# Carboniferous Microfacies, Microfossils, and Corals, Lisburne Group, Arctic Alaska

*By* AUGUSTUS K. ARMSTRONG *and* BERNARD L. MAMET

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*Description of Carboniferous foraminifers and algae with biostratigraphic zonation, relationship to carbonate facies, comparison with coral distribution, and correlations among northern Alaska, western Europe, and the midcontinent region of North America. One hundred species, of which 2 are new, and 61 genera are described and illustrated*

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# CARBONIFEROUS MICROFACIES, MICROFOSSILS, AND CORALS, LISBURNE GROUP, ARCTIC ALASKA

By AUGUST K. ARMSTRONG[1] and BERNARD L. MAMET[2]


## ABSTRACT

The 16 measured sections of the Lisburne Group in the Brooks Range of arctic Alaska and 3 from the Yukon Territory, Canada, contain microfossil assemblages assigned to zones of late Tournaisian (Osage) through early Westphalian (Atoka) age. Representatives of both Eurasiatic and American cratonic microfaunas permit correlation with the original Carboniferous type sections in western Europe as well as with the standard Mississippian and Pennsylvanian sequences in the midcontinent region of North America.

The carbonate petrology of the Lisburne Group is composed of predominantly bryozoan-pelmatozoan wackestones and packstones, with lesser amounts of mudstones, diagenetic dolomites, and pelmatozoan and ooid grainstones. The Lisburne Group of the Brooks Range was deposited on a slowly subsiding shallow-water carbonate shelf. The stratigraphic succession is commonly cyclic, alternating from open-marine to subtidal deposition. A carbonate platform depositional model for these carbonate rocks illustrating the spacial distribution of the organic remains and microfacies to water depth and salinity shows that the corals and Foraminifera are common near the shoaling-water facies, rare in the basinal and subtidal facies, and absent in the intertidal or supratidal facies. The pelmatozoan-bryozoan wackestone packstone facies, an open-marine facies, generally contains a very sparse Foraminifera fauna.

The microfauna belongs to the Alaska and Taimyr subrealms, and a temperate environment is indicated by low abundance, a very low specific diversity, high genus-species ratio, a high rate of cosmopolitanism, and very incomplete phylogenies.

Descriptions and illustrations for 100 species of Carboniferous Foraminifera and algae, of which 2 are new, and 61 genera are given. The new taxa are: *Endothyra paramosquensis* n. name and *Dainella anivikensis* n. sp.

Lithostrotionoid corals of the Lisburne Group are at the specific level, partly provincial to northern Canada and Alaska. The stratigraphic range of individual coral species and faunal assemblages generally extends throughout two to four microfossil zones. This, combined with their abundance only in the Alapah Limestone and general scarcity in the Wachsmuth and Wahoo Limestones, makes the coral less useful for regional correlation than the microfossils.


## INTRODUCTION

This study is based on 16 measured sections from the Brooks Range of Alaska and 3 measured sections from the British Mountains of the Yukon Territory, Canada (fig. 1). The regional stratigraphy and facies analysis are the result of studies by Armstrong and Mamet, the section on corals was done by Armstrong, and the section on micropaleontology and systematics is the work of Mamet.

The Lisburne Group, as employed by Brosgé and others (1962) for rocks in the eastern Brooks Range, contains Mississippian to Permian carbonate rocks. The measured sections of this report are Carboniferous.

The material from Alaska on which this study is based was collected from measured stratigraphic sections. Lithologic and foraminiferal samples were collected every 5 to 20 feet, and rugose corals were collected with the section (fig. 1). A standard system of lithologic symbols is used in this report (fig. 2).


## ACKNOWLEDGMENTS

The stratigraphic collections from the Endicott and De Long Mountains were made by Shell Oil Co. geologists in 1959, 1960, and 1962 and were loaned to the U.S. Geological Survey for study and publication by R. E. McAdams and G. E. Burton, vice presidents, J. C. Threat, exploration manager, Pacific Coast Area, and Q. C. Hebrew, Northwest Division manager, Shell Oil Co. The material for the Joe Mountain, Canada, section was given to B. L. Mamet for publication by the Union Oil Co. of Canada and for the West Trout Lake and Trout Lake sections in Canada by Chevron Standard Limited, Calgary. We express our gratitude to these three companies for permission to use the material in this study. The U.S. Geological Survey collections from Alaska were made by Armstrong during the field seasons of 1968, 1969, and 1970. He expresses his gratitude to I. L. Tailleur, the 1968 party chief, and H. N. Reiser, the 1969 and 1970 party chief, for their support of his field activities. Appreciation is extended to the Naval Arctic Research Laboratory (Barrow), Office of Naval Research, for its logistical support of the field studies.



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[2] Université de Montréal.

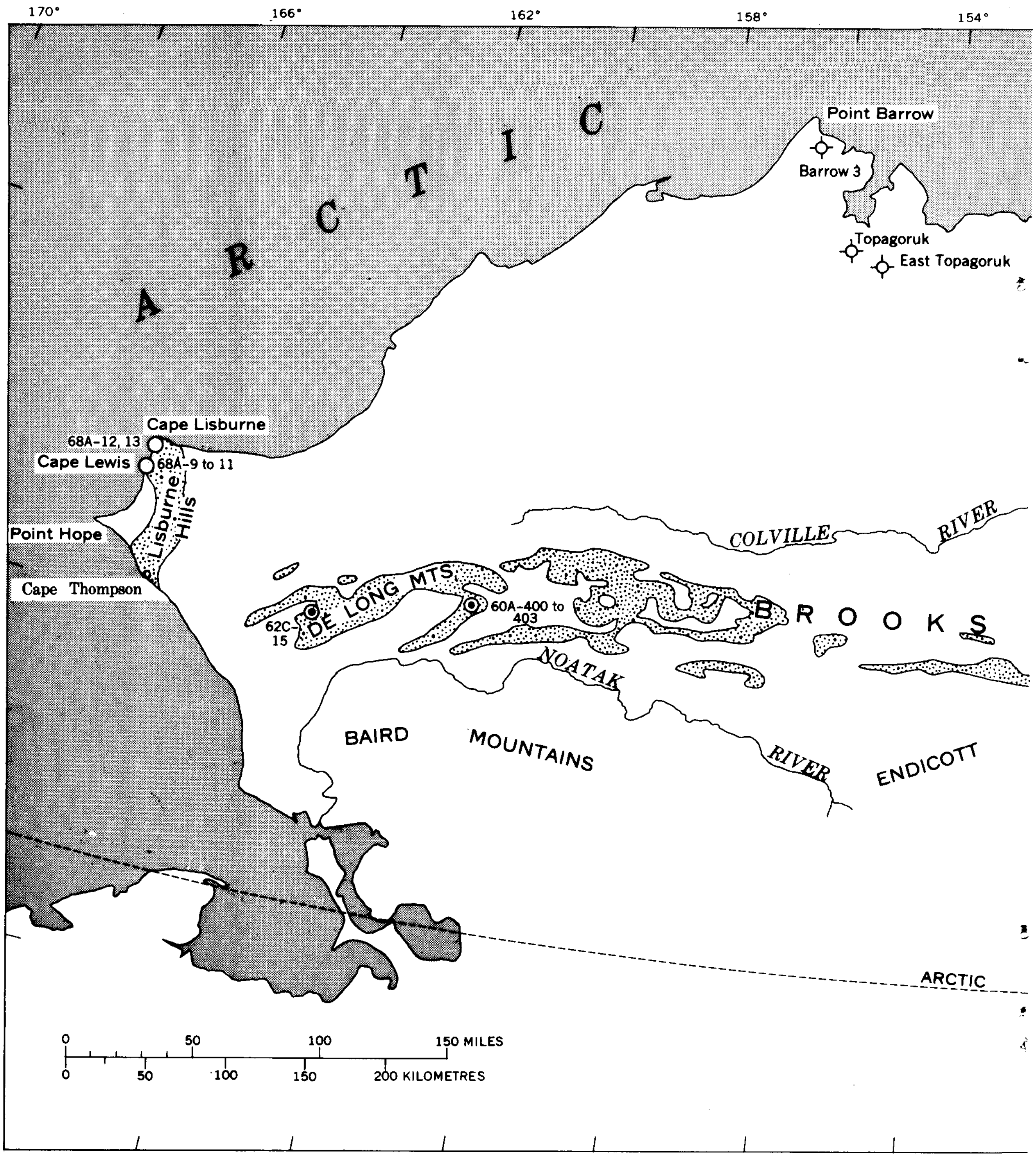
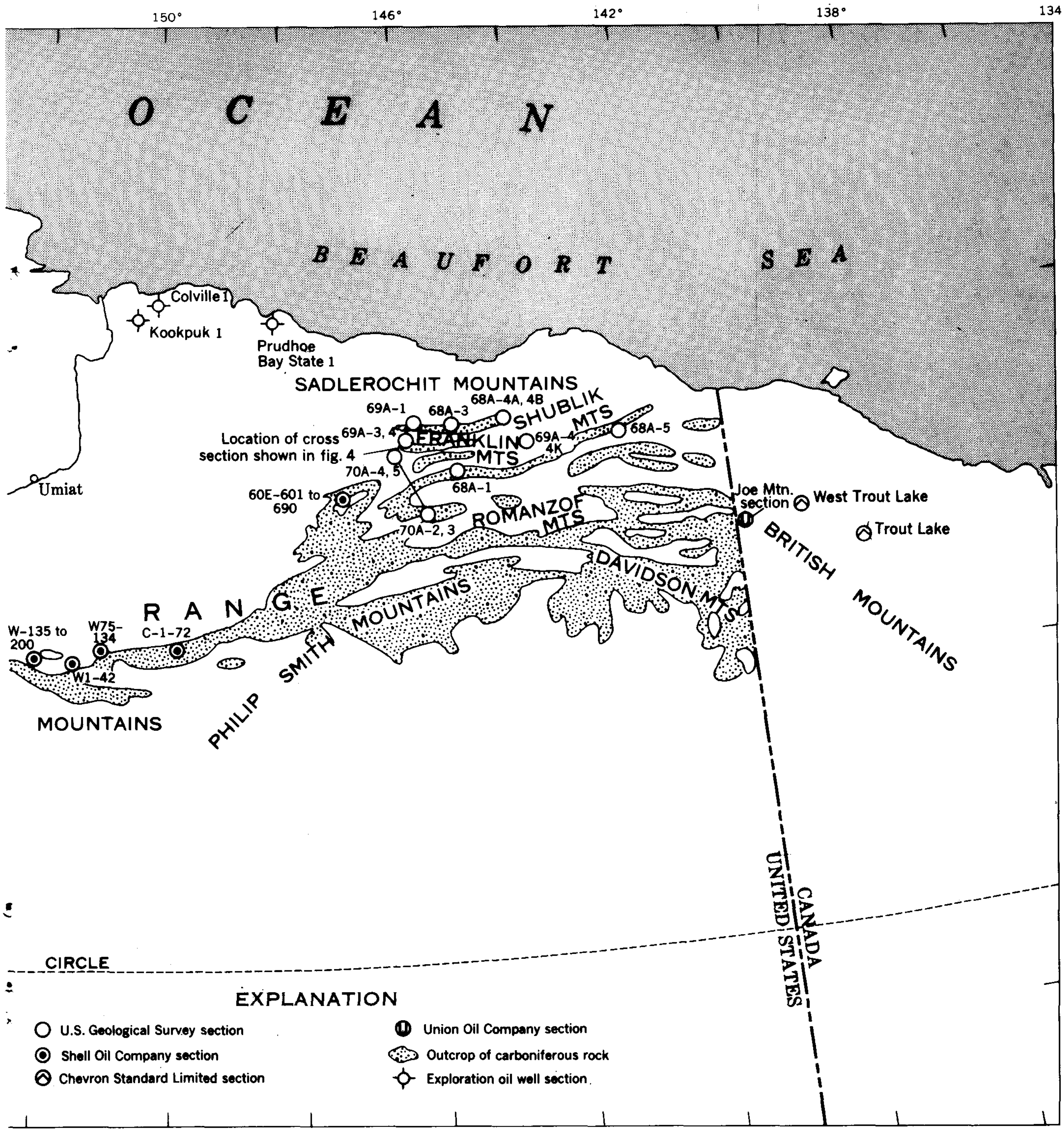



FIGURE 1.—Index map of arctic Alaska and adjacent Canada showing outcrops of Carboniferous

## PREVIOUS WORK

Schrader (1902) applied the name Lisburne Formation to limestone exposures near Cape Lisburne. Bowsher and Dutro (1957) recognized two new formations within the Lisburne in the central Brooks Range, which they raised to group rank. The lower formation, the Wachsmuth Limestone with four informally designated members, overlies the Kayak Shale. The Alapah Limestone overlies the Wachsmuth Limestone and has nine informally named




rock in Alaska and location of some stratigraphic sections described in this report.

members (fig. 3). At its type locality, the top of the Alapah Limestone is covered by Quaternary glacial gravels and alluvium.

Gordon (1957) described several new species of Mississippian cephalopods from the Lisburne Group and established a zonation for the arctic on the basis of these fossils.

Gastropods found within the Lisburne Group were described by Yochelson and Dutro (1960), who also presented regional biostratigraphic relations

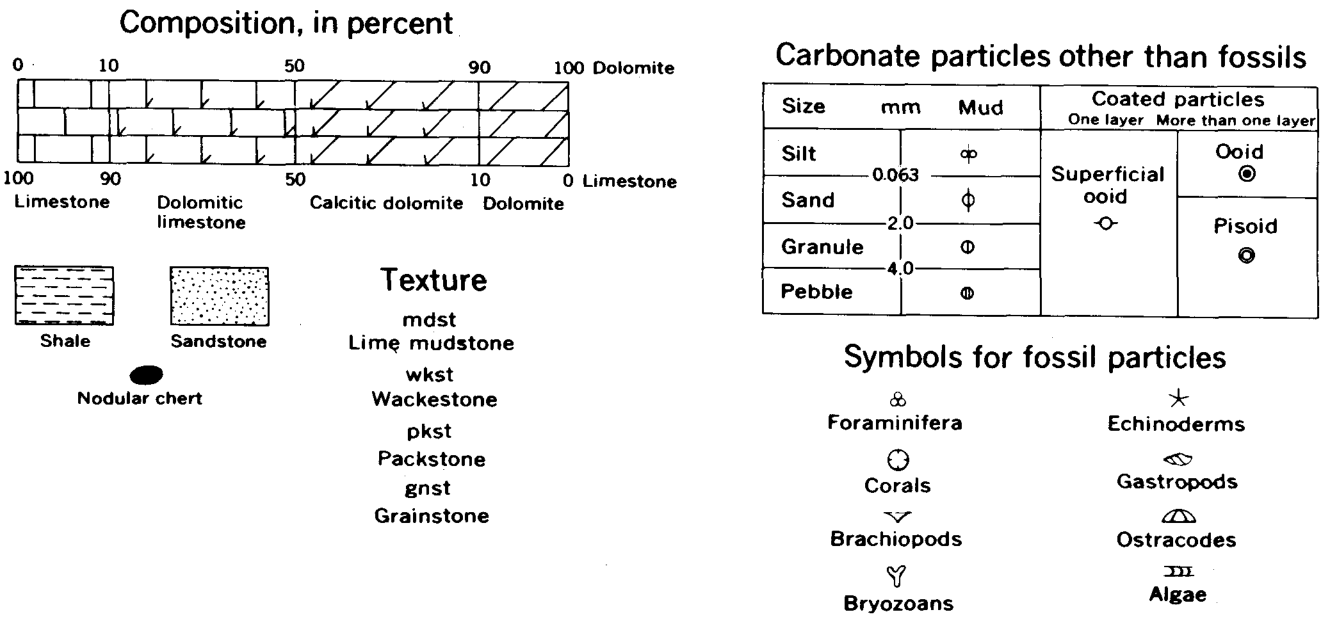



FIGURE 2.—Lithologic and paleontologic symbols used in this report.

based on gastropods and other groups of megafossils.

Sable and Dutro (1961) elevated the Lisburne Limestone in the De Long Mountains to group status with three new formations: the Utukok Formation, an arenaceous calcareous clastic sequence resting on Upper Devonian rocks; the Kogruk Formation, a thick-bedded massive sequence of predominantly cherty limestones; and the Tupik Formation, a sequence of dark-gray cherty limestone that is disconformably overlain by the Permian Siksikpuk Formation.

Brosgé and others (1962) described the Paleozoic sequence in the eastern Brooks Range and recognized three formations within the Lisburne Group: the Wachsmuth and Alapah Limestones and an overlying limestone which they named the Wahoo Limestone and to which they assigned a Pennsylvanian (?) and Permian age.

Armstrong (1970c) described the shallow-water to supratidal dolomites and cherts in the Mount Bupto-Killik River region, west-central Brooks Range. Armstrong, Mamet, and Dutro (1971) established the Foraminifera zones and outlined the carbonate facies of the Lisburne Group in the central and eastern Brooks Range. Armstrong (1970b) described and illustrated the lithostrotionoid corals from the Kogruk Formation of the De Long Mountains. Armstrong and Mamet (1970) published a series of carbonate lithofacies maps for Carboniferous carbonate rocks of arctic Alaska. Armstrong, Mamet, and Dutro (1971) zoned with microfossils and corals and described the carbonate facies sea-cliff exposures of the Lisburne Group of northwestern Alaska. Sohn (1971) described several new Late Mississippian ostracode genera and species from northern Alaska. The biostratigraphy of Mississippian corals in the Lisburne Group was given by Armstrong (1972a), and the paleoecology and biostratigraphy of the Pennsylvanian corals of the Wahoo Limestone were discussed by Armstrong (1972b). Mamet and Armstrong (1972) and Armstrong and Mamet (1975) presented a detailed account of the biostratigraphy and facies of the Lisburne Group in the Franklin and Romanzof Mountains, northeastern Alaska. Wood and Armstrong (1975) present an analysis of the diagenesis and stratigraphy of the Lisburne carbonate rocks of the Sadlerochit Mountains and adjacent areas of northeastern Alaska.

## GEOGRAPHIC SETTING

The following discussion of the physiographic divisions of arctic Alaska is taken in part from Wahrhaftig (1965).

The Brooks Range (fig. 1) consists of mountains and hills carved chiefly from folded and overthrust Paleozoic and Mesozoic sedimentary rocks. The central and eastern Brooks Range is composed of rugged glaciated east-trending ridges that rise to summits of 7,000 to 8,000 feet in the northern part and 4,000 to 6,000 feet in the southern part. The De Long Mountains consist of rugged glaciated ridges that are 4,000 to 4,900 feet in elevation. The Arctic

Foothills, to the north of the Brooks Range, consists of rolling plateaus and low linear mountains. Wahrhaftig (1965) includes the Lisburne Hills region within the Arctic Foothills. The Arctic Coastal Plain is a smooth plain rising from the Arctic Ocean to a maximum elevation of 600 feet at its southern margin. The surface rocks are Tertiary and Quaternary resting on nearly flat-lying Cretaceous sedimentary rocks. The deeply buried Paleozoic rocks have been penetrated by drilling in petroleum exploration wells at Prudhoe Bay and adjacent areas.

## GEOLOGIC SETTING

The structural geology of the Brooks Range is complex. The stratigraphic sections measured on the seacliffs of the Lisburne Hills, the De Long Mountains, and the Central Brooks Range are on allochthonous thrust sheets. The sections in the eastern Brooks Range in the Philip Smith, Franklin, and Sadlerochit Mountains are in autochthonous rocks.

An introduction to the regional geology of the central and eastern Brooks Range is provided by Bowsher and Dutro (1957), Brosgé and others (1960, 1962), Porter (1966), Reed (1968), Reiser, (1970), Reiser and others (1970, 1971), Dutro, Brosgé, and Reiser (1972), Patton and Tailleur (1964), and Chapman, Detterman, and Mangus (1964). The geology of northwestern Alaska, the De Long Mountains, and the Lisburne Hills is given by Tailleur, Kent, and Reiser (1966), and Martin (1970).

## CARBONIFEROUS ROCK OUTCROPS OF THE BROOKS RANGE

Carbonate rocks of the Lisburne Group in the Brooks Range represent a Carboniferous regional marine northward transgression on a poorly peneplained terrain of Devonian and older rocks. Outcrop patterns of Carboniferous rocks in the Brooks Range of arctic Alaska trend east-west (fig. 1). The regional correlations between outcrops are based on foraminifers (fig. 3). Brosgé and others (1962) first demonstrated the northward transgressive nature of the Lisburne's carbonate rocks in the central and eastern Brooks Range. These studies were continued by Armstrong, Mamet, and Dutro (1971), Mamet and Armstrong (1972), and Wood and Armstrong (1975).

Armstrong and Mamet (1970) recognized the existence of a regional trend of thicker carbonate rocks in the Philip Smith Mountains on the basis of core samples from the deep test wells of Prudhoe Bay region and deep tests to the south and west of the Canning River. This northeast-southwest trend was named the Canning Sag. The thick sequence of carbonate strata is well represented in the Itkillik Lake and Echooka River sections (fig. 3).

Outcrops along the Canning River display the northward marine Carboniferous transgression (fig. 4). Wood and Armstrong (1975) delineated a residual Mississippian positive area, the Sadlerochit High, consisting of Devonian carbonate rocks and the metamorphosed clastic rocks of the Neruokpuk Formation. The Sadlerochit High was probably a major source area for clastic rocks in the Kayak(?) Shale of the region. It remained above sea level through the Meramec time equivalent and was finally submerged in the lower Chester time equivalent (Zone $16_{\text{sup}}$). The Chester carbonate sediments that overlapped the old Sadlerochit High were deposited in shallow water. Armstrong (1972b) and Wood and Armstrong (1975) reported that intertidal sedimentary structures such as algal mats, birdseye structures, and small lithoclasts are common in the upper part of the Alapah Limestone in the Sadlerochit Mountains (fig. 3).

