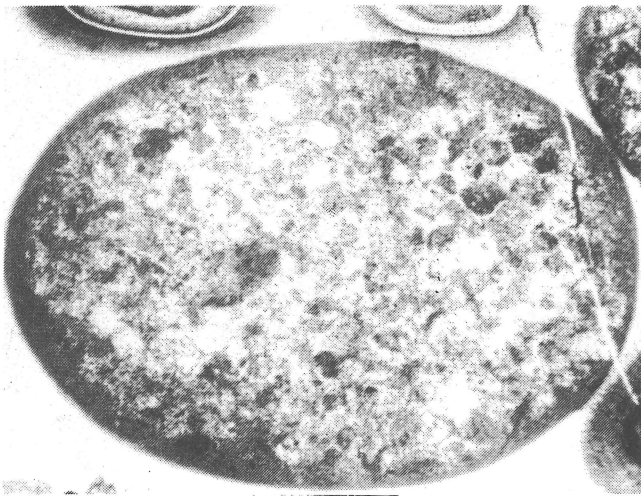
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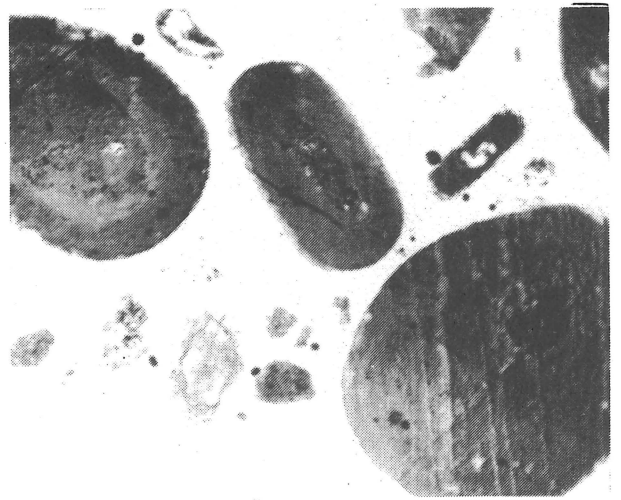
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PLATE 2

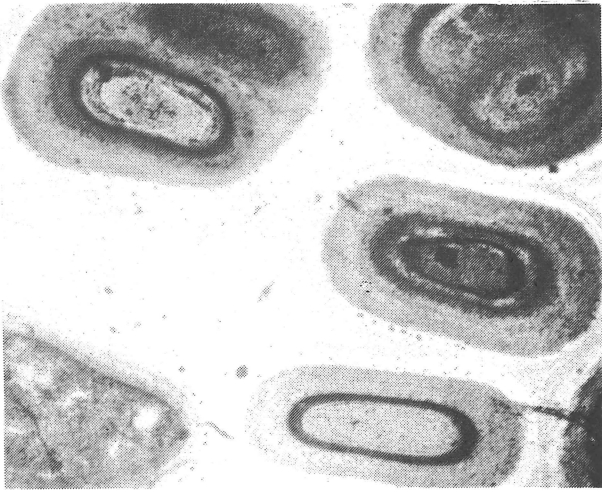
- 7 : *Volvatella marginata f. nov.* specimen n^o 11430, x 45.
- 8 : *Ambigolamellatus ovatus f. nov.* specimen n^o 11430, x 45.
- 9 : *Ambigolamellatus ovatus f. nov.* specimen n^o 11430, x 45.
- 10 : *Volvatella vadosa* Zhuravleva, specimen n^o 40370, x 45.
- 11 : *Osagia zairensis f. nov.* specimen n^o 11615, x 45.
- 12 : *Osagia sp.* specimen n^o 21105, x 45.