In the subsurface north of the Carboniferous outcrop belt, Atlantic Richfield-Humble Prudhoe Bay State well No. 1, near the axis of the Canning Sag, has more than 1,250 feet of shallow-water open-platform carbonate rocks of Chester (Zone 16) to Atoka (Zone 21) age. The carbonate rocks are underlain by about 550 feet of black and red shales, siltstones, sandstones, and thin coals that are probably the Kayak(?) Shale. The Itkilyariak Formation of Mull and Mangus (1972) was proposed for the "red bed" sequence of the subsurface and for the basal clastic beds of the Lisburne Group in Sadlerochit Mountains (see pl. 40 base of Sunset Pass section 68A–4A, 4B). The Itkilyariak is a useful concept for subsurface mappings, but it has a limited outcrop pattern and is not used for surface outcrop mapping (H. N. Reiser, oral commun., 1972). To the west of this well (fig. 1), the carbonate sections thin. The Union Oil Kookpuk No. 1 has about 900 feet of Chester to Atoka age carbonate rocks, whereas to the north the Sinclair-British Petroleum Colville No. 1 has only 300 to 400 feet of Morrow and Atoka age carbonate rocks. Chester sediments may be represented by about 400 feet of dark-gray to red siltstones, shales, and sandstones that overlie the pre-Carboniferous argillites. Farther southwest of Point Barrow (fig. 1) the United States Navy wells, Barrow No. 3 and Topagoruk and East Topagoruk wells, are devoid of Carbon-

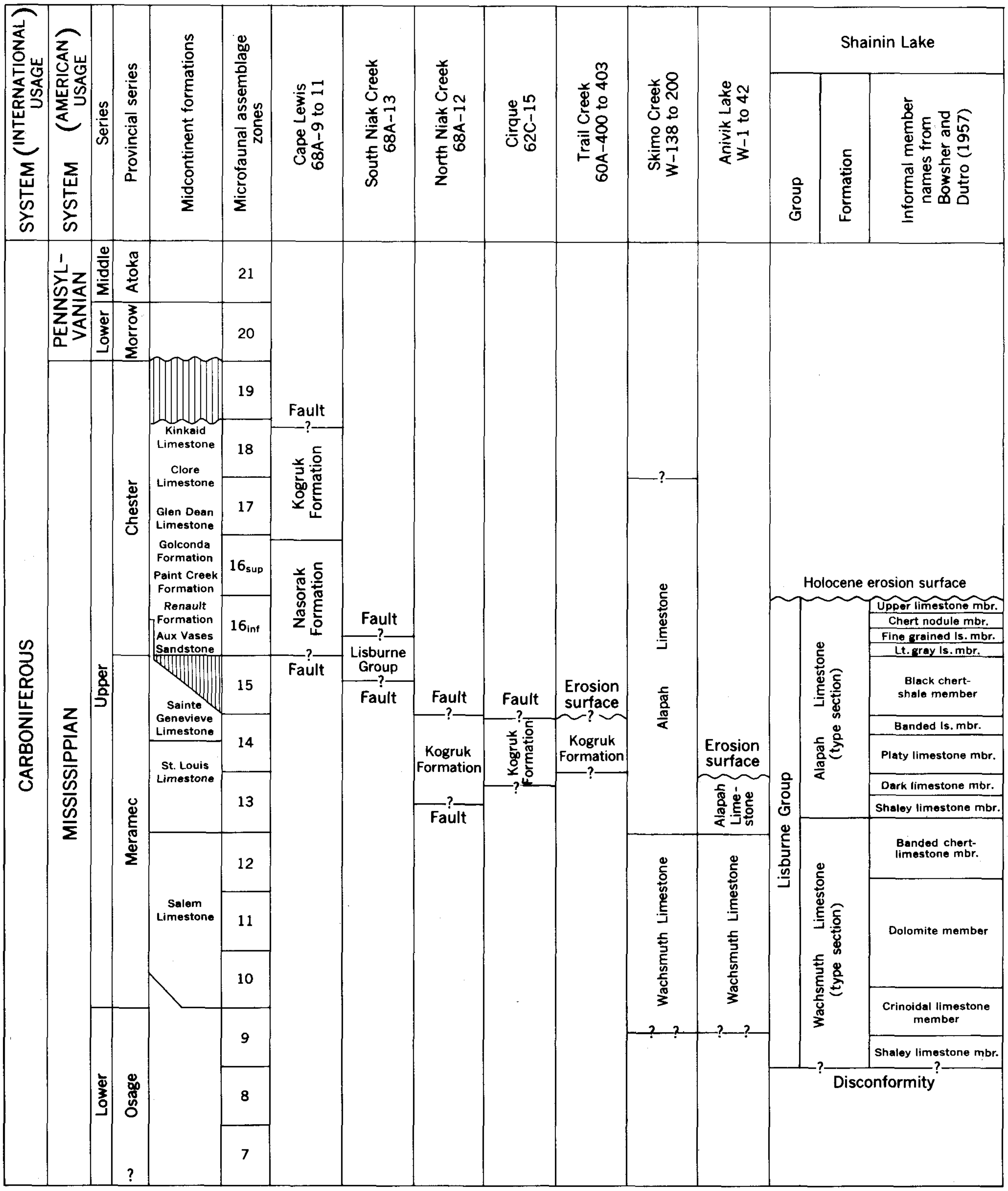



**FIGURE 3.—Regional correlation diagram for the Lisburne Group.**

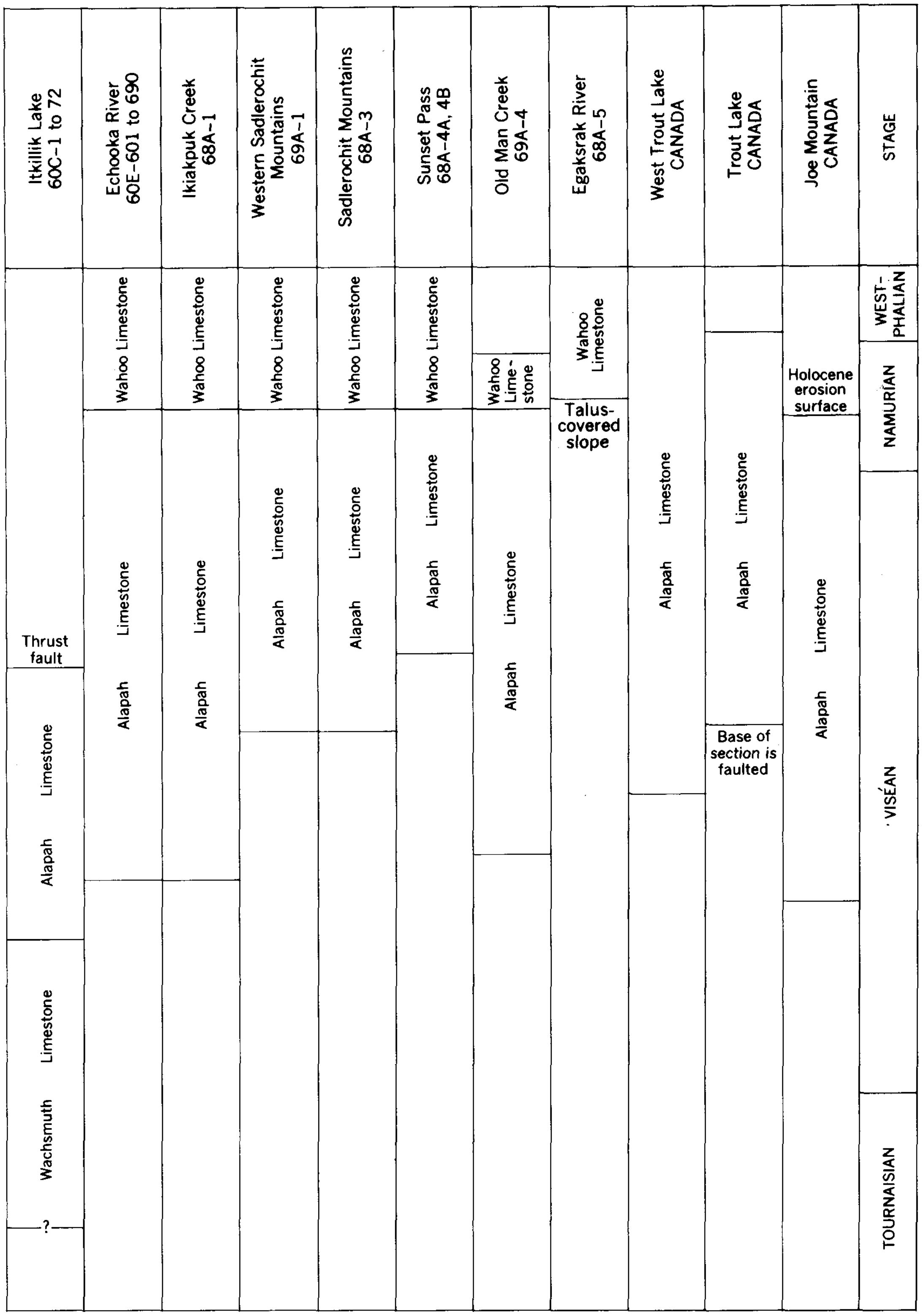



FIGURE 3.—Continued.

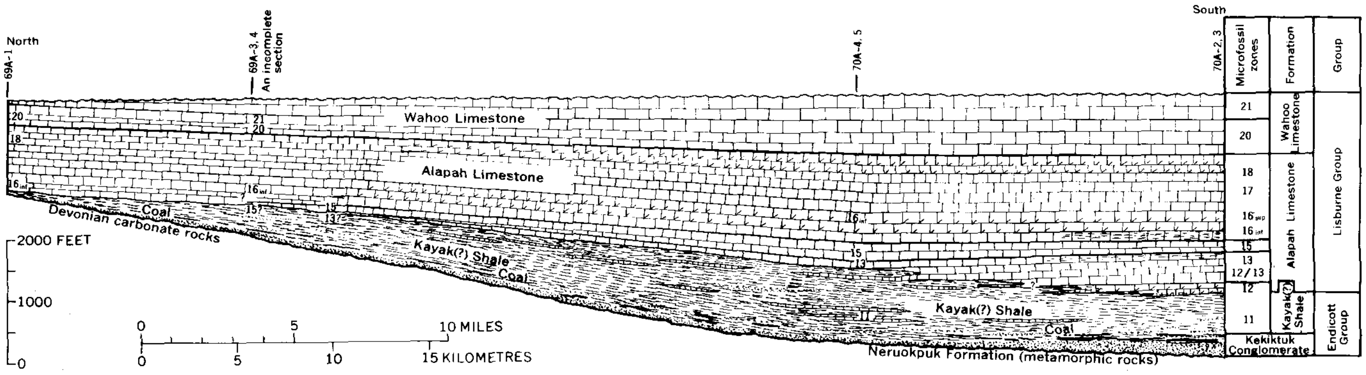



FIGURE 4.—Diagrammatic reconstruction of platform carbonate rocks, Lisburne Group, north-south along the Canning River. See figure 1 for location of section.

iferous carbonate rocks, and above the pre-Carboniferous argillites is a thin sequence of clastic shales and sandstone; these are unfossiliferous but may be of Carboniferous age. No deep tests have been made that penetrated the Carboniferous section south of the Topagoruk well or west of the Colville River. Except for scant aeromagnetic and seismic data, then, little is known of the subsurface carbonate strata in Naval Petroleum Reserve No. 4 or the area to the west to the Chukchi Sea. Projection of Carboniferous outcrops from the De Long Mountains and Lisburne Hills into the subsurface is complicated because in both of these areas the Carboniferous rock exposures are part of large-scale gravity slide thrust sheets with dislocations of 60 to 70 miles in the De Long Mountains (Martin, 1970).

## CARBONATE MICROFACIES

An idealized and conceptional carbonate depositional model for the Lisburne shelf has been made (figs. 5, 6). The types of sedimentary structures and terrigenous admixture found in each facies are shown. The probable environments of deposition of the carbonate microfacies shown on plates 1–25 are shown in figure 5.

The stratigraphic sections of the Lisburne Group are composed of cyclic packages of carbonate rocks. This is well exemplified by the sections in the Sadlerochit Mountains, where a major marine transgression was followed by intertidal carbonate offlap and another major marine transgression (pl. 40) (Armstrong, 1972b; Wood and Armstrong, 1975). The carbonate rocks in the Lisburne Peninsula region also show cyclic sedimentation in the open platform to intertidal environments.

The lithostratigraphic correlation chart for the Lisburne Group is based on microfossil studies (pl. 40). The stratigraphic locations of the carbonate microfacies photomicrographs are shown as small squares on the right side of each column, and the locations of illustrated microfossils are shown as small dots on the left side of each column.

Regional carbonate petrology and facies studies of the Lisburne Group were made (pl. 41). The dominant rock types in outcrop, and in particular those west of the Sadlerochit Mountains, are the bryozoan-pelmatozoan mudstones and wackestones, followed by bryozoan-pelmatozoan packstones and grainstones.

Dolomite is common in most of the section studied. The Lisburne dolomites appear to be primarily early diagenetic in origin (Armstrong, 1970c; Wood and Armstrong, 1975). Some dolomites, such as those in the Sadlerochit Mountains, are closely associated with intertidal sedimentary structures. These are birdseye structures, algal mats, mud cracks, and calcite pseudomorphs after gypsum. The close stratigraphic association of these intertidal sedimentary structures with the dolomites suggests a close genetic relation between the two. A somewhat similar relation exists with dolomite in the upper half of the Cape Lewis section. The thick dolomite sequences in the Shainin Lake and Itkillik Lake sections of the Endicott Mountains do not appear to be associated with well-developed intertidal sedimentary structures. Furthermore, these dolomites are generally macrodolomites that show clear evidence of extensive dolomitization of bryozoan-pelmatozoan wackestone and packstone.

Well-developed oolitic beds are confined to the Morrowan and Atokan beds of northeastern Alaska. Oolites are rare in the Mississippian carbonate rocks.

Mamet and Armstrong (1972) have interpreted the sponge spiculite facies of the Lisburne Group to represent two different environments: (1) relatively shallow water with poor circulation, or (2) the deeper part of the platform in association with radiolarians. Commonly, the shallow-water part of this facies is argillaceous and may contain some beds with calcite pseudomorphs after gypsum.

A conceptual model of the relative distribution of sedimentary structures and organic and inorganic carbonate particles on the Lisburne Group has been developed (fig. 6).

### RUGOSE CORALS

Bowsher and Dutro (1957) established the Kayak Shale, recognized the overlying Lisburne Group on Mount Wachsmuth in the Shainin Lake area, Endicott Mountains, and published the first major study of the Carboniferous stratigraphy and faunas. They give (p. 3) an excellent account of the earlier history of studies and paleontology on the Carboniferous rocks of arctic Alaska. Helen Duncan (written commun., 1950) made the first detailed study of Lisburne corals from the Endicott Mountains. She illustrated and listed several species of solitary and colonial tabulate corals of Early and Late Mississippian age. She also recognized and illustrated most of the kinds of colonial lithostrotionoids that occur in the Lisburne Group.

The stratigraphic distribution of the lithostrotionoid corals from the Lisburne Group (fig. 7; pl. 42) is based on material collected from the measured sections of this report and from the studies of Armstrong (1972a, b). The stratigraphic range of most species of Lisburne lithostrotionoid corals extends through two or more microfossil zones (fig. 7). This factor, combined with their general low abundance in pre- and post-Meramec age beds, make them a less reliable group for biostratigraphic correlation than the microfossils. Lithostrotionoid corals are not known in pre-Meramec age rocks of the Lisburne Group. The stratigraphic sections in the Endicott Range (pl. 40) show that the oldest known carbonate rocks based on microfossil evidence are of earliest Keokuk Osage age (Zone 8). Mamet reports that the oldest known carbonate rocks in the Kogruk Formation of the De Long Mountains are again in Zone 8. Present knowledge indicates that carbonate deposition in the Lisburne Group began after the decline and extinction of the widespread Cordilleran upper Kinderhook-lowermost Osage lithostrotionoid coral fauna consisting of *Lithostrotionella microstylum* (White), *L. micra* Kelly, and *L. lochmanae* Armstrong.

Helen Duncan (in Bowsher and Dutro, 1957, p. 5, 6) identified from the lower part of the type section of the Wachsmuth Limestone at Shainin Lake (W75–135, pl. 40) in Zone 8 (Osage) the solitary coral *"Zaphrentis" konincki* s. l. (Milne-Edwards and Haime).

In the Shainin Lake, Itkillik Lake, and Echooka River outcrops, Endicott and Philip Smith Mountains, there are thick sequences of Mississippian, open marine, shallow-water, platform, bryozoan-echinoderm packstones and wackestones. Colonial rugose corals are common in this facies, but they also are found in the basal transgressive phase of this facies. In the Romanzof, Franklin, and Shublik Mountains (Mamet and Armstrong, 1972), the Meramec shale and argillaceous limestone facies near the Kayak(?) Shale-Alapah Limestone contact commonly has an abundant lithostrotionoid coral fauna. The most common lithostrotionoid corals in the Meramec age equivalent rocks of the region are *Lithostrotionella banffensis* (Warren), *L. mclareni* (Sutherland), *L. birdi* Armstrong, *L. pennsylvanica* (Shimer), *Lithostrotion reiseri* Armstrong, *Lithostrotion* (*Siphonodendron*) *warreni* Nelson, *L.* (*S.*) *sinuosum* (Kelly), *L.* (*S.*) *dutroi* Armstrong, *Thysanophyllum astraeiforme* (Warren), *Sciophyllum alaskaensis* Armstrong, *S. lambarti* Harker and McLaren, and *Diphyphyllum klawockensis* Armstrong. Associated with the lithostrotionoids are numerous colonies of the tabulate coral *Syringopora* spp., and individuals of *Faberophyllum* spp. and *Amplexizaphrentis* spp.

Armstrong (1970b) described and illustrated Meramec age lithostrotionoid corals from the Kogruk Formation of the De Long Mountains. Sections 62C–15 and 60A–400 to 402 in the De Long Mountains indicated that the Kogruk Formation was deposited in an open-marine environment on a subsiding shelf on which carbonate deposition and subsidence were in near equilibrium (pl. 5). These sections clearly show that the Meramec corals are most abundant in specific rock types. The lithostrotionoid corals are common in bryozoan-echinoderm packstones and ooid packstones adjacent to ooid grainstones and well-sorted crinoid grainstones.

The Kogruk coral fauna is *Lithostrotion* (*S.*) *sinuosum* (Kelly), *L.* (*S.*) *warreni* Nelson, *L. niakensis* Armstrong, *Lithostrotionella mclareni* (Sutherland), *L. birdi* Armstrong, *L.* aff. *L. banffensis* (Warren), *Thysanophyllum astraeiforme* (Warren), *T. orientale* Thomson, *Sciophyllum lambarti* Harker and McLaren, and *S. alaskaensis* Armstrong. Also associated with the lithostrotionoids are the solitary coral *Faberophyllum* spp. and abundant tabulate corals of the genus *Syringopora*.

| Plate no. | Figure number on plate and the interpreted environment of | | | |
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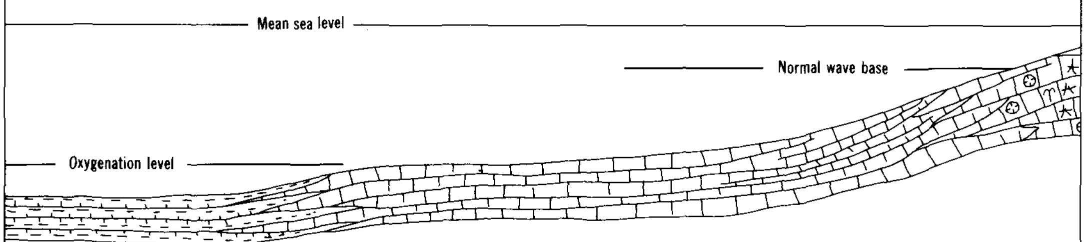
| 25 | 4 | 5 | | 3 |
| Diagrammatic cross section<br>Lisburne Group carbonate platform (free of significant terrigenous clastic influx) |   | | | |
| Environment | Basin or euxinic | Tidal shelf | Toe of slope | Foreslope |
| *Lithology* | *Shales, radiolarian cherts, and silt-stones; bedded phosphate layers* | *Interbedded thin- to medium-bedded limey mudstones, dolomites and cherts. Abundant spiculites and radiolarians* | *Interbedded limestones and dark-gray shales with abundant spiculites* | *Variable, depending on water energy upslope; sedimentary breccias and lime sands and lime mudstones* |
| Color | Dark brown to black | Gray-brown | Gray to dark gray | Gray to light gray |
| *Bedding and sedimentary structures* | *Very even, millimetre laminations, rhythmic bedding, ripple cross laminations, burrows and wormtrails on bedding surfaces* | *Thoroughly burrowed thin- to medium wavy to nodular beds; bedding surfaces show diastems* | *Laminations may be minor; many massive beds and lenses of graded sediments. Lithoclasts and exotic blocks* | *Slumps in soft sediments; foreset bedding, exotic blocks* |
| Terrigenous clastic admixtures or beds | Quartz silt and shale, fine-grained siltstone; cherty | Quartz silts, siltstones and shales; well segregated beds | Some shales, silts, and fine siltstones | Some shales, silts, and fine thin-bedded siltstones |

**FIGURE 5.**—Idealized carbonate depositional model for the carbonate platform and the distribution of most of the carbonate microfacies, Lisburne Group.

| deposition for the microfacies shown in the photomicrograph. | | | | |
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| 7, 8, 1 | | 7, 8 2, 3 6 | 4 5 | |
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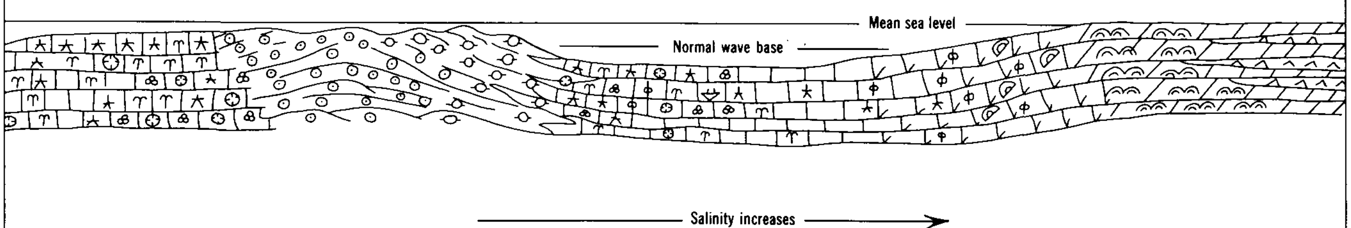


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|---|---|---|---|---|
| Crinoid and bryozoan gardens | Sands on edge of platform | Open platform | Restricted platform | Intertidal to supratidal |
| Bedded crinoid-bryozoan wackestones, packstones *and grainstones* | Crinoid-bryozoan to ooid packstones and grainstones | Variable carbonate bryozoan-crinoid packstones and wackestones, chert common | Fine and coarse crystalline dolomites; dolomitic-crinoid-bryozoan wackestones and packstones; dolomitic pelletoid lime mudstones | Irregularly laminated dolomites and dolomitic lime mudstones; anhydrite and calcite pseudomorphs of anhydrite common; algal mats; may grade into clastic red beds |
| Light gray | Light gray | Light gray | Light gray to gray | Gray, yellow, brown, red |
| Massive to thick beds, some cross bedding | Medium- to large-scale cross-bedded festoons common | Abundant burrows | Birdseye structure, algal mats on or near intertidal zone, stromatolites in shallow water; graded bedding; cross-bedded dolomites in tidal channels | Anhydrite rhombs, bedded anhydrite, cracks, chips, algal mats |
| Clastic sediments, rare | Only some quartz sand admixtures | Clastic and carbonate sediment in well segregated beds | Clastic and carbonate sediments in well-segregated beds | Windblown, land-derived admixtures of clastics may be a distinguishing feature |

**Figure 5.—Continued.**

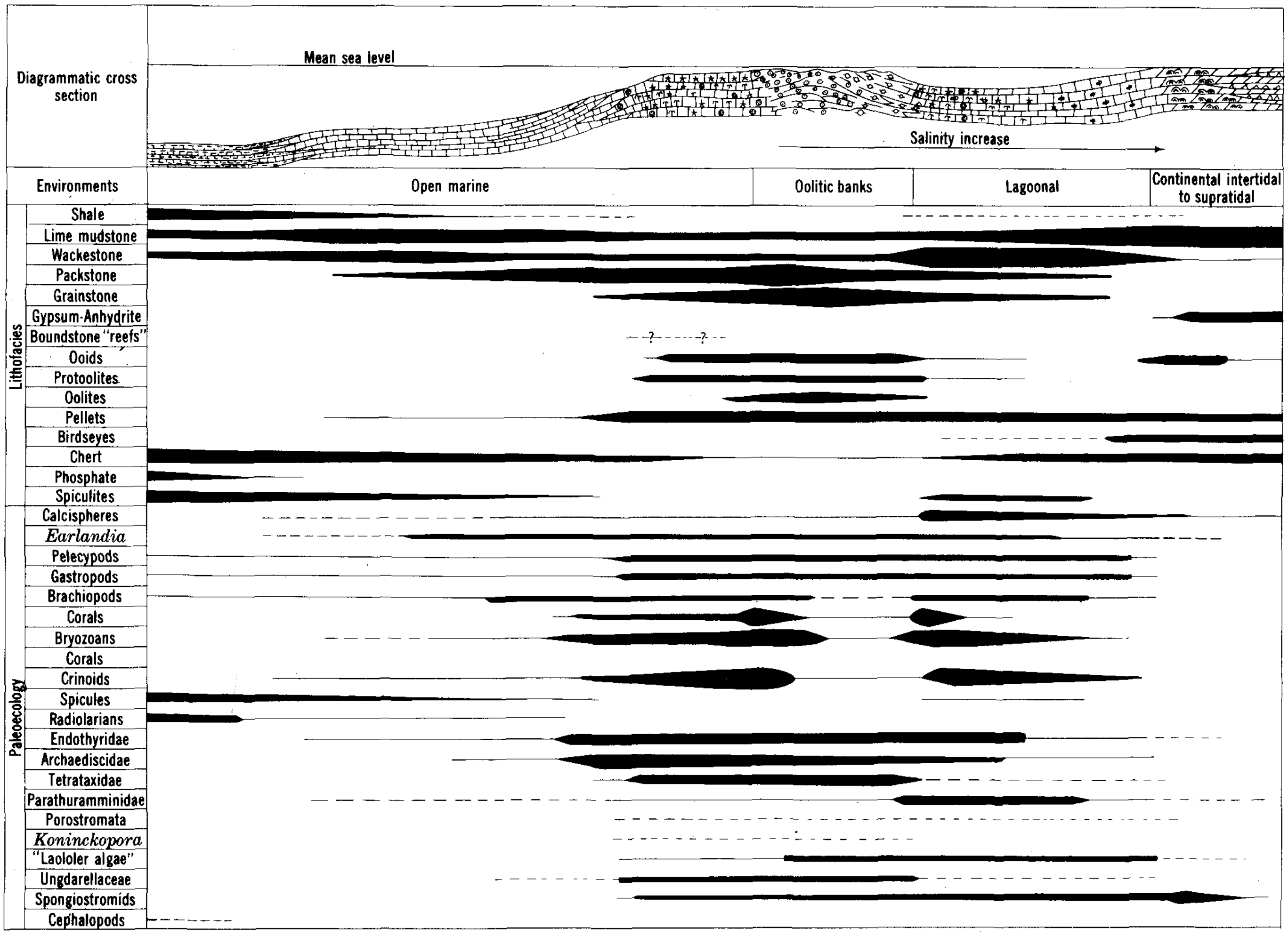


FIGURE 6.—Idealized carbonate depositional model showing the distribution of fossils, organic and inorganic particles. See figure 2 for explanation of symbols. Concept of depositional model modified from Wilson, 1970.

Armstrong, Mamet, and Dutro (1971) listed and Armstrong (1972a) described some of the corals from the base of section 68A–12. This incomplete section is in a structurally complex terrane and is exposed on a sea cliff in the northwestern Lisburne Hills. This location yielded the oldest known lithostrotionoid fauna in the Lisburne Hills region.

The corals collected from the base of section 68A–12 are: *Lithostrotion* (*S.*) *warreni* Nelson, *Lithostrotionella banffensis* (Warren), *L.* aff. *L. banffensis* (Warren), *L. niakensis* Armstrong, and *Syringopora* sp.

South of this location, a large fauna of corals (similar to fauna from 68A–9 listed below) was found in the highest beds (68A–13) of the Nasorak Formation, with a Foraminifera fauna that indicates they represent a transition zone between beds of known Meramec and Chester (Zone 15–16$_{inf}$) age. A few miles to the south at Cape Lewis (68A–9 to 11), a large fauna of lithostrotionoid corals was collected from Nasorak beds of early Chester (Zone 16$_{inf}$) age.

The coral faunas from both sections (68A–9 and 68A–13) and the Nasorak Formation at Cape Thompson are similar and contain: *Lithostrotion* (*S.*) *sinuosum* (Kelly), *L.* (*S.*) *warreni* Nelson, *L.* (*S.*) *lisburnensis* Armstrong, *Lithostrotionella banffensis* (Warren), *Lithostrotionella* sp., *L. mclareni* (Sutherland), *L. birdi* Armstrong, *Thysanophyllum astraeiforme* (Warren), *Sciophyllum lambarti* Harker and McLaren, *S. alaskaensis* Armstrong, and *Diphyphyllum nasorakensis* Armstrong.

In contrast to the central and eastern Brooks Range, where very few lithostrotionoid corals are found above the Meramec-Chester boundary, the Lisburne Hill faunas, as indicated by the microfossils, persisted in abundance into Zone 16$_{inf}$, of the Chester, then abruptly became extinct. This

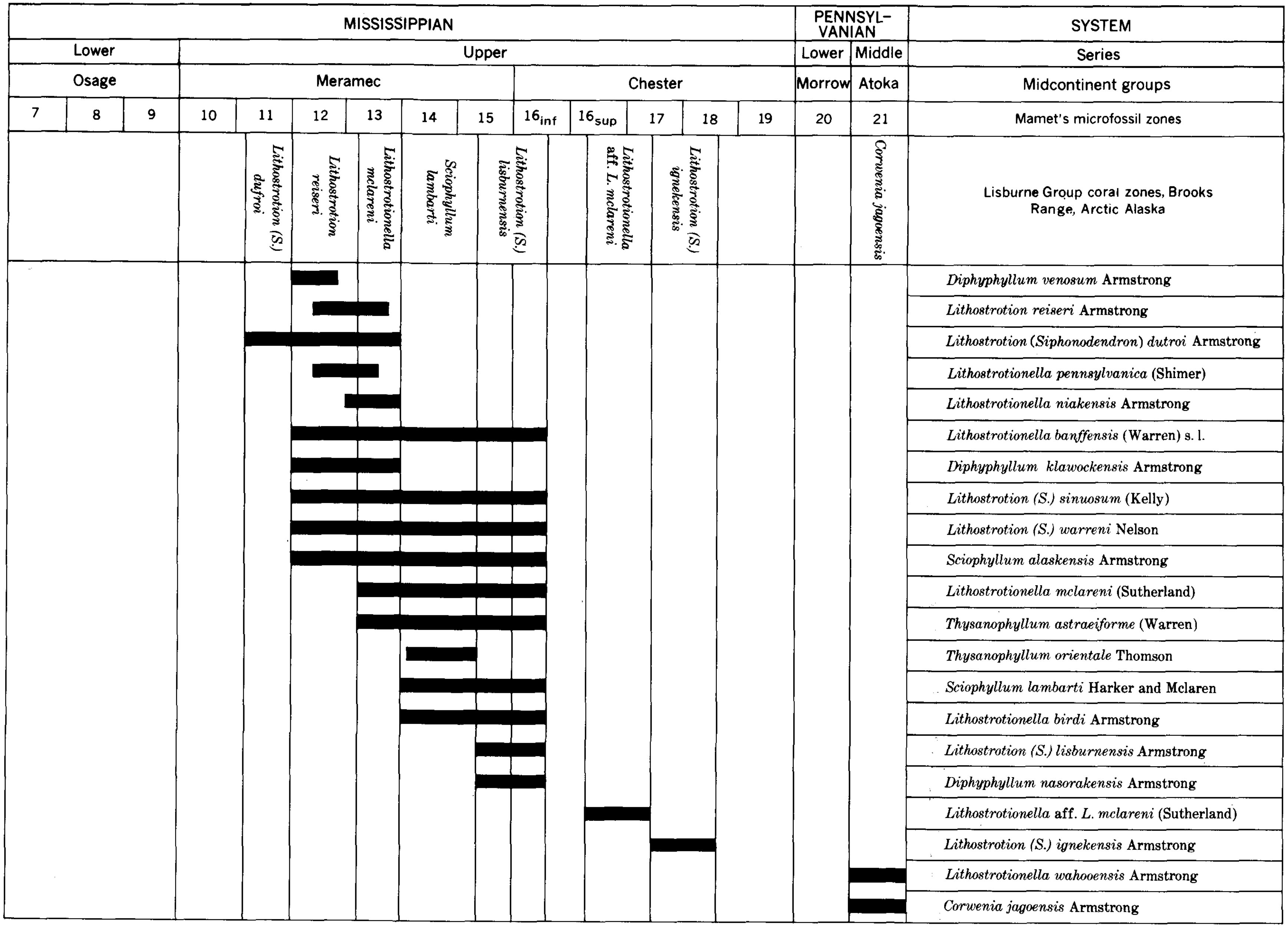


FIGURE 7.—Stratigraphic range of lithostrotionoid corals in the Lisburne Group.

coral fauna is absent in beds of $16_{sup}$ age and younger.

Armstrong, Mamet, and Dutro (1971) report from Zone $16_{inf}$ at Cape Lewis, in the thick, cyclic, shallow-shelf, carbonate sequence (pls. 7, 10), the occurrence of two new species of poorly preserved cerioid *Lithostrotionella.* Higher in the same section, cyclic shelf carbonate rocks of Zones 17 and 18 contain only a few fragmentary solitary corals. One of the few coral taxa found in beds of Zone 17 is from the northeastern Brooks Range. In the same area, Armstrong (1972a) described *Lithostrotion (Siphonodendron) ignekensis* Armstrong in Zones 17 and 18 of the Alapah Limestone from the Sadlerochit, Shublik, and Franklin Mountains.

Pennsylvanian carbonate rocks, as shown on plate 7, are known only in the arctic Alaska from the northeast part of the State. The Wahoo Limestone of the Lisburne Group represents Morrow (Zone 20) and Atoka (Zone 21) age sedimentation. Rugose corals are only moderately abundant in Zone 21, and only fragments of solitary corals are known in Zone 20. Armstrong (1972b) described two species of colonial rugose corals, *Lithostrotionella wahooensis* Armstrong and *Corwenia jagoensis* Armstrong, from beds with a Foraminifera fauna of Atoka age. Tabulate corals from the Atoka age carbonate rocks are a thick-walled syringoporoid and *Michelinia* sp.

### REGIONAL RELATIONS OF CORAL FAUNAS IN THE LISBURNE GROUP

Coral faunas in the Meramec age, Zones 12 through 15, of the Lisburne Group contain many species in common with the upper part of the Peratrovich Formation on the Prince of Wales Island, southeastern Alaska. These rocks contain the following species of corals in common (Armstrong, 1970a): *Lithostrotion (Siphonodendron) warreni* Nelson, *L. (S.) sinuosum* (Kelly), *Lithostrotionella birdi* Armstrong, *L. banffensis* (Warren), *L. pennsylvanica* (Shimer), *Thysanophyllum astraeiforme* (Warren), *Sciophyllum alaskaensis* Armstrong, and *Diphyphyllum klawockensis* Armstrong.

The Lisburne corals shown in figure 7 that occur in the upper half of microfaunal Zone 13 and in Zone 14 correspond approximately to Macqueen and Bamber's (1968) macrofaunal Zones 2 and 3, and those corals in Zone 15 are in their macrofaunal Zone 4 for the Mississippian of Alberta, Canada. Macqueen and Bamber's (1967, 1968) and Petryk, Mamet, and Macqueen's papers (1970) on the lower Carboniferous of southwestern Alberta list for their Zones 2–4 (Mamet's microfossil Zones 13–15) the following species of corals in common with the Lisburne Group: *Lithostrotion (S.) warreni* Nelson, *Lithostrotionella pennsylvanica* (Shimer), *L. mclareni* (Sutherland), *Thysanophyllum astraeiforme* (Warren). The large solitary corals *Faberophyllum* spp. and *Ekvasophyllum* spp. are common to both areas.

Macqueen and Bamber list several Meramec age taxa from southwestern Alberta that have not been found in the Lisburne Group. They are *Lithostrotionella shimeri* (Crickmay), *Lithostrotion (S.) arizelum* (Crickmay) and from Zones $16_{inf}$ and $16_{sup}$ of the Chester, *Lithostrotion (S.) genevievensis* Easton.

Sando, Mamet, and Dutro's (1969, p. E7) list of lithostrotionoids from the Mississippian of the northern Cordilleran of the United States shows no species in common with the Lisburne Group.

Rugose corals from Zone 21 (Atoka) of the Wahoo Limestone are represented by two new species, *Corwenia jagoensis* Armstrong and *Lithostrotionella wahooensis* Armstrong. The nearest described morphologic and time-stratigraphic equivalents are *Lithostrotionella orboensis* Groot (1963) from the upper Moscovian of Spain and *Petalaxis mohikana* Fomichev (1953) from the upper Moscovian of the Donetz Basin, U.S.S.R. *Corwenia jagoensis* Armstrong shows close similarity to the upper Moscovian corals *Corwenia symmetrica* (Dobroljubova) (1958) from Spain and Moscow and Donetz Basins of U.S.S.R. Taxa similar to *L. wahooensis* have not been described from the Pennsylvanian of the Cordilleran region of North America.

## FORAMINIFERAL AND ALGAL MICROBIOTA

The study of Foraminifera and algae of the Brooks Range carbonate succession is generally difficult; bryozoan-echinoderm wackestone and packstone, very common in the Carboniferous of Alaska, are very unfavorable for the preservation of Protozoa. Moreover, dolomitization and stress reorientation of the calcite commonly have obliterated the original texture of the sediments and have complicated the identification of the foraminiferal ghosts.

Despite these hindrances, foraminiferal assemblages have been observed at many levels of the sections investigated and permit recognition of a dozen foraminiferal zones ranging in age from late Tournaisian (Osage) to early Westphalian (Atoka).

The microfauna belongs to the Taimyr-Alaska transition realm (Mamet, 1962; Mamet and Belford, 1968). Although this fauna has many representatives of the North American fauna (abundant and diversified *Eoendothyranopsis, Eoforschia,* and *Zellerina discoidea*), it also contains many Eurasiatic elements, mostly among the Tournayellidae and the Endothyridae. In addition, there are enough "cosmopolitan" elements (mostly among the Archaediscidae) to allow direct correlation with both the original Carboniferous zonation of Europe and part of the American midcontinent succession.

This favorable paleobiologic dispersion permits the use in Alaska of a foraminiferal zonation that originally was established in Europe by Russian micropaleontologists and recently has been extended to North America (Mamet, 1968a, b; Mamet and Mason, 1968; Mamet and Skipp, 1970b; Sando and others, 1969). In this zonation, the Tournaisian and Viséan Stages are formally divided, respectively, into four and eight zones, established on the basis of Endothyridae and Tournayellidae for the Tournaisian and Endothyridae, Archaediscidae, Eostaffellidae, and Pseudoendothyridae for the Viséan (pl. 43).

## FORAMINIFERAL ZONES

### LATE TOURNAISIAN (MIDDLE TO UPPER OSAGE AGE EQUIVALENT)

Late Tournaisian Zones 8 and 9 are poorly represented in northern Alaska. They have been observed only in the basal part of the Wachsmuth Limestone in the central Brooks Range (Shainin Lake section, Itkillik Lake section).

The zones are readily identified by the abundance of Tournayellids; *Glomospiranella, Septaglomospiranella* (*S. chernoussovensis*), *Septatournayella* (*S. pseudocamerata*), and *Tournayella.* Zone 8, in addition, yields scarce *Rectoseptaglomospiranella nalivkini,* whereas abundant *Tournayella discoidea* and *Carbonella* are indicative of Zone 9. Endothyrids are represented by *Latiendothyra* (*Latiendothyra* of the group *L. parakosvensis,* and *L. kosvensis*). The spinose endothyrids *Tuberendothyra* and *Spinoendothyra,* generally abundant at that level in the southern part of the American Cordillera, are very scarce. This scarcity is explained by the absence at the basal part of the Wachsmuth Limestone of pelletoid, calcisphere-rich, clean bioclastic grainstones and the widespread occurrence of pelmatozoan-bryozoan epitaxial grainstones.

In addition, Zone 9 yields the first *Endothyra* of the group *E. similis* and the first *Priscella* (notably *Priscella* of the group *P. prisca*). Other important first occurrences are *Eoforschia* of the group *E. moelleri,* which is very scarce at that level, and "*Septatournayella*" *henbesti.* The earliest forms of Tetrataxids are also very scarce.

In the North American Cordillera, similar zones are known:

1. In the Shunda Formation of the Fort St. John region and in the Jasper-Banff Parks region (British Columbia and Alberta); the Shunda fauna, however, is much richer and diversified than its Alaskan equivalents (Petryk and others, 1970);
2. In the lower part of the Prophet and Flett Formations in British Columbia and the Northwest Territories (Mamet, unpub. data);
3. In the lower part of the Livingstone Formation of southern Alberta and British Columbia (Mamet and Mason, 1968);
4. In the lower part of the Mission Canyon Limestone of Montana and western Wyoming (Sando and others, 1969);
5. In the upper part of the Madison Limestone of central Wyoming (Sando and others, 1969);
6. In the Thunder Springs Member and part of the Mooney Falls Member of the Redwall Limestone in Arizona (Skipp *in* McKee and Gutschick, 1969);
7. In the Dawn and part of the Anchor Limestone Members of the Monte Cristo Limestone in Nevada (Brenckle, 1970; Mamet and Skipp, 1970a).

### EARLY VISÉAN (LOWER AND MIDDLE SALEM AGE EQUIVALENT)

The Early Viséan Zones are grouped here as Zones 10, 11 as they are difficult to separate in Alaska; endothyroids are very scarce in the middle part of the Wachsmuth Limestone, and most carbonates are recrystallized or dolomitized. Moreover, the nondiagnostic "*Earlandia* facies" is often present at that level; it consists of an accumulation of *Earlandia* (*Earlandia* of the groups *E. elegans, E. moderata, E. clavatula,* and *E. vulgaris*) associated with parathuramminids and calcispheres.