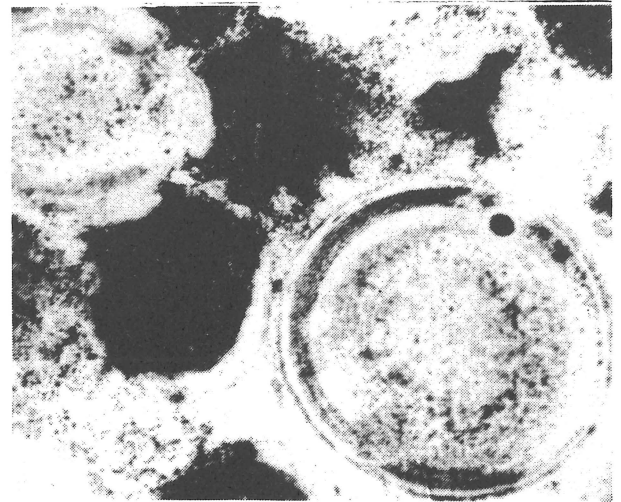
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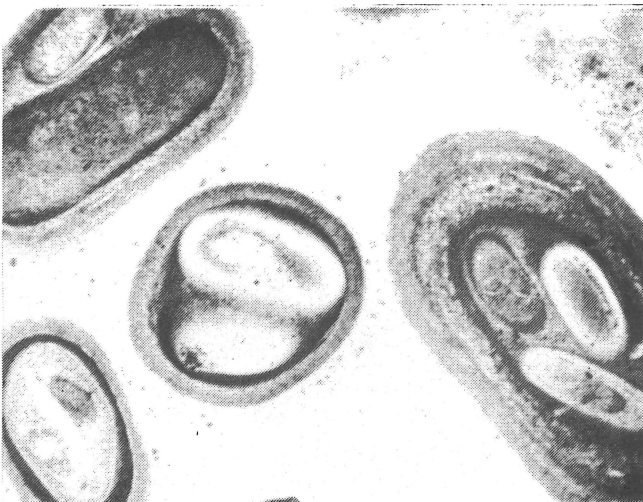
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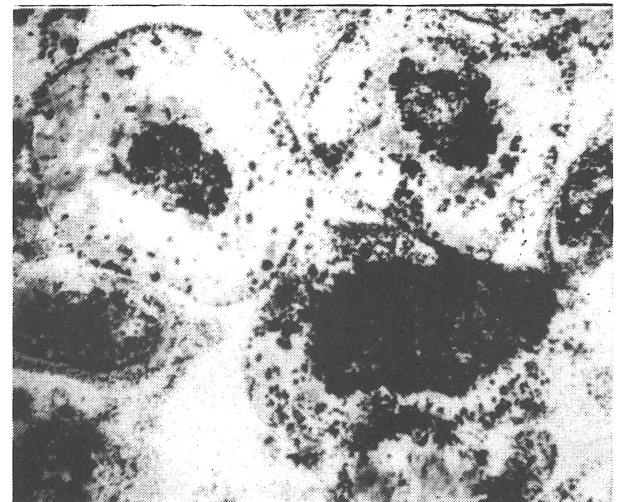
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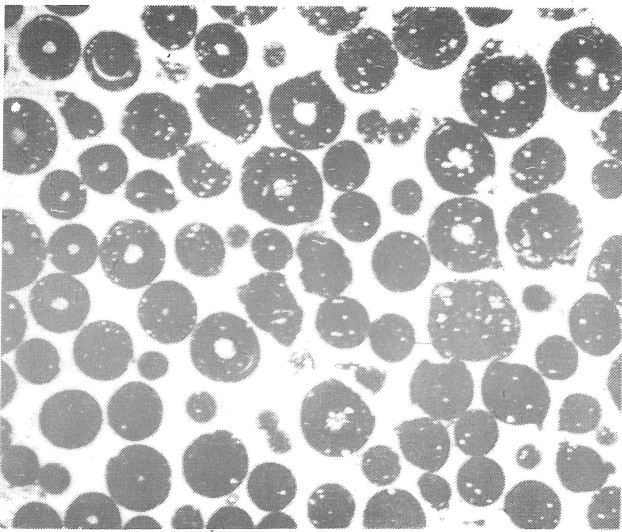
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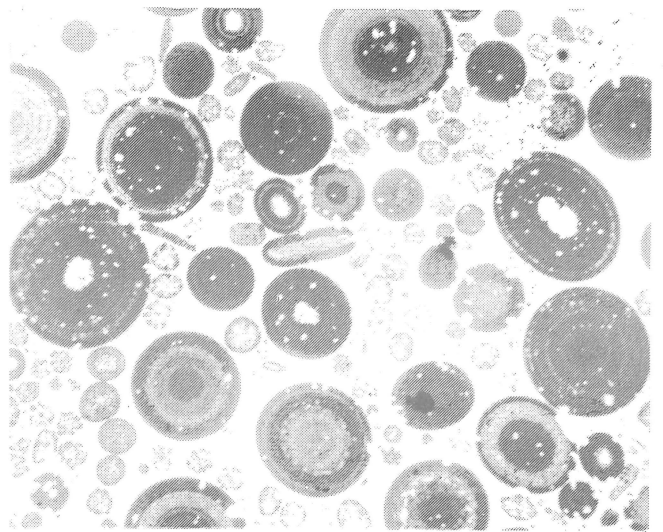
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PLATE 3