When endothyroids are present, few *Eoendothyranopsis* (*Eoendothyranopsis* of the group *E. spiroides*), *Globoendothyra* (*Globoendothyra* of the group *G. baileyi*), *Priscella* and *Inflatoendothyra multicamerata* are recognized. They are usually associated with Stacheiinae (mostly *Stacheia,* rarer *Stacheoides*).

In the North American Cordillera, similar zones are known:

1. In the middle part of the Prophet Formation, British Columbia (Mamet, unpub. data);
2. In the middle part of the Flett Formation, northwest Territories (Mamet, unpub. data);

3. In the lower part of the lower member of the Debolt Formation, Fort St. John region;
4. In the Turner Valley Formation and in the Livingstone Formation of Alberta (Petryk and others, 1970);
5. In the lowermost part of the Mt. Head Formation, southwestern Alberta (Petryk and others, 1970);
6. In the upper part of the Mission Canyon Limestone of Montana and western Wyoming (Sando and others, 1969);
7. In the upper part of the Madison Limestone of central Wyoming (Sando and others, 1969);
8. In the Mooney Falls Member of the Redwall Limestone of Arizona (Skipp in McKee and Gutschick, 1969).

#### MIDDLE VISÉAN (UPPER SALEM AND LOWER ST. LOUIS AGE EQUIVALENT)

The Middle Viséan Zones 12 and 13 are well displayed in Alaska and in the Yukon Territory in the upper part of the Wachsmuth Limestone and the basal Alapah Limestone. Bioclastic wackestones, packstones, and grainstones, pelletoidal lump-bearing grainstones, and bahamite grainstones yield abundant microfauna and some microflora.

Zone 12 is characterized by abundant *Eoendothyranopsis* of the group *E. spiroides* (*Eoendothyranopsis spiroides* and *E. hinduensis*), *Skippella*, *Globoendothyra* of the group *G. baileyi* mixed with the first *Globoendothyra* of the group *G. tomiliensis*. *Dainella anivikensis* is abundant, mixed with scarce *Koninckopora* and *"Palaeotextularia."*

The transition between Zones 12 and 13 is characterized by the short concurrent assemblage of the last *Eoendothyranopsis* of the group *E. spiroides* and the earliest *Eoendothyranopsis* of the group *E. rara*.

The fauna of Zone 13 is rich and diversified, including the first occurrence of abundant *Archaediscus* of the group *A. krestovnikovi* (*Archaediscus krestovnikovi, A. koktjubensis*), abundant *Globoendothyra* of the group *G. tomiliensis* (*G. paula*), first *Endothyra* of the group *E. bowmani*, first *Endothyranopsis* (*Endothyranopsis compressa*) and the first occurrence of abundant *Eoendothyranopsis scitula*. Among the dasyclad algae, *Koninckopora inflata* is present, associated with *Sphinctoporella* and *Yukonella*.

In the North American Cordillera, Zones 12 and 13 are known:

1. In the upper part of the Prophet Formation in British Columbia (Mamet, unpub. data);
2. In the upper part of the Flett Formation in the Northwest Territory (Mamet, unpub. data);
3. In the upper part of the lower Debolt and in the lower part of the upper Debolt Formation, Fort St. John region;
4. At the base of the Peratrovich Formation, southwestern Alaska;
5. In the middle part (Salter and Loomis Members) of the Mt. Head Formation;
6. In the upper part of the Livingstone Formation in the Rocky Mountains Main Range, south and southwest of Banff, Alberta (Petryk and others, 1970);
7. At the base of the White Knob Limestone and in the Middle Canyon Formation of Idaho (Zone 13 only) (Mamet and others, 1971; Skipp and Mamet, 1971);
8. In the Little Flat Formation, Idaho and northeastern Utah (Sando and others, 1969);
9. In the upper part of the Mooney Falls and in the Horseshoe Mesa Members of the Redwall Limestone, Arizona (Skipp *in* McKee and Gutschick, 1969);
10. In the Bullion Dolomite Member of the Monte Cristo Limestone of Nevada (Brenckle, 1973).

The *Globoendothyra baileyi–Eoendothyranopsis spiroides–Koninckopora* assemblage is known in the the upper part of the Salem Limestone in Indiana, Illinois, and Missouri.

The short concurrent *Eoendothyranopsis spiroides–Eoendothyranopsis scitula* assemblage is known from the Salem–St. Louis transition in Illinois and Missouri.

The *Eoendothyranopsis scitula* fauna is well displayed in the St. Louis Limestone of the American midcontinent.

#### EARLY LATE VISÉAN ZONES 14 AND 15 (ST. LOUIS AND STE. GENEVIEVE AGE EQUIVALENT)

Zones 14 and 15, much like Zones 10 and 11, are rather poorly displayed in Alaska. They are usually recognized on the presence of the *"Brunsia* facies," an assemblage of *Brunsia-Brunsia lenensis–Planoarchaediscus* whose age can be determined only by the presence of underlying Zone 13 and the overlying Zone $16_{\text{inf}}$.

Where the endothyrid fauna is better represented (in normal marine carbonates), Zone 14 is recognizable by the abundance of *Eoendothyranopsis* of the group *E. ermakiensis, E. macra, E. utahensis*, and *Banffella*.

Zone 15 has *Eoendothyranopsis* of the group *E.*

*ermakiensis*, widespread *E. robusta*, but few *Eoendothyranopsis* of the group *E. rara*. *Endothyranopsis crassa* occurs for the first time, associated with gigantic *Globoendothyra* of the group *G. globulus* and *Archaediscus approximatus*. Two-layered *Climacammina* and *Palaeotextularia* occur for the first time at that level in Eurasia, but they are not found in the Taimyr–Alaska realm at that level.

In the North American Cordillera, Zones 14 and 15 are known:

1. In the Peratrovich Formation of southwestern Alberta;
2. In the upper part of the upper Debolt Formation, Fort St. John (Mamet, unpub. data);
3. In the Opal, Marston, and Carnarvon Members of the Mt. Head Formation in Alberta (Petryk and others, 1970);
4. In the Scott Peak Formation, Idaho (Mamet and others, 1971);
5. In the Monroe Canyon Limestone, southeastern Idaho and northeastern Utah (Sando and others, 1969);
6. In the Yellowpine Limestone Member of the Monte Cristo Limestone of Nevada (Brenckle, 1973);

In the American midcontinent, the two zones are present in the St. Louis and the Ste. Genevieve Limestones (Illinois and Kentucky).

##### LATE LATE VISÉAN ZONES $16_{inf}$ AND $16_{sup}$ (LOWER CHESTER AGE EQUIVALENT)

The transition between Zones 15 and $16_{inf}$ is underlined by the extinction of part of the Meramec fauna (*Eoendothyranopsis*, *Eoforschia*) and its replacement by a Chester fauna among which the Archaediscidae with closed lumen become progressively conspicuous.

Zone $16_{inf}$ witnesses the first appearance of primitive *Neoarchaediscus* and *Zellerina* (*Zellerina discoidea*). The *Eoendothyranopsis* assemblage is replaced by a morphologically similar *Eostaffella*–*Pseudoendothyra* assemblage.

Zone $16_{sup}$ marks the outburst of *Neoarchaediscus* (*N. parvus, N. parvus regularis, and N. incertus*) mixed with abundant *Planospirodiscus* sp.

In the North American Cordillera, Zones $16_{inf}$ and $16_{sup}$ are known:

1. In the Hart River Formation in the Ogilvie Mountains-Peel River region, northern Yukon Territory, (Mamet and Ross, in Bamber and Waterhouse, 1971);
2. In the basal part of the Nizi Formation, British Columbia (Mamet and Gabrielse, 1969);
3. In the lower part of the Etherington Formation of southwestern Alberta (Mamet, 1968b);
4. In the upper part of the Scott Peak Formation and in the South Creek Formation in the Lost River Range, Idaho (Mamet and others, 1971);
5. In the middle part of the Monroe Canyon Limestone of the Idaho depositional province of Sando and others (1969);
6. In the uppermost part of the Battlewash Formation of Brenckle (1973) in Nevada.

The zones are known from the Aux Vases Sandstone to the Golconda Formation in the Chester type region.

##### EARLY NAMURIAN ZONES 17 AND 18 (MIDDLE AND UPPER CHESTER AGE EQUIVALENT)

Whereas, in the Carboniferous Tethys, the Viséan-Namurian passage is characterized by the extinction of numerous genera (for example, *Valvulinella*, *Howchinia*, and *Saccaminopsis*), this passage is much more transitional, in North America.

Zone 17 marks the rapid development of *Asteroarchaediscus baschkiricus*. Scarce *Pseudoendothyra* of the group *P. kremenskensis* occur for the first time at that level; this group occurs already in the latest Viséan in Alberta and Eurasia.

Zone 18 includes the first appearance of common *Biseriella* of the group *B. parva* and abundant *Planospirodiscus taimyricus*, mixed with abundant *Pseudoendothyra* of the group *P. kremenskensis*. At the top of the zone, the pseudofibrous nature of the *Planospirodiscus* wall disappears, and a glassy, hyaline structure is observed for the first time among the Archaediscidae.

*Eostaffellina*, whose first abundant occurrence is characteristic of Zone 18 and which is rather abundant in the Tethys and in the northern part of the American Cordillera (Amsden Formation of Wyoming), is unknown in Alaska.

In the North American Cordillera, Zones 17 and 18 are known:

1. In the Hart River Formation, Keele Range (Mamet and Ross, in Bamber and Waterhouse, 1971);
2. At the base of the Ettrain Formation, Ogilvie Mountains-Peel River area, northern Yukon Territory (Mamet and Ross, in Bamber and Waterhouse, 1971);
3. In the Calico Bluff Formation, Yukon River, east-central Alaska (Mamet, unpub. data);
4. In the middle and upper part of the Nizi For-

mation in northern British Columbia (Mamet and Gabrielse, 1969);

5. In the Peratrovich Formation, southwestern Alaska (Mamet, unpub. data);
6. In the middle and upper Etherington Formation of southeastern British Columbia and Alberta (Mamet, 1968b);
7. In the Surrett Canyon Formation, Lost River Range, Idaho (Mamet and others, 1971);
8. In the upper part of the Monroe Canyon Limestone of the Idaho depositional province of Sando, Mamet, and Dutro (1969);
9. In the middle part of the Amsden Formation in Wyoming (Sando and others, 1969);
10. In the Indian Springs Formation of Brenckle (1973) in Nevada.

In the midcontinent, Zones 17 and 18 are well displayed in the middle and upper Chester carbonates (Glen Dean to Kinkaid).

#### MIDDLE NAMURIAN ZONE 19 (UPPERMOST CHESTER AGE EQUIVALENT)

The zone is recognized on the short acme of *Quasiarchaediscus–Quasiarchaediscus rugosus–Eosigmoilina?*.

*Homoceras* equivalents are scarce in North America, but Zone 19 is known from:

1. The upper part of the Surrett Canyon Formation in Idaho (Mamet and others, 1971);
2. The upper part of the Indian Springs Formation of Brenckle (1973) in Nevada and in scattered localities of the Great Basin. The zone is absent by hiatus in most of the American midcontinent. It has, however, recently been observed in the subsurface of Alabama (Shell Robison, Pickens Co., 14–205–16 W) and of Mississippi (TX Sheely 29–19 N–12 E).

#### LATE NAMURIAN AND EARLY WESTPHALIAN ZONES 20 AND 21 (MORROW AND ATOKA AGE EQUIVALENT)

Zone 20 is characterized by the first appearance of true Fusulinidae, *Millerella* s. s. occurring for the first time (notably *Millerella* aff. *carbonica*). Two-layered *Globivalvulina* also occur for the first time, associated with *"Lipinella."*

The base of Zone 21 is characterized by the outburst of abundant *Eoschubertella, Pseudostaffella,* and *Globivalvulina* of the group *G. bulloides.*

In the North American Cordillera, these zones are known at the base of the Pennsylvanian sequence of the Malcolm River section and in the Ettrain Formation in the Keele Range, Yukon Territory (Mamet and Ross, in Bamber and Waterhouse, 1971). The zones are also well displayed at the base of the Pennsylvanian succession of central Idaho (Mamet and others, 1971), the upper part of the Amsden Formation of Wyoming, and in the Bird Spring Formation in Nevada (Brenckle, 1973; Mamet and Skipp, 1970a).

#### ZONAL INTEGRITY

The best way to test the validity of a zonation is to check its results with zonations based on other fossil groups. For instance, Sando, Mamet, and Dutro (1969) have recently compiled stratigraphic information derived from the study of brachiopods, corals, and foraminifers in Wyoming, Montana, Idaho, and Utah. They concluded that, although the respective faunas were benthonic and facies sensitive, they evolved rapidly and thus were reliable for correlations.

In the Early Tournaisian, brachiopods and corals apparently evolved faster than the accompanying foraminifers. In contrast, at the Viséan-Namurian boundary, foraminifers give a more refined zonation than the macrofauna. Moreover, in the basin under study, the microfaunal and macrofaunal zonations appeared to be fairly consistent. For instance, macrofaunal Zones D, E, F, pre-K, and K of Sando, Mamet, and Dutro (1969) consistently correspond to foraminiferal Zones 10 and 11, 13 and 14, 14 and 15, 16 $_{inf}$, and 16 $_{sup}$ through 18, respectively.

It would have been interesting to use the same approach in the Lisburne carbonates. Unfortunately, brachiopods are not very abundant, and most corals are restricted to a few levels. Hence it was unfeasible to extend the approach used in Wyoming and Utah to the Alaskan Carboniferous.

However, in the region under study, the integrity of superposition of the foraminiferal zones appears to be well supported. No inversion of the succession could be detected; no chiasm is apparently present; and no condensation is required to explain the observed faunal distribution (See pls. 44–47).

Dinantian foraminifers are obviously facies sensitive (Mamet and Skipp, 1970b), but since the zones are usually defined on several taxa belonging to different families, an internal check of the validity of the approach is possible. There are, however, a few minor discrepancies between the Lisburne and an "ideal" foraminiferal distribution.

Ideally, the base of Zone 16 $_{sup}$ is underlined by the base of the acme of *Neoarchaediscus* and *Planospirodiscus*. In most Carboniferous basins, the bases of both acmes occur at the same level; this is also generally true in Alaska (see pl. 44, Trout Lake, Old

Man Creek, West Sadlerochit). However, plate 44 also shows that the first appearance of numerous *Neoarchaediscus* of the group *N incertus* sometimes precedes the first outburst of *Planospirodiscus* (for example, Joe Mountain by 120 feet, Sunset Pass by 40 feet, and Cape Lewis by 100 feet).

Ideally, the last occurrence of *Eoendothyranopsis* should coincide with the $15–16_{\text{inf}}$ boundary. (See pl. 46.) Again, this is true for many sections of the Lisburne Group (Joe Mountain, Ikiakpuk Creek, Itkillik Lake, and South Niak Creek); however, because the "*Brunsia* facies" eliminates all endothyrids, the extinction of *Eoendothyranopsis* apparently occurs "too soon" in the Echooka River section. Ideally, the last *Eoforschia* (see pl. 45) should coincide with the last *Eoendothyranopsis*. Again, this is not always true (Echooka River, Joe Mountain, and Itkillik Lake), when the "'*Brunsia* facies" is well developed in Zones 14 and 15. Ideally, the last *Eoendothyranopsis* of the group *E. ermakiensis* (see pl. 46) normally coincides with the Meramec-Chester boundary; this is true in all known sections except in the Joe Mountain sequence. These observations emphasize the necessity of using multiple assemblage zones and, if feasible, multiple phylogenies. In other words, the order of succession of the faunal distribution is identical everywhere in Alaska, but we can rightly suspect that the zonal boundaries are not synchronous. This can be explained by inadequate sampling, gaps in the record, or facies influence.

In the Lisburne Group, we have found abundant faunal elements and complete phylogenies at only a few levels. Thus, in many instances, the zonal boundaries are undetermined. A notable exception is the 12–13 boundary based on a short concurrent assemblage of *Eoendothyranopsis* that permits application of the principle of "phylogenic unity" (Mamet, 1967) and is probably "synchronous" in the basin. It is remarkable that this 12–13 boundary closely coincides with the lithostratigraphic Wachsmuth-Alapah contact in central Alaska. This close coincidence suggests that these mappable units are "synchronous" over nearly a hundred miles.

## DIACHRONISM

The boundaries of the Lisburne Group are obviously diachronic.

At its base, the Kayak-Lisburne contact in central northern Alaska extends from Late Tournaisian (Itkillik Lake and Shainin Lake) to Middle Viséan (Echooka River). In northeastern Alaska and in the northern Yukon Territory, the first massive carbonate units are Middle Viséan (Joe Mountain section) to Late Viséan (West Trout Lake).

The top of the Lisburne is eroded, and the Permian Sadlerochit Formation rests on different levels of the middle Carboniferous. The youngest observed zone in the Wahoo Limestone is Zone 21. However, in the Wahoo Lake region, impure carbonate units are observed above the massive, whitish, oolitic Zone 21 grainstones. If these units (spiculites and chertified calcareous siltstones) are included in the Wahoo Limestone, they would extend the age of that formation into the Middle Westphalian. These recessive units are equivalent in age to part of the newly erected Ettrain Formation of Bamber and Waterhouse (1971).

If the boundaries of the group are diachronic, detailed study of the carbonate units at a much smaller scale shows that the formation boundaries are nearly synchronous. As we have already pointed out, the Wachsmuth-Alapah contact is practically synchronous in central Alaska (Passage of Zone 12–13). The Alapah-Wahoo contact is nearly equivalent to the Zone 19–20 contact. The massive oolite grainstone of the Wahoo Limestone is usually Zone 21. The position of the black, euxinic mudstones-wackestones of the upper Wachsmuth is also constant (Zone 12).

In conclusion, although the boundaries of the major lithostratigraphic units are diachronous, the boundaries of the formations, wherever they could be checked, are generally synchronous.

## SYSTEMATIC PALEONTOLOGY

Systematic paleontology was completed in 1970 and the synonymy lists are reasonably complete to that date. No attempt has been made to up-date the taxonomy at the galley-proof stage except for last minute minor corrections and emendations.

### Phylum PROTOZOA?
### Order FORAMINIFERIDA?
### Family PARATHURAMMINIDAE Bykova 1955

#### Genus VICINESPHAERA Antropov 1950

1950. *Vicinesphaera* Antropov. Akad. Nauk SSSR Kazakh. Fil., Geol. Ser., no. 1, p. 22–23.

1954. *Vicinesphaera* Reitlinger, VNIGNI Trudy, Paleont. Ser., no. 1, p. 66, 67.

1955. *Vicinesphaera* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 19.

1959. *Vicinesphaera* Konoplina. Akad. Nauk Ukrain. SSSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 26, p. 19.

1959. *Vicinesphaera* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 38, p. 89.

1962. *Vicinesphaera* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofizikii Trudy, p. 83–84.
1962. *Parathurammina* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 101.
1963. *Vicinesphaera* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 128.
1964 *Vicinesphaera* Conil and Lys. Louvain Univ. Géol. Mém., v. 23, p. 31.
1964. *Archaesphaera* Loeblich and Tappan. Treatise Invert. Paleontology, part C, p. C314 [part].
1965. *Parathurammina* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 26.
1966. *Vicinesphaera* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofizikii Trudy, p. 74–77.
1970. *Vicinesphaera* Hallet. 6ème Cong. Avanc. Strat. Carb., Compte Rendu, p. 886.

*Diagnosis*.—"Test" free, monolocular, irregular in inner and outer outline; wall calcareous secreted, dense, dark microcrystalline, one layered. No agglutination. Apertures unknown.

*Type of genus*.—1950 *Vicinesphaera squalida* Antropov. Akad. Nauk SSSR Kazakh. Fil., Geol. Ser., no. 1, p. 22, 23, pl. 1, figs. 1, 2.

Taxa included in the genus *Vicinesphaera*:

1950 *angulata* Antropov
1954 *grandis* Reitlinger
1966 *irregularis* Bogush and Yuferev
1965 *obnata* Chuvashov
1954 *solida* Reitlinger

*Remarks*.—Loeblich and Tappan (1964) put *Vicinesphaera* in synonymy with *Archaesphaera* Suleimanov. However, *Archaesphaera* is an algal spore case, which should be transferred to the Calcispherids sensu Andrews. *Archaesphaera* is spherical with minute, regular, radiating pores, whereas *Vicinesphaera* is grossly irregular and without pores.

The genus is readily distinguished from *Parathurammina* by the absence of hollow spines.

A report by Pronina (1965) that the wall is agglutinated appears unfounded.

*Stratigraphic range and distribution*.—Reports of *Vicinesphaera* in the Cambrian (Reitlinger, 1959a; Chuvashov, 1965) need further confirmation. The oldest reliable report is from the Frasnian (Antropov, 1950) and the genus is very common in Famennian, Tournaisian, and Viséan (Antropov, 1950; Reitlinger, 1954; Durkina, 1959; Malakhova, 1959; Bogush and Yuferev, 1962, 1966; Sando and others, 1969; Petryk and others, 1970). Although Conil and Lys (1964) restrict *Vicinesphaera* to the Upper Famennian and basal Tournaisian of Belgium, the genus is certainly far longer ranging and is observed in all lagoonal, dark, bioclastic wackestones of the Viséan. Latest occurrence is undetermined; scarce forms are still observed in the Early Namurian of the American Cordillera (Sando and others, 1969).

The genus is cosmopolitan in the Northern Hemisphere.

#### Vicinesphaera sp.

Plate 26, figure 1

*Diagnosis*.—"Test" free, ranging from 120$\mu$ to 200$\mu$ in diameter, the most frequent dimensions being 130$\mu$ to 140$\mu$. Wall dense, dark, not agglutinated, ranging from 8$\mu$ to 20$\mu$.

*Stratigraphic range and distribution*.—Generally scarce in the Tournaisian and Viséan Wachsmuth and Alapah Limestones. Rather common in the dark wackestones of Zones 12 and 13 at Itkillik Lake, Anivik Lake, and Skimo Creek sections.

*Figured specimen*.—USNM 179312.

### Genus PARATHURAMMINA Suleimanov 1945

1881. *Calcisphaera* Williamson. Royal Soc. London Philos. Trans., v. 171, p. 522 [part].
1945. *Parathurammina* Suleimanov. Akad. Nauk SSSR Doklady, v. 48, no. 2, p. 125–127.
1950. *Parathurammina* Antropov. Akad. Nauk SSR Kazakh. Fil., Geol. Ser., no. 1, p. 23–26.
1950. *Parathurammina* Vissarionova. Bashkiria Neft, no. 1, p. 35.
1950. *Parathurammina* Lipina Akad. Nauk SSSR Geol. Inst. Trudy 119, no. 43, p. 119–121.
1952. *Parathurammina* Bykova. VNIGRI Trudy 60, p. 17.
1954. *Parathurammina* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 23–27.
1954. *Parathurammina* Reitlinger. VNIGNI Trudy, Paleont. sbornik no. 1, p. 67, 68.
1955. *Parathurammina* Bykova *in* Bykova and Polenova. VNIGRI Trudy, 87, p. 17–20.
1955. *Parathurammina* Antropov *in* Bykova and Polenova. VNIGRI Trudy 87, p. 19.
1955. *Parathurammina* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 21–22.
1955. *Parathurammina* Lipina *in* Bykova and Polenova. VNIGRI Trudy 87, p. 1.
1955. *Parathurammina* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 21, 22.
1955. *Parathurammina* Lipina *in* Bykova and Polenova. VNIGRI Trudy 87, p. 18.
1959. *Parathurammina* Antropov. Akad. Nauk SSSR Kazakh. Fil., Geol. Ser., no. 7, p. 29 [part].
1959. *Parathurammina* Konoplina. Akad. Nauk Ukrain SSR Inst. Geol. Trudy, Ser. Paleont. Strat., no. 26, p. 20–23.
1959. *Parathurammina* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 38, p. 91.
1960. *Parathurammina* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 39.

1960. [not] *Parathurammina* Pronina. VSEGEI Trudy, Min. Geol. Okhran Nedr SSSR, no. 1, p. 138, 139.
1960. *Parathurammina* Vdovenko. Kiev. Univ. Visn., Bull 3, no. 2, p. 30.
1960. *Parathurammina* Vdovenko. Paleont. Zhur., no. 1, p. 46–49.
1960. ?*Parathurammina* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 203.
1961. *Thurammina* (*Thurammina*) Poyarkov *in* Purkin, Poyarkov, and Rozanetz. Akad. Nauk Kirgiz. SSR Izv. Ser. Yestestv. i Tekh. Nauk, Bull 3, no. 4, p. 17.
1961. *Thurammina* (*Salpingothurammina*) Poyarkov *in* Purkin, Poyarkov, and Rozanetz. Akad. Nauk Kirgiz. SSR Yestestv. i Tekh. Nauk, Bull. 3, no. 4, p. 17.
1961. *Parathurammina* Yuferev. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 5, p. 126.
1961. [not] *Parathurammina* Blumenstengel. Geologie, v. 10, no. 3, p. 320, pl. 3, figs. 5–7.
1962. *Parathurammina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Odteleniye Inst. Geologii i Geofiziki Trudy, p. 77–79.
1962. *Parathurammina* Reitlinger. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., no. 5, p. 52–55 [part].
1962. *Parathurammina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Odteleniyi Inst. Geologii i Geofiziki Trudy, p. 77–83 [part].
1962. *Parathurammina* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 101 [part].
1963. *Parathurammina* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 126, 127.
1963. *Parathurammina* Pronina. Paleont. Zhur., no. 4, p. 6.
1964. *Parathurammina* Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pl. 1, fig. 2.
1964. *Parathurammina* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 30–31.
1965. *Parathurammina* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 18–26 [part].
1965. *Parathurammina* Toomey. Canadian Petroleum Geology Bull., v. 13, no. 2, p. 257.
1966. *Parathurammina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Odteleniyi Inst. Geologii i Geofiziki Trudy, p. 80, 81.
1968. *Parathurammina* Leavitt. Canadian Petroleum Geology Bull., v. 16, no. 3, pl. 13, figs. 41, 42.
1969. *Parathurammina* Platonov. NIIGA Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 51.
1969. *Parathurammina* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 31.
1970. *Parathurammina* Toomey, Mountjoy, and MacKenzie. Canadian Jour. Earth Sci., v. 7, no. 3, p. 968–972.

*Diagnosis.*—"Test" free, monolocular. External outline irregular, spinose. Inner outline, spherical to irregular. Wall calcareous secreted, dense, micritic, one layered. Apertures multiple at end of hollow spines.

*Remarks.*—The forms showing attachment disks should be referred to other taxa.

*Type of the genus.*—1945 *Parathurammina dagmarae* Suleimanov. Akad. Nauk SSSR Doklady, v. 48, no. 2, p. 125, fig. 3.

Taxa included in the genus *Parathurammina*:

1960 *aperturata* Pronina
1960 *arguta* Pronina
1962 *bella* Reitlinger *in* Bogush and Yuferev
1960 *brazhnikovae* Vdovenko
1962 *breviradiosa* Reitlinger
1963 *clivosa* Pronina
1950 *crassitheca* Antropov
1945 *cushmani* Suleimanov
1950 *cushmani minima* Antropov
1950 *devonica* Vissarionova
1954 *eodagmarae* Reitlinger
1950 *gekkeri* Antropov
1960 *graciosa* Pronina
1965 *horrida* Chuvashov
1960 *irregularis* Pronina
1950 *lipinae* Antropov
1950 *magna* Antropov
1960 *marginara* Pronina
1965 *monstrata* Chuvashov
1945 *oldae* Suleimanov
1962 *pachysphaerica* Bogush and Yuferev
1954 *paracushmani* Reitlinger
1950 *paradagmarae* Lipina
1952 *paulis* Bykova
1963 *polygona* Pronina
1954 *praetuberculata* Reitlinger
1950 *radiata* Antropov
1962 *radiosphaerica* Bogush and Yuferev
1962 *ramosa* Reitlinger
1965 *regularis* Chuvashov
1965 *scitula* Chuvashov
1881 *spinosa* Williamson
1960 *sergiensis* Pronina
1954 *stellaeformis* Grozdilova and Lebedeva
1950 *stellata* Lipina
1955 *subvasta* Bykova
1950 *suleimanovi* Lipina
1950 *tuberculata* Lipina
1965 *turgida* Chuvashov

*Remarks.*—Although *Parathurammina* is readily identifiable even in random thin section, its speciation is extremely difficult. As most of the taxa erected by the Russian authors are based on random thin sections, the species list is obviously indicative of duplication. At any rate, five species groups can safely be recognized:

1. *Parathurammina* of the group *P. dagmarae* Suleimanov 1945. Very thin walled, regular *Parathurammina* with numerous, thin, regular spine projections.
2. *Parathurammina* of the group *P. spinosa* Williamson 1881. Medium-thick-walled *Parathu-*

*rammina* with few, long spine projections. Canals are regular and thin.

3. *Parathurammina* of the group *P. cushmani* Suleimanov 1945. Medium-thick-walled *Parathurammina* with few, short, stout spine projections. Canals are thin.
4. *Parathurammina* of the group *P. suleimanovi* Lipina 1950. Thick to very thick walled *Parathurammina,* with massive short spine projections. Canals are thin.
5. *Parathurammina* of the group *P. paracushmani* Reitlinger 1954. Medium- to thick-walled *Parathurammina,* with massive spines. Canals are straight, dichotomous, and thick.

*Stratigraphic range and distribution.*—Pronina (1965) and Chuvashov (1965) report *Parathurammina* as low as the Eifelian but the first well-documented *Parathurammina* is Givetian (Pronina, 1960; Platonov, 1969). The genus is extinct by the middle Carboniferous.

The taxon is widespread from Frasnian to Tournaisian and cosmopolitan in the Northern and the Southern Hemispheres (Mamet and Belford, 1968; Toomey, 1965).

In the North American Cordillera the youngest known occurrence is early Namurian (Mamet, 1968b; Mamet and Mason, 1968).

In Alaska, *Parathurammina* is known in the Wachsmuth and Alapah Limestones (Zones 8 to 17).

#### Parathurammina of the group P. spinosa (Williamson 1881)

Plate 26, figures 2–4, 6–8

Group exemplified by:

1881. *Calcisphaera spinosa* Williamson. Royal Soc. London Philos. Trans., v. 171, p. 522, pl. 20, figs. 71–73, 76 [not 75 and 77].

1950. *Parathurammina spinosa* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 119, no. 43, p. 117, 118.

1954. *Parathurammina spinosa* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 25, pl. 2, figs. 1–3.

1955. *Parathurammina* spinosa Lipina *in* Bykova and Polenova. VNIGRI Trudy 87, p. 18, pl. 2, figs. 6, 8, pl. 4, fig. 4 [part].

1959. *Parathurammina spinosa* Konoplina. Akad. Nauk. Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont. no. 26, p. 20, pl. 1, fig. 6.

1961. [not]*Thurammina* (*Thurammina*) aff. *spinosa* Poyarkov *in* Purkin, Poyarkov, and Rozanetz. Akad. Nauk Kirgiz. SSR Izv. Ser. Yestestv. i Tekh. Nauk, Bull. 3, no. 4, p. 17, pl. 3, fig 4.

1962. *Parathurammina spinosa* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Odteleniye Inst. Geologii i Geofiziki Trudy, p. 78, 79, pl. 1, fig. 10.

1964. [not] *Parathurammina* aff. *spinosa* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 30, pl. 3, fig. 12.

1970. *Parathurammina* sp. cf. *P. spinosa* Toomey, Mountjoy, and MacKenzie. Canadian Jour. Earth Sci., v. 7, no. 3, p. 968 [part].

*Diagnosis.*—"Test" monolocular, free, ranging from 150μ to 250μ in diameter. Wall dense, dark, micritic, of irregular thickness, 10μ to 30μ. General outline of the chamber, subangular. Spines long, numerous, irregularly spaced. Canals thin, 3μ to 12μ. Apertures simple, at open end of canals.

*Stratigraphic range and distribution.*—Present in the Wachsmuth and Alapah Limestones. Common in the dark, wackestones of Zones 12 and 13 at Itkillik Lake, Anivik Lake, Skimo Creek, and Shainin Lake sections. Also conspicuous in the pelmatozoan grainstones of Zone 9.

*Figured specimens.*—USNM 179313–179316; Univ. Montréal 205/9 and 205/11.

#### Parathurammina of the group P. cushmani Suleimanov 1945

Plate 26, figure 5

*Diagnosis.*—"Test" free, monolocular, ranging from 150μ to 250μ in diameter. Inner and outer outlines subangular. Spines rare, short, blunt. Canals thin (3μ to 10μ). Wall calcareous secreted, dense, microcrystalline, thick (30μ). Apertures at the open end of the canals.

Group exemplified by:

1945. *Parathurammina cushmani* Suleimanov. Akad. Nauk SSSR Doklady, v. 48, no. 2, p. 126, fig. 5.

1954. *Parathurammina cushmani* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 26, pl. 1, figs. 4, 5.

1955. *Parathurammina cushmani* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 21, pl. 1, fig. 17.

1959. *Parathurammina cushmani* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 38, p. 91, pl. 2, figs. 7, 8.

1961. *Thurammina* (*Salpingothurammina*) *cushmani* Poyarkov *in* Purkin, Poyarkov, and Rozanetz. Akad. Nauk Kirgiz. SSR Izv. Ser. Yestestv. i Tekh. Nauk, Bull. 3, no. 4, p. 17.

1963. *Parathurammina cushmani* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 126, pl. 1, fig. 8.

*Stratigraphic range and distribution.*—Present in the Wachsmuth and Alapah Limestones from the Yukon Territory to the central Brooks Range. Abundant in Zones 12 and 13.

*Figured specimen.*—USNM 179319.

#### Parathurammina of the group P. suleimanovi Lipina 1950

Plate 26, figures 9–12

Group exemplified by:

1950. *Parathurammina suleimanovi* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 119, no. 43, p. 120, pl. 1, figs. 12-14.

1950. *Parathurammina suleimanovi stellata* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 119, no. 43, p. 120, 121, pl. 1, figs. 15, 16.

1954. *Parathurammina suleimanovi stellata* Reitlinger. VNIGNI Trudy, Paleont. sbor. no. 1, p. 67, 68, pl. 20, fig. 16.

1955. *Parathurammina suleimanovi stellata* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 22, pl. 2, figs. 1, 2.
1959. *Parathurammina suleimanovi stellata* Konoplina. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 26, p. 23, pl. 1, fig. 12.
1961. *Thurammina* (*Thurammina*) *suleimanovi* Poyarkov *in* Purkin, Poyarkov, and Rozanetz. Akad. Nauk Kirgiz. SSR Izv. Ser. Yestestv. i Tekh. Nauk, Bull. 3, no. 4, p. 17.
1964. *Parathurammina suleimanovi* Conil. Soc. Géol. Belgique Bull., v. 72, pl. 1, fig. 2.
1966. *Parathurammina suleimanovi* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Odteleniye Inst. Geologii i Geofiziki Trudy, p. 81, pl. 1, fig. 14.
1969. *Parathurammina suleimanovi* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 31, pl. 1, fig. 1.

*Diagnosis.*—"Test" free, ranging from 200$\mu$ to 350$\mu$, ordinarily 250$\mu$ to 300$\mu$ in diameter. Wall dark, secreted, microcrystalline, thick, irregular; maximum observed thickness may reach up to 85$\mu$. Spines irregular, thick, long. Canals very thin (3$\mu$ to 6$\mu$). Apertures at open end of canals.

*Stratigraphic range and distribution.*—Present in the Wachsmuth and the lower part of the Alapah Limestone.

*Figured specimens.*—USNM 179320–179323.

*Remark on the Parathuramminidae.*—*Vicinesphaera* and *Parathurammina* have always been reported to the Foraminifera. However, Parathuramminidae and Calcispheres have a strikingly similar ecological distribution and further investigation will perhaps show that the family groups calcified algal kysts.

### Family Tuberitinidae Mikluko-Maklai 1958

### Genus EOTUBERITINA Mikluko-Maklai 1958

1950. *Tuberitina* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 88 [part].
1956. *Tuberitina* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 87.
1957. *Tuberitina* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk, sbornik 2, p. 97–99 [part].
1958. *Eotuberitina* Mikluko-Maklai. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 134.
1959. *Tuberitina* Conil. Acad. Royale Belgique Mém., Cl. Sci., v. 14, no. 5, pl. 4, fig 21.
1961. *Eotuberitina* Poyarkov *in* Purkin, Poyarkov, and Rozanetz. Akad. Nauk Kirgiz. SSR Izv. Ser. Yestestv. i Tekh. Nauk, Bull. 3, no. 4, p. 28.
1962. *Eotuberitina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 94, 95.
1964. *Eotuberitina* Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, p. 125.
1964. *Tuberitina* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C321, C322.
1964. *Eotuberitina* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 34, 35.
1965. *Eotuberitina* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 33, 34.
1965. *Eotuberitina* Omara and Conil. Soc. Géol. Belgique Annales, v. 88, no. 5, p. 225.
1966. *Eotuberitina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 81, 82.
1968. [not] *Eotuberitina* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 500.
1969. *Tuberitina* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 229.
1969. *Eotuberitina* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 31.
1970. *Archaesphaera* Hallett. 6ème Cong. Avanc. Strat. Carb., Compte Rendu, p. 888.
1970. *Eotuberitina* Hallett. 6ème Cong. Avanc. Strat. Carb., Compte Rendu, p. 890.

*Type of genus.*—1958 *Eotuberitina reitlingerae* Mikluko-Maklai, Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 134; *pro Tuberitina maljavkini* Reitlinger 1950, Akad. Nauk SSSR Geol. Inst. Trudy 126, p. 88, pl 19, fig. 2, not *Tuberitina maljavkini* Mikhailov 1939, Leningrad Geol. Trust Symp. no. 3, p. 48, pl. 1, figs. 11, 12.

Taxa included in the genus *Eotuberitina:*

- 1970 *cornuta* Hallett
- 1961 ?*crassa* Poyarkov, *in* Purkin, Poyarkov, and Rozanetz
- 1964 *firmata* Conil and Lys
- 1970 *fornicata* Hallett
- 1957 *grandis* Golubsov
- 1961 ?*talassica* Poyarkov, *in* Purkin, Poyarkov, and Rozanetz

*Remarks.*—*Eotuberitina* is readily distinguishable from *Tuberitina* by its lack of pseudofibrous hyaline layer. It is, however, very difficult in most sections to differentiate the taxon from *Diplosphaerina* Derville 1952. The systematic position of *Tuberitina* and *Eotuberitina* is unclear, and they could very well belong to the botanical realm.

*Stratigraphic range and distribution.*—The genus is reported in Eurasia from the Early Famennian (Chuvashov, 1965) to the middle Carboniferous (Reitlinger, 1950). Most references, however, are Tournaisian and Viséan. The genus is scarce in North America and has only been illustrated once by Skipp (in McKee and Gutschick, 1969) from the Redwall Limestone of Arizona. In Alberta, the genus range from Tournaisian to Viséan (Mamet and Mason, 1968).

### Eotuberitina reitlingerae Mikluko-Maklai 1958

Plate 26, figure 13

1950. *Tuberitina maljavkini* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 88, pl. 19, fig. 2.
1956. *Tuberitina maljavkini* Malakhova. Akad. Nauk SSSR

Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 87, pl. 1, figs. 1, 2.

1958. *Eotuberitina reitlingerae* Mikluko-Maklai. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 134.

1962. *Eotuberitina reitlingerae* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniy Inst. Geologii i Geofiziki Trudy, p. 94, 95, pl. 1, fig. 12.

1964. *Eotuberitina reitlingerae* Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, p. 125.

1964. *Eotuberitina reitlingerae* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 34, pl. 4, figs. 27–32.

1965. *Eotuberitina reitlingerae* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 33, 34, pl. 4, fig. 15.

1966. *Eotuberitina reitlingerae* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 81, 82, pl. 1, fig. 15.

*Diagnosis.*—Test? attached, small, consisting of a 150$\mu$ hemispherical chamber? and a thin attachment disk. Wall thin, 10$\mu$ to 12$\mu$, dark, secreted, microcrystalline. No aperture visible.

*Stratigraphic range and distribution.*—A scarce form found mostly in the Viséan Kogruk Formation of western Alaska.

*Figured specimen.*—USNM 179324.

### Phylum PROTOZOA
### Order FORAMINIFERIDA
### Family EARLANDIIDAE Cummings 1955

#### Genus EARLANDIA Plummer 1930

1876. *Nodosinella* Brady. Palaeont. Soc. London Pub., v. 30, p. 104 [part].

1888. *Hyperammina* Howchin. Royal Micros. Soc. London Jour., pt. 2, p. 535.

1927. *Hyperammina* Cushman and Waters. Cushman Lab. Foram. Research Contr., v. 3, p. 109, 110.

1928. *Hyperamminella* Cushman and Waters. Cushman Lab. Foram. Research Contr., v. 4, p. 36.

1928. *Hyperamminoides* Cushman and Waters. Cushman Lab. Foram. Research Contr., v. 4, p. 112.

1930. *Earlandia* Plummer. Texas Univ. Bull. 3019, p. 12, 13.

1937. *Hyperammina* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova and Fursenko. ONTI, p. 256, 257.

1939. *Hyperammina* Mikhailov. Leningrad Geol. Trust. Symp. no. 3, pl. 1, fig. 1.

1940. *Hyperammina* Rauzer-Chernoussova, Beljaev, and Reitlinger. Neft. Geol. Razved. Inst. Trudy 7, p. 55, 56.

1940. *Hyperammina* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, ser. geol. 18, no. 5, 6, p. 122.

1945. *Earlandia* Plummer. Texas Univ. Bull. 4401, p. 224.

1948. *Hyperammina* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 3.

1948. *Hyperammina* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 239.

1948. *Hyperammina* Birina. Sovetskaya Geologiya, sbornik 28, p. 155, 156.

1950. *Hyperammina* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 12, 13.

1950. *Hyperammina* Vissarionova. Bashkiria Neft, no. 1, p. 35.

1954. *Hyperammina* Lebedeva. VNIGRI Trudy 81, p. 239.

1954. *Hyperammina* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel. Geol., Geol. Ser., Trudy 29, no. 1, p. 50.

1955. *Hyperammina* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 24, 25.

1955. *Earlandia* Bykova *in* Bykova and Polenova. VNIGRI Trudy 87, p. 28, 29.

1955. *Earlandia* Cummings. Micropaleontology, v. 1, no. 3, p. 228.

1956. *Hyperammina* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 36.

1956. *Hyperammina* Brazhnikova. Akad. Nauk Ukrain. SSR, Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, pl. 2, figs. 4, 5.

1957. *Hyperammina* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk, sbornik 2, p. 95.

1959. *Earlandia* Bykova and Reitlinger *in* Rauzer-Chernoussova and Fursenko. Osnovy Paleont., p. 172, 173.

1959. *Earlandia* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 38, p. 92.

1960. *Earlandia* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 38.

1961. *Hyperammina* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 204.