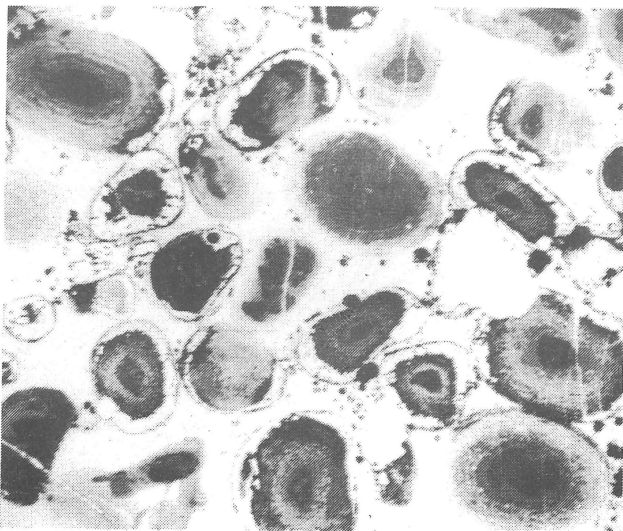
- 13 : *Ambigolamellatus horridus* Zhuravleva, specimen n^o 7339, x 10.
- 14 : Rock section of specimen n^o 7575 showing *Osagia nucleata f. nov.*
- 15 : *Osagia nucleata f. nov.* specimen n^o 7575, x 45.
- 16 : Rock section of specimen n^o 74307 showing *Ambigolamellatus horridus* Zhuravleva and *Asterosphaeroïdes serratus* Zhuravleva, x 10.
- 17 : *Ambigolamellatus horridus* Zhuravleva, specimen n^o 74307, x 45.
- 18 : *Asterosphaeroïdes serratus* Zhuravleva, specimen n^o 74307, x 80.