1961. *Earlandia* Conkin. Am. Paleontologist Bull. 196, v. 43, no. 196, p. 273, 274.

1961. *Earlandia* Cummings. Great Britain Geol. Survey Bull. 18, p. 117.

1962. *Earlandia* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 70, 71.

1963. *Earlandia* Malakhova. Paleont. Zhur., v. 3, p. 110.

1963. *Earlandia* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 124, 125.

1964. *Earlandia* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C317 [part].

1964. *Earlandia* Conil et Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pl. 1, fig. 2 [no text].

1964. *Earlandia* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 53, 54.

1965. *Earlandia* Omara and Conil. Soc. Géol. Belgique Annales, v. 88, no. 5, p. 225.

1966. *Earlandia* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 82–84.

1968. *Earlandia* Eickhoff. Neues Jahrb. Geologie u. Paleontologie Monatsh., no. 3, p. 132–136.

1969. *Earlandia* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 90.

1969. *Earlandia* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 196.

1969. *Earlandia* Platonov. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 53–57.

1969. *Earlandia* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 34, 35.

1970. *Earlandia* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 890.

1970. *Earlandia* Mamet. Canada Geol. Survey Paper 70–21, p. 10.

*Diagnosis.*—Test free. Proloculus followed by a long, nonseptate straight or slightly curved tubular chamber. Wall calcareous secreted, dark, microcrystalline, one layered, nonagglutinated. Aperture simple, at the end of the tubular chamber.

*Type of genus.*—1930 *Earlandia perparva* Plummer. Texas Univ. Bull. 3019, p. 12, pl. 1, fig. 2 a–c.

Taxa included in the genus *Earlandia:*

1950 *aljutovica* Reitlinger
1957 *bulbosa* Cushman and Waters emend. St Jean
1888 *clavatula* Howchin
1961 ?*consternatio* Conkin
1937 *elegans* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova and Fursenko.
1957 *elegans brazhnikovae* Golubsov
1950 ?*longa* Vissarionova
1948 *minima* Birina
1945 *minuta* Cushman and Waters emend. Plummer
1954 *moderata* Malakhova
1955 *pulchra* Cummings
1937 *vulgaris* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova and Fursenko
1948 *vulgaris minor* Rauzer-Chernoussova

*Remarks.*—As for the genus *Parathurammina,* random thin sectioning rarely discloses perfect longitudinal sections. However, even oblique sections enable recognition of a number of species groups that are defined as such:

1. *Earlandia* of the group *E. minima* (Birina 1948). Very slender tubular chamber (diameter around 30μ) with very thin, fragile walls (around 5μ).
2. *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova and Reitlinger 1937). Minute tubular chamber (diameter ranging from 50μ to 100μ) with rather thin walls (10μ to 20μ).
3. *Earlandia* of the group *E. moderata* (Malakhova 1954). Medium-sized tubular chamber (diameter around 120μ) with moderately thick walls (15μ to 30μ).
4. *Earlandia* of the group *E. clavatula* (Howchin 1888) (*Earlandia vulgaris minor* of the Russian authors). Tubular chamber important (diameter around 200μ) with sturdy, solid walls (40μ to 50μ).
5. *Earlandia* of the group *E. vulgaris* (Rauzer-Chernoussova and Reitlinger 1937). Tubular chamber extremely big (diameter around 300μ to 400μ) with very thick walls (as much as 80μ).

*Stratigraphic range and distribution.*—*Earlandia* is a very common cosmopolitan form. It abounds in Eurasia as well as in America and Australia. Appears in Givetian (Bykova *in* Bykova and Polenova, 1955) and develops slowly in Frasnian and Famennian time. Very abundant from the latest Famennian to the Namurian. Upper range unknown, probably late Carboniferous or Early Permian.

**Earlandia of the group E. elegans (Rauzer-Chernoussova and Reitlinger 1937)**

Plate 26, figures 14–16, 20

This group is exemplified by:

1937. *Hyperammina elegans* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova and Fursenko. ONTI, p. 256, 257, fig. 191 [not *Hyperammina elegans* Crespin 1958 (inval.)].
1940. *Hyperammina elegans* Rauzer-Chernoussova, Beljaev, and Reitlinger. Neft. Geol. Razved. Inst. Trudy 7, p. 55, pl. 8, fig. 11.
1955. *Earlandia elegans* Bykova *in* Bykova and Polenova. VNIGRI Trudy 87, p. 29, pl. 9, fig. 5.
1960. *Earlandia elegans* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 38, pl. 1, fig. 2.
1962. *Earlandia elegans* Bogush and Yuferev. Akad. Nauk SSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 70, 71, pl. 1, fig. 1.
1963. *Earlandia elegans* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 124, 125.
1964. *Earlandia elegans* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 53, pl. 7, figs. 98, 99.
1966. *Earlandia elegans* Bogush and Yuferev. Akad. Nauk SSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 83, 84, pl. 1, figs. 18, 19.
1968. *Earlandia elegans* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 90, pl. 1, fig. 1.
1969. *Earlandia elegans* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 35, pl. 1, figs. 9, 10.
1969. *Earlandia* aff. *elegans* Platonov. NIIGA, Uchenнye Zapiski, Paleont. Biostrat., Bull. 28, p. 56, pl. 1, fig. 15.
1970. *Earlandia* of the group *E. elegans* Mamet. Canada Geol. Survey Paper 70–21, pl. 3, fig. 4.

*Diagnosis.*—Proloculus spherical, 100μ to 110μ in diameter. Tubular, cylindrical chamber, slightly curved; diameter ranges from 70μ to 90μ. Wall of proloculus thin, rapidly enlarging in straight part where it attains 20μ. Aperture simple, at open end of tube.

*Stratigraphic range and distribution.*—A common group in all carbonate facies of the Lisburne Group. Abundant at the base of the Wachsmuth Limestone (Zone 8 to 10? and 11?). Accumulations of *Earlandia* of the group *E. elegans, Earlandia* of the group *E. moderata* and *Earlandia* of the group *E. clavatula* form the widespread Early Viséan "*Earlandia* facies" in the middle Wachsmuth Limestone.

*Earlandia* of the group *E. elegans* is also abundant in southern Alberta where it is scattered through the entire Rundle Group (Petryk and others, 1970).

*Figured specimens.*—USNM 179325–179327; Univ. Montréal 205/5.

**Earlandia of the group E. moderata (Malakhova 1954)**

Plate 26, figures 17–19

Group exemplified by:

1954. *Hyperammina moderata* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., Trudy 29, no. 1, p. 50, pl. 1, fig. 3.
1955. *Hyperammina moderata* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 24, pl. 2, figs. 13, 14.
1963. *Earlandia moderata* Malakhova. Paleont. Zhur., no. 3, p. 110.
1963. *Earlandia moderata* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 124, pl. 1, figs. 3, 4.
1966. *Earlandia moderata* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 84, pl. 1, fig. 20.
1970. *Earlandia moderata* Malakhova. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Byull. 60, p. 97, pl. 1, fig. 20.

*Diagnosis.*—Proloculus spherical, 120μ to 160μ in diameter, followed by straight, or slightly curved, cylindrical chamber, whose diameter ranges from 100μ to 130μ. Wall of proloculus thin, then rapidly thickening in straight part (20μ to 30μ). Aperture simple, at open end of tube.

*Stratigraphic range and distribution.*—The group is common in all carbonate facies of the Lisburne Group. As previously mentioned, it forms part of the Early Viséan "*Earlandia* facies" of the Wachsmuth Limestone. In Eurasia, the group is also long ranging but appears rather common in Zones 8 to 12 (Kizel Limestone to the Lunev Formation) (Malakhova, 1954; Lipina, 1955; Malakhova, 1959; Mamet, 1965).

*Figured specimens.*—USNM 179332, 179333; Univ. Montréal 205/19.

**Earlandia of the group E. clavatula (Howchin 1888)**

Plate 26, figure 21

Group exemplified by:

1888. *Hyperammina elongata clavatula* Howchin. Royal Micros. Soc. London Jour., pt. 2, p. 535, pl. 8, figs. 1, 2.
1948. *Hyperammina vulgaris minor* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 239, pl. 17, fig. 1.
1954. *Hyperammina vulgaris minor* Lebedeva. VNIGRI Trudy 81, p. 239, pl. 1, fig. 1.
1956. *Hyperammina vulgaris minor* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 36, pl. 1, fig. 1.
1962. *Earlandia minor* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, pl. 1, fig. 2.
1963. *Earlandia vulgaris minor* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 124, pl. 1, fig. 2.
1964. *Earlandia vulgaris minor* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 53, pl. 7, figs. 96, 97.
1970. *Earlandia* of the group *E. clavatula* Mamet. Canada Geol. Survey Paper 70–21, pl. 4, fig. 2.
1970. *Earlandia vulgaris* Hallett. 6ème Cong. Avanc. Strat. Carb., p. 890, pl. 3, fig. 10.

*Diagnosis.*—Proloculus large (200μ and more) followed by straight, or slightly curved, cylindrical chamber whose diameter averages 200μ. Wall calcareous secreted, microcrystalline, one layered, rather thick (about 50μ). Aperture simple, at open end of tube.

*Stratigraphic range and distribution.*—The most common Earlandiidae of the lower Carboniferous in the Northern Hemisphere. Abundant in the Wachsmuth and Alapah Limestones and the Kogruk and Nasorak Formations of Alaska. It is questionably present in the Wahoo Limestone.

*Figured specimens.*—USNM 179338.

**Earlandia of the group E. vulgaris (Rauzer-Chernoussova and Reitlinger 1937)**

Plate 1, figure 7; plate 14, figure 5; plate 20, figure 5

Group exemplified by:

1937. *Hyperammina vulgaris* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova and Fursenko. ONTI, p. 255, 256, fig. 190.
1940. *Hyperammina vulgaris* Rauzer-Chernoussova, Beljaev, and Reitlinger. Neft. Geol. Razved. Inst. Trudy 7, p. 55, 56.
1956. *Hyperammina vulgaris* Brazhnikova. Akad. Nauk Ukrain. SSR, Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, pl. 2, figs. 4, 5.
1955. *Earlandia pulchra* Cummings. Micropaleontology, v. 1, no. 3, p. 228, 229, pl. 1, figs. 1, 15, 21.
1960. *Earlandia vulgaris* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 38, pl. 1, fig. 1.
1964. *Earlandia vulgaris vulgaris* Conil and Lys. Louvain Univ. Inst. Géol. Mém., no. 23, p. 53, pl. 7, fig. 95.
1969. *Earlandia vulgaris vulgaris* Pelhate Soc. Géol. Minéral. Bretagne Bull., p. 34, pl. 1, fig. 14.
1970. [not] *Earlandia vulgaris* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 890, pl. 3, fig. 10.

*Diagnosis.*—Proloculus big, followed by cylindrical, straight or slightly curved second chamber, whose diameter range from 300μ to 400μ. Wall is very thick, single layered, microcrystalline, nonagglutinated and reaching up to 80μ in thickness. Aperture simple, at open end of tube.

*Stratigraphic range and distribution.*—This group is readily recognizable by its large size and is a useful indicator of a post-Tournaisian age.

In Alaska it is scarce in the Early Viséan, then becomes rather abundant in Zone 12 and upwards. This distribution is similar to that observed in most of the American Cordillera and in Eurasia (Mamet and Skipp, 1971).

*Figured specimens.*—Univ. Montréal 204/6; USNM 180027, 180052.

#### Genus EARLANDINELLA Cummings 1955

1876. *Nodosinella* Brady. Palaeont. Soc. London Pub., v. 30, p. 104, pl. 7, figs. 4–7
1888. *Nodosaria* Howchin. Royal Micros. Soc. London Jour., pt. 2, p. 543, 544, pl. 9, fig 21 a, b.
1955. *Earlandinella* Cummings. Micropalentology, v. 1, no. 3, p. 229, 230.
1964. *Earlandinella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 54, pl. 7, fig. 103 [not 102].
1969. *Earlandinella* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 196.

*Diagnosis.*—Test free. Proloculus followed by a straight or slightly curved cylindrical tube, slightly tapering, subdivided by irregular, incomplete pseudosepta. Each septum corresponds to an outer faint constriction. Wall calcareous secreted, pseudomicrocrystalline, one layered, not agglutinated but easily recrystallized. Aperture simple, at open end of tube.

*Type of genus.*—1876 *Nodosinella cylindrica* Brady. Palaeont. Soc. London Pub., v. 30, p. 104, pl. 7, figs. 4–7.

*Remarks.*—Although Cumming's original description reports the presence of fine calcareous particles bound by a calcareous cement, all Viséan materials examined by the author to this time are entirely secreted.

*Stratigraphic range and distribution.*—Originally described from the latest Viséan of the British Isles, it is known from the Middle Viséan to the Early Namurian in the Archerbeck borehole (Cummings, 1961). In Belgium, it appears to extend from the Tournaisian through the entire Viséan, although it is reported only from the lower part of the Viséan by Conil and Lys (1964).

Surprisingly, the genus has never been reported by Russian micropaleontologists with the exception of Reitlinger who confused it with *Paratikhinella* (1971). It is a rather long-ranging taxon in North America (Mamet and Mason, 1968).

#### Earlandinella sp.

Plate 26, figures 22–25

*Diagnosis.*—Proloculus not observed. Second chamber cylindrical, massive, with faint irregular pseudosepta. Diameter of tube 180$\mu$ to 220$\mu$. Wall thick, calcareous secreted, one layered, 20$\mu$ to 30$\mu$ thick.

*Remarks.*—The Alaska form does not fit any *Earlandinella* described in the literature. However, better material should be discovered before erecting a formal new taxon.

*Stratigraphic range and distribution.*—A rather scarce long-ranging form, from the Late Tournaisian Wachsmuth to the Viséan part of the Alapah Limestone. In the Lisburne Group, rather common in Zones 12 and 13 in the central part of the Brooks Range.

*Figured specimens.*—Univ. Montréal 204/12, 204/30, 204/1; USNM 179334.

### Family PSEUDOAMMODISCIDAE Conil 1970

#### Genus PSEUDOAMMODISCUS Conil 1970

1948. *Ammodiscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 227, 240.
1950. *Ammodiscus* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 13, 14 [part].
1951. *Ammodiscus* Brazhnikova. Akad. Nauk Ukrain, SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 5, p. 78, 79.
1954. *Cornuspira* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 28, 29, pl. 3, fig. 1.
1955. *Ammodiscus* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 28, 29 [part].
1956. *Ammodiscus* Ganelina. VNIGRI Trudy 98, p. 65 [part].
1956. *Ammodiscus* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 96 [part].
1956. *Ammodiscus* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 21–24.
1957. *Ammodiscus* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk, sbornik 2, p. 104.
1958. *Hemidiscus* Orlova. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 126.
1958. *Ammodiscus* Woodland. Jour. Paleontology, v. 32, no. 5, pl. 102, figs. 4, 6, 7 [not 2, 5].
1959. *Ammodiscus* Durkina. VNIGRI Trudy 136, p. 140.
1960. ?*Cornuspira* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 348 [part].
1961. ?*Cornuspira* Gerke. NIIGA Trudy, v. 120, p. 153–155 [part].
1961. *Ammodiscus* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 204 [part].
1962. *Ammodiscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 108, 109.
1963. *Ammodiscus* McKay and Green. Research Council Alberta Bull. 10, p. 25.
1964. *Ammodiscus* Conil and Lys. Louvain Univ. Inst. Geol. Mém., v. 23, p. 59, 60.
1965. *Ammodiscus* Skvorzov. Paleont. Zhur., no. 3, p. 23.
1969. *Tournayella* Sada. Paleont. Soc. Japan, Trans. and Proc., new ser., no. 75, art 555, p. 124, 125.
1969. *Cornuspira* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 195.
1969. *Ammodiscus* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 35–36.

1970. *Brunsiella* Hallett. 6ème Cong. Avanc. Strat. Carb., Compte Rendu, p. 892.

1970. *Cornuspira* Mamet. Canada Geol. Survey Paper 70–21, p. 10.

1970. *Pseudoammodiscus* Conil. Liège Univ. Cong. et Coll., v. 55, p. 52–53.

*Discussion.*—Upper Paleozoic *Ammodiscus* and *Cornuspira* of the literature appear to group a variety of taxa whose only common link is a morphologic convergence; a planispirally coiled cylindrical tube.

The *Ammodiscus* listed above do not have an agglutinated, siliceous wall, but a calcareous secreted, single layered tectum, and are transferred to the genus *Pseudoammodiscus.*

The *Cornuspira* mentioned above do not have a porcellaneous wall and ought therefore to be removed from the *Cornuspira-Cyclogyra* taxon.

Some Paleozoic *Ammodiscus* (such as *Ammodiscus bellus* Malakhova 1956, *Ammodiscus borealis* Malakhova 1956, or *Ammodiscus medius* Reitlinger 1954) and Paleozoic *Cornuspira* (such as *Cornuspira pusila* Chuvashov 1965) have to be transferred to the Tournayellidae. Moreover, many *Ammodiscus* or *Cornuspira* of the literature (for instance, *Ammodiscus multivolutus* Reitlinger 1949) have to be transferred to the lasiodiscid *Eolasiodiscus-Monotaxinoides* group.

*Remarks.*—The genus *Pseudoammodiscus* is the ancestor of the primitive *Tournayella* which are derived from it in Famennian time.

*Type of genus.*—1948 *Ammodiscus priscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 227, pl. 15, figs. 2, 3.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere. Present in Eurasia from Frasnian (Bykova *in* Bykova and Polenova, 1955) to Permian(?) (Gerke, 1961). Abundant from the Viséan to the basal middle Carboniferous.

**Pseudoammodiscus volgensis (Rauzer-Chernoussova 1948)**

Plate 26, figures 26, 27

1948. *Ammodiscus volgensis* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 240, pl. 17, figs. 7, 8.

1956. *Cornuspira captiosa* Ganelina. VNIGRI Trudy 98, p. 65, pl. 1, fig. 2 [not fig. 3].

1956. *Ammodiscus buskensis* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 23, 24, pl. 1, figs. 13–15, 17.

1958. ?*Hemidiscus contractus* Orlova. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 126, fig. 1 a–c.

1962. *Ammodiscus volgensis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Geologii i Geofiziki Trudy, p. 108, pl. 2, fig. 14.

1964. *Ammodiscus* aff. *volgensis* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 59, 60, pl. 7, fig. 112.

1964. *Ammodiscus buskensis* Conil and Lys. Louvain Univ. Inst. Géol .Mém., v. 23, p. 59, pl. 7, figs. 109, 110, 111?

1970. *Brunsiella volgensis* Hallett, 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 892, pl. 4, figs. 3, 4.

*Diagnosis.*—Test free. Proloculus followed by evolute, planispirally coiled cylindrical tube. Diameter of test, 300$\mu$ for three to 550$\mu$ for five whorls. Spire expansion rapid. Wall dark, calcareous secreted, microcrystalline, composed of a nonagglutinated tectum; thickness, in last whorl around 10$\mu$.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere, but much more abundant in Eurasia than in North America. Reported in Eurasia from Early Middle Viséan to Early Namurian. In Alaska, appears restricted to the Alapah Limestone, and ranges from Zones 13 to 17.

*Figured specimens.*—USNM 179335, 179336.

**Pseudoammodiscus priscus (Rauzer-Chernoussova 1948)**

Plate 26, figure 28

1948. *Ammodiscus priscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 227, pl. 15, figs. 2, 3.

1954. *Cornuspira prisca* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 28, pl. 3, fig. 1.

1956. *Ammodiscus priscus* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 23, 24, pl. 1, figs. 23, 24.

1959. ?*Ammodiscus priscus* Durkina. VNIGRI Trudy 136, p. 140, pl. 1, figs. 1, 2.

*Diagnosis.*—Test free. Proloculus (50$\mu$) followed by evolute, planispirally coiled cylindrical tube. Rate of expansion of spire is small. Diameter of test 170$\mu$ to 250$\mu$ for 2½ to 3 whorls. Wall calcareous secreted, microcrystalline, thin.

*Stratigraphic range and distribution.*—Originally described from the Stalinogorsk Horizon (Bobrikov Horizon) (basal to middle Viséan?), it is also known in the entire Viséan of the Donetz Basin.

In Alaska, appears to be restricted to the Viséan part of the Alapah Limestone.

*Figured specimen.*—USNM 179337.

**Genus BRUNSIA Mikhailov 1939**

1879. *Spirillina* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 96–99.

1932. *Hemigordius* Liebus. Preuss. Geol. Landesant. Abh., new ser., no. 141, p. 153.

1935. *Brunsia* Mikhailov (nom. nud.) Leningrad Geol. Hydr. Trust Bull. 2, 3 (7, 8), p. 34–35.

1939. *Brunsia* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 64.

1940. *Brunsia* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, ser. geol. 18, no. 5–6, p. 124.
1948. *Brunsia* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 241.
1948. *Brunsia* Grozdilova and Glebovskaia. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 148.
1948. *Glomospira* Grozdilova and Glebovskaia. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 147 [part].
1948. *Glomospira* Brazhnikova and Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 1, Bull. 2, p. 96
1950. ?*Brunsiella* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 17 [part].
1954. *Brunsia* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 29–31.
1954. *Brunsia* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel. Geol., v. 29, no. 1, p. 51–54.
1955. *Glomospirella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 30–32.
1956. *Glomospira* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 90–94 [part].
1959. *Brunsia* Voloshina, Dain, and Reitlinger *in* Rauzer-Chernoussova and Fursenko. Osnovy Paleontologii, v. 1, p. 180.
1959. *Brunsia* Durkina. VNIGRI Trudy 136, p. 137, 138 [part].
1960. *Brunsiella* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 42.
1960. [not] *Brunsia* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 351.
1961. *Brunsia* Cummings. Great Britain Geol. Survey Bull., no. 18, pt. 8, p. 117.
1962. *Brunsia* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 105–107.
1963. *Glomospirella* McKay and Green. Research Council Alberta Bull. 10, p. 25.
1963. *Glomospirella* Pronina. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 65, p. 128–130.
1964. *Brunsia* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C355–C356 [part].
1964. *Glomospirella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 64–66.
1964. *Glomospirella* Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pl. 1, figs. 11, 12 [no text].
1965. ?*Brunsia* Chuvashov. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 74, p. 47.
1965. ?*Glomospirella* Solovieva and Krasheninikov. Akad. Nauk SSSR Voprosy Mikropalentologii, no. 9, p. 19.
1966. *Brunsia* Ganelina. VNIGRI Trudy 250, p. 68, 69.
1966. *Brunsia* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 90–96.
1966. *Brunsia* Sossipatrova. NIIGA Uchennye Zapiski, Paleont. Biostrat. Bull. 11, p. 19.
1967. [not] *Brunsia* Ross. Jour. Paleontology, v. 41, no. 3, p. 714.
1968. *Brunsia*. Conil and Lys. Soc. Géol. Belgique Annales, v. 91, Bull. 4, p. 538.
1969. *Brunsia* Conil and Lys. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 73.
1969. *Brunsia* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 90.
1969. *Glomospirella* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 36, 37.
1970. *Glomospirella* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 892.
1970. *Brunsia* Gorecka and Mamet. Rev. Micropaléontologie, v. 13, no. 3, p. 162.

*Diagnosis.*—Test free. Proloculus followed by tubular nonseptate chamber. Initial coils, glomospiral then regular, nearly planispiral. Wall calcareous secreted microcrystalline, a one-layered tectum. Aperture simple, at open end of tube.

*Type of genus.*—1879 *Spirillina irregularis* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 29, fig. 8.

Taxa included in the genus *Brunsia:*

1966 *crassa* Bogush and Yuferev
1948 *duplex* Grozdilova and Glebovskaia
1959 ?*ezhwadorica* Durkina
1966 *fluctata* Bogush and Yuferev
1966 *lata* Bogush and Yuferev
1966 *lenensis* Bogush and Yuferev
1965 *novita* Chuvashov
1959 *obtusa* Durkina
1959 *parva* Durkina
1939 *pulchra* Mikhailov (= *pseudopulchra* Lipina 1955)
1948 *spirillinoides* Glebovskaia and Grozdilova
1965 *sairamica* Poyarkov *in* Skvorzov
1966 *sibirica* Bogush and Yuferev
1948 *sygmoidalis* Rauzer-Chernoussova
1966 *tiksinensis* Bogush and Yuferev
1966 *umbilicata* Bogush and Yuferev

*Remarks.*—The original description of Mikhailov clearly states that *Brunsia* has a cribrate aperture. This characteristic, however, is not observed in the figured type material of von Möller and has never been found in any Russian or west European lower Carboniferous material. The author follows here the emendation of Voloshinova, Dain, and Reitlinger *in* Rauzer-Chernoussova and Fursenko (1959) who considers the aperture simple, at the open end of the tube.

**Brunsia of the group B. pulchra Mikhailov 1939**

Plate 26, figure 29

Group exemplified by:

1935. *Brunsia pulchra* Mikhailov. Leningrad Geol. Hydr. Trust Bull. 2–3 (7–8), p. 35 (nom. nud.).
1939. *Brunsia pulchra* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 64, figs. 1, 7; pl. 2, figs. 5–7.
1940. *Brunsia pulchra* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel. Geol., v. 48, ser. geol. 18, no. 5–6, p. 124, pl. 2, fig. 5.

1948. *Brunsia pulchra* Grozdilova and Glebovskaia. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 148, pl. 1, figs. 5, 6.
1954. *Brunsia pulchra* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel. Geol., Geol. Ser., Trudy 29, no. 1, p. 52–54, pl. 1, figs. 8–10.
1955. *Glomospirella pseudopulchra* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 31, 32, pl. 2, figs. 25, 31.
1962. *Brunsia pulchra* Bogush and Yuferev. Akad. Nauk SSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 106, pl. 2, fig. 10.
1963. *Glomospirella pseudopulchra* Pronina. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 65, p. 128, 129, pl. 1, figs. 17, 18, 20.
1964. *Glomospirella pseudopulchra* Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pl. 1, fig. 11 [no text].
1964. *Glomospirella pseudopulchra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 65, pl. 8, figs. 138–144 [not 137].
1965. [not] *Glomospirella pseudopulchra* Solovieva and Krasheninikov. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 9, p. 19, pl. 1, figs. 7, 8.
1966. *Brunsia pulchra* Ganelina. VNIGRI Trudy 250, p. 68, 69, pl. 1, fig. 8.
1968. ?*Brunsia pulchra* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 538, pl. 2, fig. 13.
1970. *Brunsia pulchra* Gorecka and Mamet. Rev. Micropaléontologie, v. 13, no. 3, p. 162, pl. 3, fig. 5.

*Diagnosis.*—Test free. Proloculus small, followed by irregularly coiled, tight, cylindrical tube forming a protruding glomospiral twin. Last two or three coils are nearly planispiral and evolute. Diameter of test, 300$\mu$ to 400$\mu$. Height of tubular chamber, 40$\mu$ to 50$\mu$ in the last coil. Wall dark, dense, microgranular (tectum); its thickness reaches 14$\mu$ to 20$\mu$, in last coil.

*Stratigraphic range and distribution.*—The group is cosmopolitan in the Northern Hemisphere but much more abundant in Eurasia than in North America. It is common from Middle Tournaisian (Zone 7) to the Late Viséan.

In Alaska it is present from the Tournaisian Wachsmuth Limestone to the Late Viséan of the Alapah Limestone.

*Figured specimen.*—USNM 179339.

**Brunsia of the group B. lenensis Bogush and Yuferev 1966**

Plate 26, figures 30–32

Group exemplified by:

1966. *Brunsia? lenensis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 96, pl. 1, figs. 37, 38.
1966. *Brunsia? sibirica* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 95, pl. 1, fig. 36.

*Diagnosis.*—Test free. Proloculus rather prominent followed by two tightly coiled asymmetrical whorls. Last two coils are nearly planispiral. The initial coils do not form a protruding glomospiral twine. Diameter of test 250$\mu$ to 370$\mu$. Thickness, 100$\mu$ to 130$\mu$. Adult forms usually have four volutions, rarely five. Height of tubular chamber 30$\mu$ to 65$\mu$. Wall calcareous secreted, dark, microcrystalline, a single tectum, thin, around 10$\mu$ to 12$\mu$.

*Stratigraphic range and distribution.*—Apparently restricted to the Taimyr-Alaska transitional realm and the northern part of the North American Cordillera. Originally described from the Late Viséan Tiksin "Suite" on the Lena River (Siberia). Very abundant in Alaska in the Late Viséan Zone 14, where its accumulation forms the "*Brunsia* facies."

*Figured specimens.*—USNM 179340–179342.

**Brunsia of the group B. irregularis (von Möller 1879)**

Plate 26, figures 33–36

Group exemplified by:

1879. *Spirillina irregularis* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 29, fig. 8.
1932. *Hemigordius harltoni germanica* Liebus. Preuss. Geol. Landesanst. Abh., new ser., no. 141, p. 153, pl. 10, fig. 10.
1939. *Brunsia irregularis* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 64, fig. 2.
1948. *Glomospira spirillinoides* Grozdilova and Glebovskaia. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 147, pl. 1, figs. 2–4.
1950. [not] *Brunsiella? irregularis* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 17, pl. 2, figs. 20, 21.
1954. *Brunsia spirillinoides* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel. Geol., Geol. Ser., Trudy 29, no. 1, p. 54, pl. 1, fig. 13.
1954. *Brunsia irregularis* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 30, pl. 3, figs. 2–4.
1955. *Glomospirella irregularis* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 30, pl. 2, figs. 27, 28, 30.
1955. *Glomospirella irregularis multivoluta* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 30, pl. 2, fig. 29.
1956. *Glomospira spirillinoides* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 93, pl. 2, figs. 3–5, 10.
1956. *Glomospira spirillinoides* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 94, pl. 2, fig. 21.
1960. *Brunsiella spirillinoides* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 42, pl. 1, fig. 6.
1962. *Brunsia irregularis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 107, pl. 2, fig. 12.
1962. *Brunsia spirillinoides* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 106, pl. 2, fig. 11.
1964. *Glomospirella pseudopulchra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 65 [part], pl. 8, fig. 137 [not 138–144].

1964. *Glomospirella pseudopulchra* Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pl. 1, fig. 11.
1964. *Glomospirella spirillinoides spirillinoides* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 65, pl. 8, figs. 145–149.
1966. *Brunsia irregularis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 91, pl. 1, figs. 23–25.
1966. *Brunsia spirillinoides* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 91, pl. 1, fig. 26.
1969. *Brunsia spirillinoides* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, pt. 1, p. 90, pl. 1, fig. 6.
1969. *Glomospirella spirillinoides spirillinoides* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 36, 37, pl. 1, fig. 17, 18.

*Diagnosis.*—Test free. Proloculus followed by small, tightly coiled, nonprotruding glomospiral tubular chamber, in turn followed by four to five planispirally coiled spires. Diameter, 350$\mu$ to 650$\mu$ for mature forms. Thickness, 80$\mu$ to 150$\mu$. Thickness of wall increases from 10$\mu$ to 12$\mu$ in early coils to 20$\mu$ in last volution. Tectum one layered, dense, dark, microcrystalline. Aperture simple, at end of tube.

*Stratigraphic range and distribution.*—A cosmopolitan group in the Northern Hemisphere. Originally described from the Kizel Limestone (Late Tournaisian, Urals). Abundant in Viséan time.

In Alaska, it appears restricted to the Middle and Late Viséan, mostly in the "*Brunsia* facies" (Alapah Limestone and Kogruk Formation).

*Figured specimens.*—USNM 179343–179346.

### Family ARCHAEDISCIDAE Cushman 1928

### Genus PROPERMODISCUS Mikluko-Maklai 1953

1939. *Hemigordius* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 61.
1953. *Propermodiscus* Mikluko-Maklai. Ezh. Vses. Paleont. Otdeleniye Trudy 14, p. 128.
1956. *Propermodiscus* Mikluko-Maklai. VSEGEI Trudy, Ser. Geol., Bull. 12, p. 10 [part].
1958. [not] *Propermodiscus* Porschniakova. Leningrad. Univ. Vestnik, Ser. Geologiya i Geografii, no. 24 (4), p. 35, 36.
1960. *Propermodiscus* Vdovenko. Visn. Kiev. Univ., no. 2, Bull. 3, p. 35.
1961. *Propermodiscus* Cummings. Great Britain Geol. Survey Bull. 18, pt. 8, p. 125.
1962. *Propermodiscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 210.
1963. *Permodiscus* McKay and Green. Research Council Alberta Bull. 10, p. 26.
1964. *Propermodiscus* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 134.
1964. *Archaediscus* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C354–C355 [part].
1965. [not] *Propermodiscus* Skvorzov. Paleont. Zhur., no. 3, p. 29.
1965. [not] *Propermodiscus* Omara and Conil. Soc. Géol. Belgique Annales, v. 88, no. 5, p. 229.
1966. [not]*Propermodiscus* Ganelina. VNIGRI Trudy 250, p. 118.
1966. *Propermodiscus* Conil and Lys. Soc. Géol. Belgique Annales, v. 89, Bull. 6, pl. 2, fig. 16.
1967. *Propermodiscus* Pelhate. Soc. Géol. France Bull., 7ème sér., v. 9, no. 6, p. 898.
1969. *Propermodiscus* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 92.
1969. *Propermodiscus* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 45.
1970. *Paraarchaediscus* Austin, Conil, and Husri. Liège Univ. Cong. et Coll. Mém., v. 55, pl. 2, fig. 7.

*Diagnosis.*—Test free, lenticular. Proloculus followed by slightly irregularly coiled tubular chamber which becomes nearly planispiral, involute in last whorls. Wall two layered, with thick tectum and very coarse, well-developed pseudofibrous layer. Fibrous umbilical plug conspicuous. Aperture simple, at open end of tube.

*Type of genus.*—1939 *Hemigordius ulmeri* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 61, pl. 1, fig. 9.

Taxa included in the genus *Propermodiscus*:

1964 *deflectens* Conil and Lys
1964 *lenitortus* Conil and Lys
1967 *lenitortus* var. *strictus* (OBJ infrasubspecific) Pelhate
1967 *miloni* Pelhate
1964 *mixtus* Conil and Lys
1964 *oblongus* Conil and Lys
1964 *rigens* Conil and Lys

*Stratigraphic range and distribution.*—One of the roots of the Archaediscidae; it appears in Early Viséan and has a short acme in Late Early to Early Middle Viséan.

Rather uncommon in Eurasia, but abounds in the $C_2$ interval of the British Isles. Scarce in North America, where it is usually found in the Middle Viséan.

#### Propermodiscus sp.

Plate 27, figure 1

*Diagnosis.*—Test free. Proloculus followed by slightly irregularly coiled tubular chamber, which is planispiral in last three whorls. Diameter of test around 450$\mu$. Thickness 140$\mu$. Wall bilayered, with a well-developed pseudofibrous layer. Umbilical depression filled by fibrous umbilical plug. Aperture simple, at open end of tube.

*Stratigraphic range and distribution.*—Scarce in the basal part of the Alapah Limestone.

*Figured specimen.*—USNM 179347.

**Genus PLANOARCHAEDISCUS Mikluko-Maklai 1956**

1948. *Archaediscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 10–12 [part].
1948. *Archaediscus* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 152, 153 [part].
1953. *Archaediscus* Grozdilova. VNIGRI Trudy 74, p. 110 [part].
1954. *Archaediscus* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 61 [part].
1956. *Archaediscus* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 64.
1956. *Planoarchaediscus* Mikluko-Maklai. VSEGEI Trudy, Ser. Geol., Bull. 12, p. 10.
1957. *Archaediscus* Golubsov. Akad. NaukBeloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 155–156.
1960. *Planoarchaediscus* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 95.
1960. *Archaediscus* Fomina. Materialii geol. polezn. iskop. Central Rayon Europ. Chasti SSSR, p. 115.
1962. *Planoarchaediscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 208–210.
1962. *Planoarchaediscus* Sossipatrova. VNIGA Trudy 30, sbornik Stat. Paleob. Biostrat., p. 57, 58 [part].
1964. *Planoarchaediscus* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 132, 133.
1964. *Planoarchaediscus* Conil et Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull, v. 72, p. 194, 195 [no text].
1964. *Planoarchaediscus* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, pl. 2, fig. 28 [no text].
1964. *Brunsia* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C355 [part].
1965. *Propermodiscus* Omara and Conil. Soc. Géol. Belgique Annales, v. 88, no. 5, p. 229.
1965. *Planoarchaediscus* Skvorzov. Paleont. Zhur., no. 3, p. 30.
1965. *Planoarchaediscus* Omara and Conil. Soc. Géol. Belgique Annales, v. 88, no. 5, p. 228.
1966. *Planoarchaediscus* Sossipatrova. NIIGA, Uchennye Zapiski, Paleont. Biostrat. Bull. 11, p. 20–25 [part].
1966. *Planoarchaediscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 156–162 [part].
1967. *Planoarchaediscus* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 164–166.
1968. *Planoarchaediscus* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 556.
1968. *Paraarchaediscus* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 556 [part].
1969. ?*Planoarchaediscus* Pelhate. Soc. Géol. Minéral. Bretagne. Bull. p. 44, 45.
1969. *Planoarchaediscus* Solovieva. NIIGA Trudy, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 14.
1970. *Planoarchaediscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 73, 74.
1970. *Planoarchaediscus*? Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 894.

*Diagnosis.*—Test free, lenticular. Proloculus initially followed by irregularly coiled tubular chamber which coils planispirally and becomes evolute in ditional hyaline, pseudofibrous layer restricted to outer whorls. Wall dark, microcrystalline, with adearly glomospiral whorls. Aperture simple at open end of tube.

*Type of genus.*—1948 *Archaediscus spirillinoides* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 12, pl. 3, fig. 7.

Taxa included in the genus *Planoarchaediscus*:

1962 ?*absimilis* Sossipatrova
1965 *aegyptiacus* Omara and Conil
1966 ?*brunsieformis* Sossipatrova
1966 compressa Bogush and Yuferev (OBJ, infrasubspecific)
1964 *concinnus* Conil and Lys
1965 *contiguus* Omara and Conil
1970 ?*duxundaensis* Bogush and Yuferev
1970 *emphaticus* Hallett
1967 *eospirillinoides* Brazhnikova *in* Brazhnikova and others
1967 involuta Brazhnikova (OBJ, infrasubspecific)
1970 ?*kolymensis* Bogush and Yuferev
1966 ?*lenaensis* Sossipatrova
1965 *longus* Skvorzov
1954 *monstratus* Grozdilova and Lebedeva
1956 ?*paraspirillinoides* Brazhnikova
1966 ?*pseudospirillinoides* Sossipatrova
1970 ?*zyrjanicus* Bogush and Yuferev

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere, but scarce in North America.

Originally described from the Late Viséan of the Russian Platform. Appears in Early Viséan, with an acme in Middle Viséan.

**Planoarchaediscus spirillinoides (Rauzer-Chernoussova 1948)**
Plate 27, figure 2

1948. *Archaediscus spirillinoides* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 12, pl. 3, figs. 7, 8, not 9.
1948. *Archaediscus spirillinoides* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 152, pl. 2, figs. 7, 8.
1953. *Archaediscus spirillinoides* Grozdilova. VNIGRI Trudy 74, p. 110, pl. 4, figs. 16, 17.
1956. *Archaediscus spirillinoides* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 64, pl. 12, figs. 14, 15.
1956. *Planoarchaediscus spirillinoides* Mikluko-Maklai. VSEGEI Trudy, Ser. Geol., Bull. 12, p. 10.
1957. (not) *Archaediscus spirillinoides grandis* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik, 2, p. 156, pl. 7, fig. 30.
1957. (not) *Archaediscus svirillinoides faceta* Golubsov. Akad. Nauk. Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 155, pl. 7, figs. 25, 32.

1960. *Planoarchaediscus spirillinoides* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 95, pl. 9, figs. 7, 8.
1961. (not) *Archaediscus* aff. *spirillinoides* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 217, pl. 4, fig. 8.
1962. *Planoarchaediscus spirillinoides* Bogush and Yuferev. Akad. Nauk. SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 208–210, pl. 9, figs. 19–22.
1964. *Planoarchaediscus spirillinoides* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 133, pl. 20, fig. 400.
1964. *Planoarchaediscus spirillinoides* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, pl. 2, fig. 28.
1964. *Planoarchaediscus concinnus* Conil and Lys. Louvain Univ. Inst. Géol. Mém., no. 23, p. 132, pl. 20, fig. 398.
1966. *Planoarchaediscus spirillinoides* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 156, pl. 9, figs. 1, 2.
1968. *Planoarchaediscus eospirillinoides* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 556, figs. 145, 146.

*Diagnosis.*—Test free, lenticular. Proloculus followed by initial glomospirally coiled tubular chamber that becomes planispiral and slightly evolute in last whorls. Diameter of test about 300$\mu$ to 350$\mu$. Thickness 80$\mu$ to 100$\mu$. Ratio of diameter to thickness around 0.25. Proloculus small, around 35$\mu$. Height of tubular chamber increases rapidly. Wall thin, dark, microcrystalline, about 10$\mu$, with an additional clear, pseudofibrous layer well developed in early glomospiral coils. Aperture simple, at open end of tube.

*Stratigraphic range and distribution.*—The type is of Early Late Viséan age. It is most abundant in Zone 13 in Eurasia. Scarce in the Viséan Kogruk Formation of Alaska.

*Figured specimen.*—USNM 179348.