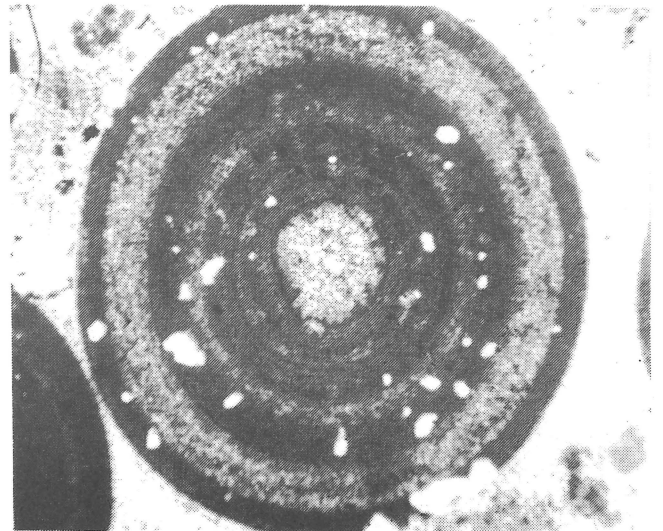
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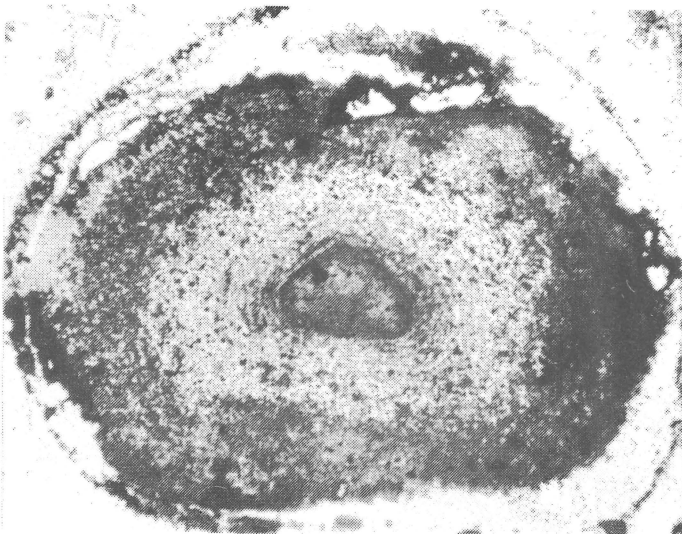
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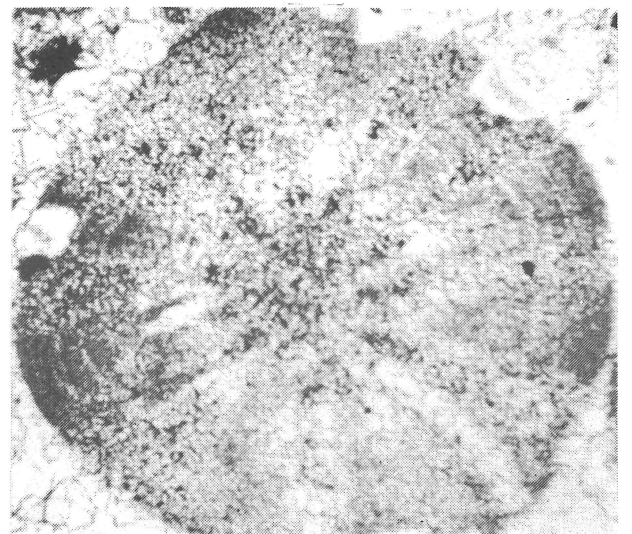
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17



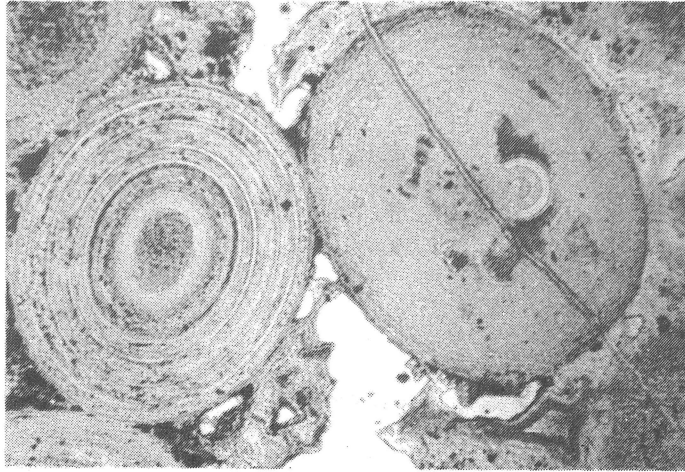
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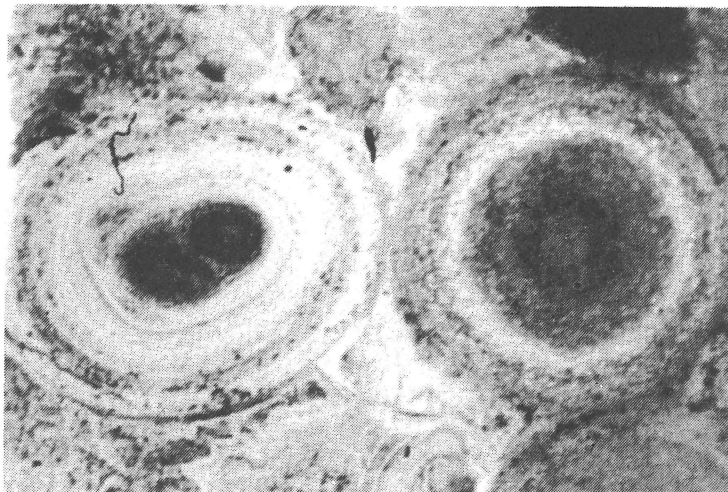
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PLATE 4

19-20 : *Osagia tenuilamellata* Reitlinger, specimen n^o 12079, x 45.



19



20