### Genus ARCHAEDISCUS Brady 1873

1873. *Archaediscus* Brady. Ann. Mag. Natural History, ser. 4, v. 12, p. 286.
1876. *Archaediscus* Brady. Palaeont. Soc. London Pub., v. 30, p. 142.
1878. *Archaediscus* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 25, no. 9, p. 116, 117.
1879. *Archaediscus* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 76, 77.
1888. [not] *Archaediscus* Meunier. Soc. Hist. Nat. Autun Bull., no. 1, p. 236.
1914. [not] *Archaediscus* Meyer *in* Steinmann. Neues Jahrb. Mineralogie, Geologie u. Paläontologie, v. 37, p. 600.
1932. *Archaediscus* Liebus. Preuss. Geol. Landesant. Abh., new ser., no 141, p. 171.
1935. [not] *Archaediscus* Mikhailov. Leningrad Geol. Hydr. Trust Bull. 2–3. (7–8), p. 35.
1936. [not] *Archaediscus* Krestovnikov and Teodorovitch. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 44, Geol. Ser. 14 (1), p. 87.
1939. *Archaediscus* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 48 [part].
1948. *Archaediscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 10–12 [part].
1948. *Archaediscus* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 152–154 [part].
1948. *Archaediscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 229–233 [part].
1948. *Archaediscus* Brazhnikova and Potievskaia. Akad. Nauk Ukrain. SSR, Ser. Strat. Paleont., no. 1, Byull 2, p. 98 [part].
1949. [not] *Archaediscus* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol. no. 6, p. 161–163.
1950. [not] *Archaediscus* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 83–86.
1950. *Archaediscus* Termier and Termier. Paléontologie Maroc. Invertébrés Ere Primaire, pt. I, pl. 2, figs. 15–25.
1951. *Archaediscus* Shlykova. VNIGRI Trudy 56, p. 161–172 [part].
1951. *Archaediscus* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleontologii, no. 5, p. 88, 89 [part].
1953. *Archaediscus* Mikluko-Maklai. Ezh. Vses. Paleont. Otdel. Trudy 14, p. 127, 128 [part].
1953. [not] *Archaediscus* Dain *in* Grozdilova. VNIGRI Trudy 74, p. 106.
1953. *Archaediscus* Grozdilova. VNIGRI Trudy 74, p. 79–111 [part].
1953. [not] *Archaediscus* Grozdilova and Lebedeva *in* Grozdilova. VNIGRI Trudy 74, p. 101 and 111.
1954. *Archaediscus* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 43–63 [part].
1955. *Paraarchaediscus* Orlova. Akad. Nauk SSSR Doklady, v. 102, no. 3, p. 621.
1956. *Archaediscus* Brazhnikova. Akad. Nauk Ukrain. SSR. Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 61–66 [part].
1956. *Archaediscus* Ganelina. VNIGRI Trudy 98, p. 74–79 [part].
1956. *Archaediscus* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 40, 41 [part].
1957. *Archaediscus* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 152–156 [part].
1958. *Archaediscus* Potievskaia. Akad. Nauk Ukrain. SSR, Ser. Strat. Paleont., Geol. Inst. Trudy 31, p. 20–24 [part].
1960. *Archaediscus* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 90–95 [part].
1960. *Archaediscus* Milkluko-Maklai. VSEGEI Trudy, part 1, p. 150.
1960. *Archaediscus* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 352 [part].
1961. *Archaediscus* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 212–217 [part].
1961. *Archaediscus* Cummings. Great Britain Geol. Survey Bull. 18, pl. 4 [part].
1962. *Archaediscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 200–204.
1962. *Archaediscus* Sossipatrova. VNIGA Trudy 30, sb. Strat. Paleob. Biostrat., p. 53–57 [part].
1964. *Archaediscus* Conil and Lys. Louvain Univ. Géol. Inst. Mém., v. 23, p. 106–129 [part].
1964. *Archaediscus* Conil and Pirlet. Soc. Belge Géologie,

Paléontologie et Hydrologie Bull., v. 72, p. 194, 195 [no text].
1964. *Archaediscus* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C354, C355 [part].
1965. *Archaediscus* Skvorzov. Paleont. Zhur., no. 3, p. 28 [part].
1966. *Archaediscus* Sossipatrova. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 11, p. 8–18 [part].
1966. *Archaediscus* Conil and Lys. Soc. Géol. Belgique Annales, v. 89, Bull. 6, p. 221.
1966. *Archaediscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 163–167.
1966. *Planoarchaediscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 161 [part].
1966. *Archaediscus* Mamet *in* Mamet, Choubert, and Hottinger. Maroc Service Géol. Notes et Mém., v. 27, no. 198, p. 16 [only].
1967. [not] *Archaediscus* Chanton. Soc. Géol. France Bull., 7ème sér., v. 8, p. 37.
1968. *Paraarchaediscus* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 556 [part].
1968. *Archaediscus* Mamet. Rev. Micropaléontologie, v. 11, no. 3, p. 134.
1968. *Archaediscus* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 556.
1969. *Archaediscus* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 92.
1969. *Archaediscus* Hewitt and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 78, pl. 2, figs. 28, 41.
1969. *Archaediscus* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 11–14.
1969. *Archaediscus* Pelhate. Soc. Géol. Minéral Bretagne Bull., p. 41–44 [part].
1970. *Archaediscus* Mamet. Geol. Survey Canada Paper 70–21, p. 7, 8.
1970. *Archaediscus* Austin, Conil, and Husri. Liège Univ. Mém. Coll., v. 55, pl. 2, figs. 1–4, 6.
1970. *Paraarchaediscus* Austin, Conil, and Husri. Liège Univ. Mém. Coll., v. 55, pl. 2, fig. 7.
1970. *Archaediscus* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 894.
1970. *Archaediscus* Gorecka and Mamet. Rev. Micropaléontologie, v. 13, no. 3, p. 162.
1971. ?*Archaediscus* Petryk. Micropaleontology, v. 17, no. 2, p. 249–251.

*Diagnosis.*—Test free, lenticular. Proloculus followed by nonseptate tubular chamber that coils in various planes. Second chamber remains free of fibrous filling during whole life of animal. Wall two layered; one inner thin, dark, dense, microcrystalline tectum, and an outer pseudofibrous clear layer. Aperture simple, at open end of tube.

*Remarks.*—Loeblich and Tappan (1964) also include in the genus *Archaediscus, Neodiscus, Propermodiscus, Asteroarchaediscus,* and *Rugosarchaediscus,* four taxa erected by Mikluko-Maklai.

*Neodiscus* is not an Archaedicidae as it does not possess a tectum and an outer pseudofibrous wall.

*Propermodiscus* has umbilical fillings, a character absent in *Archaediscus.*

*Asteroarchaediscus* and *Rugosarchaediscus* have secondary fibrous deposits whereas the second chamber of *Archaediscus* is free of them.

The genus *Paraarchaediscus* Orlova is considered here as an *Archaediscus* of the group *A. krestovnikovi* Rauzer-Chernoussova.

*Type of genus.*—1873 *Archaediscus karreri* Brady. Ann. Mag. Nat. History, ser. 4, v. 12 p. 286, pl. 9, figs. 1–6.

Taxa included in the genus *Archaediscus:*

1961 *acutus* Saurin
1956 *approximatus* Ganelina
1964 *aucta* Conil and Lys
1964 *celsus* Conil and Lys
1966 *chernoussovensis* Mamet *in* Mamet, Choubert, and Hottinger
1962 *commutabilis* Sossipatrova
1964 *componens* Conil and Lys
1953 *convexus* Grozdilova and Lebedeva
1964 *cornua* Conil and Lys
1964 *crassus* Conil and Lys
1964 *cyrtus* Conil and Lys
1964 *decussatus* Conil and Lys
1964 *demaneti* Conil and Lys
1964 *densospira* Conil and Lys
1964 *depressus* Conil and Lys
1951 *discoidea* Brazhnikova
1953 *donetzianus* Sosnina *in* Grozdilova
1962 *dubius* Sossipatrova
1956 *electus* Ganelina
1961 *elongatus* Saurin
1951 *embolicus* Shlykova
1951 *enormis* Shlykova
1962 *enodatus* Sossipatrova
1961 *foliaceus* Saurin
1970 *geniculatus* Hallett
1964 *globosus* Conil and Lys
1964 *globulus* Conil and Lys (OBJ, nom. nud.)
1956 *glomus* Ganelina
1964 *gracilis* Conil and Lys
1951 *grandiculus* Shlykova
1957 *granum* Golubsov
1951 *infantis* Shlykova
1951 *inflatus* Shlykova
1964 *inflexus* Conil and Lys
1951 *itinerarius* Shlykova
1956 *karreri compressa* Brazhnikova
1948 *karreri fragilis* Rauzer-Chernoussova
1948 *karreri nana* Rauzer-Chernoussova
1948 *koktjubensis* Rauzer-Chernoussova

1948 *krestovnikovi* Rauzer-Chernoussova
1951 *krestovnikovi discoidea* Brazhnikova
1948 *krestovnikovi pusillus* Rauzer-Chernoussova
1958 *longus* Potievskaia
1964 *macer* Conil and Lys
1951 *magnus* Shlykova
1956 *matutinus* Ganelina
1954 *maximus* Grozdilova and Lebedeva
1951 *mellitus* Shlykova
1948 *moelleri* Rauzer-Chernoussova
1948 *moelleri gigas* Rauzer-Chernoussova
1951 *moelleri ventrosa* Shlykova
1964 *mohae* Conil and Lys
1964 *mutans* Conil and Lys
1951 *operosus* Shlykova
1951 *pauxillus* Shlykova
1956 *paraspirillinoides* Brazhnikova
1957 *perlucidus* Golubsov
1964 *piesis* Conil and Lys
1961 *praecursor* Saurin
1950 *probatus* Reitlinger
1966 *pseudoapproximatus* Sossipatrova
1949 *pseudomoelleri* Reitlinger
1960 *pseudovisherensis* Saurin
1964 *pulvinus* Conil and Lys
1958 *reliquus* Potievskaia
1956 *rhombiformis* Ganelina
1964 *rhombus* Conil and Lys
1964 *saleei* Conil and Lys
1956 *spectabilis* Ganelina
1953 *stilus* Grozdilova and Lebedeva
1948 *subcylindricus* Brazhnikova and Potievskaia
1964 *teres* Conil and Lys
1966 *tiksinensis* Sossipatrova
1964 *triangulus* Conil and Lys
1964 *valens* Conil and Lys
1954 *varsanofievae* Grozdilova and Lebedeva
1954 *velgurensis* Grozdilova and Lebedeva
1964 *vertens* Conil and Lys
1954 *visherensis* Grozdilova and Lebedeva

This extensive list is certainly indicative of extreme duplication. *Archaediscus* are very difficult to speciate as their tubular chamber is undivided and does not allow correct appraisal of the position of the main axis of symmetry.

For instance, Conil and Lys (1964) report the existence of no fewer than 42 different taxa in one single zone of the Belgian carbonate platform. There is, however, little indication that Carboniferous foraminiferal populations were so radically different from those observed nowadays; that 42 different "species" of one single genus could compete and survive successfully on a carbonate platform seems very hard to conceive.

Three morphological groups can be distinguished on the coiling pattern of the last three whorls:

1. *Archaediscus* of the group *A. krestovnikovi;* coiling sygmoidal.
2. *Archaediscus* of the group *A. moelleri;* coiling deflected regularly, on one direction; the angle of deflection is around 30° per coil.
3. *Archaediscus* of the group *A. chernoussovensis;* coiling erratic.

It is to be noted here that *Archaediscus karreri* Brady 1873 belongs to the *A. moelleri* group (see Mamet, 1968a). *Archaediscus karreri* of the Russian literature is to be transferred to the *A. chernoussovensis* group.

**Archaediscus of the group A. krestovnikovi Rauzer-Chernoussova 1948**

Plate 27, figures 3, 4

Group exemplified by:
*Archaediscus krestovnikovi* Rauzer-Chernoussova, the description, diagnosis, and synonymy of which follow.

*Figured material.*—USNM 179349, 179350.

**Archaediscus krestovnikovi Rauzer-Chernoussova 1948**

Plate 27, figure 4

1932. *Archaediscus karreri* Liebus. Preuss. Geol. Landesanst. Abh., new ser., no. 141, p. 171, pl. 10, figs. 11, 12.
1940. *Archaediscus krestovnikovi* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, Ser. Geol. 18, no. 5–6, p. 120 (nom. nud.).
1948. *Archaediscus krestovnikovi* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 10, pl. 2, figs. 18–20.
1948. *Archaediscus krestovnikovi* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 152, 153, pl. 2, figs. 2–4, [not 5, 6, 11].
1950. *Archaediscus karreri* Termier and Termier. Paléontologie Maroc. Invertébrés Ere Primaire, Pt. 1, pl. 2, figs. 16–25.
1951. *Archaedicus krestovnikovi* Shlykova. VNIGRI Trudy 56, p. 169, pl. 5, figs. 8, 9.
1953. *Archaediscus stilus* Grozdilova. VNIGRI Trudy 74, p. 110, pl. 4, figs. 19, 20.
1953. *Archaediscus krestovnikovi* Grozdilova. VNIGRI Trudy 74, p. 94–96, pl. 2, figs. 17–19.
1954. *Archaediscus krestovnikovi* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 56, 57, pl. 7, figs. 2, 3.
1954. *Archaediscus ninae* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 55, pl. 6, fig. 11; pl. 7, fig. 1.
1954. *Archaediscus stilus* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 61, pl. 7, fig. 19.
1957. *Archaediscus krestovnikovi* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, Sbornik 2, p. 149, pl. 7, figs. 12–15.

1960. *Archaediscus krestovnikovi* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 94, pl. 9, figs. 3, 4.

1961. *Archaediscus krestovnikovi* Cummings. Great Britain Geol. Survey Bull. 18, pl. 4.

1962. *Archaediscus dubius* Sossipatrova. VNIGA Trudy 30, Sbornik Strat. Paleob. Biostrat., p. 53, pl. 4, fig. 5.

1962. *Archaediscus krestovnikovi* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 202, 203, pl. 9, fig. 7 [not 8–10].

1962. *Archaediscus krestovnikovi* Sossipatrova. VNIGA Trudy 30, sbornik Strat. Paleob. Biostrat., p. 55, 56, pl. 4, figs. 9–11.

1963. *Archaediscus* sp. McKay and Green. Research Council Alberta Bull. 10, p. 25, pl. 7, figs. 1, 3.

1964. *Archaediscus krestovnikovi* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, pl. 2, fig. 12, not 13.

1964. *Archaediscus krestovnikovi* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 120, pl. 18, figs. 345–351.

1966. *Archaediscus krestovnikovi* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniyi Inst. Geologii i Geofiziki Trudy, p. 164, pl. 9, figs. 12–14.

1966. *Planoarchaediscus? ninae* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otedeleniye Inst. Geologii i Geofiziki Trudy, p. 161, pl. 11, fig. 9.

1966. *Planoarchaediscus stilus magna* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 161, pl. 11, fig. 8.

1966. ?*Archaediscus tiksinensis* Sossipatrova. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 11, p. 8, 9, pl. 2, figs. 1, 2.

1968. *Archaediscus krestovnikovi* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 556, pl. 11, fig. 153.

1969. *Archaediscus krestovnikovi* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, pt. 2, p. 92, pl. 2, fig. 24 [only].

1969. *Archaediscus convexus convexus* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 42, pl. 3, fig. 28.

1969. *Archaediscus krestovnikovi* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12, pl. 1, figs. 17–19, 24, 25, pl. 2, fig. 28.

1969. *Archaediscus krestovnikovi* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 42, 43.

1970. *Archaediscus krestovnikovi* Mamet. Canada Geol. Survey Paper 70–21, p. 8, pl. 7, figs. 1, 2, 4, 5.

1970. *Archaediscus krestovnikovi* Hallett. 6ème Cong. Avanc. Strat. Carb., Compte Rendu p. 894, pl. 5, fig. 3.

*Diagnosis*.—Test free, lenticular. Proloculus followed by 2½ whorls, glomospirally coiled, then by three sygmoidally arranged whorls. Height of lumen increases rapidly and reaches 55$\mu$ in last whorl. Diameter of test 300$\mu$ to 450$\mu$, rarely 500$\mu$. Width 120$\mu$ to 170$\mu$. Flanks subparallel to uneven. Wall two layered; an inner, well-developed tectum; an outer pseudofibrous layer. Aperture simple, at open end of tube.

*Remarks*.—The separation of *Archaediscus krestovnikovi* from *Archaediscus stilus* proposed by Conil and Lys (1968) is not recognized here.

*Stratigraphic range and distribution*.—Originally described from the Late Viséan of the Russian Platform. The group appears in the Early Viséan where it is uncommon (Mamet, 1965); the species *A. krestovnikovi* has a characteristic outburst at the base of Zone 13 all over Eurasia.

It is rather widespread in Alaska (from Zone 13 upwards), notably in the Alapah Limestone and Kogruk and Nasorak Formations. It is scarce in the Wahoo Limestone.

*Figured specimen*.—USNM 179350.

**Archaediscus koktjubensis Rauzer-Chernoussova 1948**

Plate 27, figure 3

1948. *Archaediscus krestovnikovi koktjubensis* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 11, pl. 3, figs. 1–3.

1951. *Archaediscus krestovnikovi koktjubensis* Shlykova. VNIGRI Trudy 56, p. 170, pl. 5, figs. 11, 12.

1953. *Archaediscus visherensis* Grozdilova. VNIGRI Trudy 74, p. 93, pl. 3, fig. 15.

1954. *Archaediscus visherensis* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 50, pl. 7, fig. 6.

1956. *Archaediscus visherensis* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, pl. 13, figs. 10, 11.

1962. *Archaediscus krestovnikovi* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 202, 203 [part], pl. 7, figs. 8, 9 [part].

1964. *Archaediscus koktjubensis* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 119, pl. 17, figs. 338–340.

1964. ?*Archaediscus demaneti* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 111, pl. 15, figs. 293, 294.

1966. *Archaediscus koktjubensis* Conil and Lys. Soc. Géol. Belgique Annales, v. 89, Bull. 6, p. 221, pl. 2, fig. 13.

1966. *Archaediscus krestovnikovi koktjubensis* Sossipatrova. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 11, p. 15, 16, pl. 2, figs. 13, 14.

1966. *Archaediscus krestovnikovi koktjubensis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Goefiziki Trudy, p. 164, 165, pl. 9, figs. 15–17.

1969. *Archaediscus krestovnikovi* Dvorak and Conil. Soc. Belge Géologie, Páleontologie et Hydrologie Bull., v. 77, pl. 2, fig. 23.

1970. *Archaediscus koktjubensis* Mamet. Canada Geol. Survey 70–21, p. 8, pl. 7, fig. 3.

*Diagnosis*.—Test free, lenticular. Proloculus followed by two tightly glomospirally coiled whorls, then by three sygmoidally coiled volutions. Height of lumen increases rapidly and reaches 50$\mu$ in last whorl. Diameter of test, 300$\mu$ to 450$\mu$, rarely as much as 500$\mu$. Width 120$\mu$ to 200$\mu$. Flanks convex. Wall two layered; inner tectum microcrystalline; outer wall pseudofibrous. Aperture simple, at open end of tube.

*Stratigraphic range and distribution.*—Originally described from the Late Viséan (*Gigantella* beds) and widespread in the Russian Platform, the Urals, Kazakhstan, western Europe, and northern Siberia. In Eurasia, appears in the Early Viséan and has a characteristic outburst at the base of Zone 13. Scarce in Early Namurian.

Present in Alaska in the Viséan part of the Kogruk Formation and Alapah Limestone.

*Figured specimen.*—USNM 179349.

**Archaediscus of the group A. chernoussovensis Mamet 1966**

Plate 27, figures 6–8

Group exemplified by:

1948. *Archaediscus karreri* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 230, pl. 15, figs. 10, 11 [not *Archaediscus karreri* Brady 1873].
1966. *Archaediscus chernoussovensis* Mamet *in* Mamet, Choubert, and Hottinger. Maroc Service Géol. Notes et Mém., v. 27, no. 198, p. 16.

The following taxa are also included in the group:

1951. *Archaediscus karreri* Shlykova. VNIGRI Trudy 56, p. 159, 160, pl. 9, figs. 12, 13.
1953. *Archaediscus convexus* Grozdilova. VNIGRI Trudy 74, p. 91, pl. 2, fig. 11.
1953. *Archaediscus karreri* Grozdilova. VNIGRI Trudy 74, p. 80, pl. 1, fig. 1–8.
1954. *Archaediscus convexus* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 41, pl. 5, figs. 9–12.
1956. *Archaediscus karreri* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy, v. 24, no. 3, p. 40, pl. 3, fig. 1.
1959. *Archaediscus karreri* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 147, 148, pl. 8, figs. 6–9.
1960. *Archaediscus karreri* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 91, pl. 9, fig. 2.
1964. *Archaediscus karreri* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 118, pl. 17, figs. 326–333.
1964. *Archaediscus saleei* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 126, pl. 19, figs. 376–379.
1964. *Archaediscus convexus* (part) Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 108, pl. 15, figs. 280, 281.
1964. *Archaediscus macer* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 123, pl. 18, figs. 361, 362.
1969. [not] *Archaediscus karreri* Hewitt and Conil. Soc. Belge Géologie, Páleontologie et Hydrologie Bull., v. 78, pl. 2, fig. 27 (no text).

In addition, the most important species belonging to the group are:

1948 *Archaediscus nanus* Rauzer-Chernoussova
1951 *Archaediscus pauxillus* Shlykova

*Diagnosis.*—Proloculus followed by erratically coiled tubular chamber. Wall calcareous, secreted, double layered; an inner, dense, microcrystalline tectum and an outer pseudofibrous clear layer. Aperture at open end of tube.

*Stratigraphic range and distribution*—Ubiquitous in the Northern Hemisphere.

Originally described from the Late Viséan of the U.S.S.R., it appears in Early Viséan time. The group has an acme in Late Viséan time and flourished up to the Namurian.

In Alaska, the group appears in Middle Viséan time and is observed in the Late Viséan and Namurian Alapah Limestone, Wahoo Limestone, and Kogruk Formation.

*Figured specimens.*—USNM 179351, 179352; Univ. Montréal 221/35.

**Archaediscus of the group A. moelleri Rauzer-Chernoussova 1948**

Plate 27, figures 9, 10

Group exemplified by:

1878. *Archaediscus karreri* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 25, no. 9, p. 116, 117, pl. 7, figs. 4, 5 [not *Archaediscus karreri* Brady 1873].
1948. *Archaediscus moelleri* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 231, pl. 15, figs. 14, 15.

The following taxa are also included in the species:

1951. *Archaediscus moelleri* Shlykova. VNIGRI Trudy 56, p. 165, pl. 5, figs. 1, 2.
1953. *Archaediscus moelleri* Grozdilova. VNIGRI Trudy 74, p. 84, pl. 1, figs. 15–20.
1954. *Archaediscus moelleri* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 47, pl. 5, fig. 6.
1964. *Archaediscus mölleri* (sic) Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 124, pl. 19, fig. 370.
1964. *Archaediscus mölleri* (sic) Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, pl. 2, fig. 22.
1964. *Archaediscus mohae* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 123, pl. 18, figs. 364–366.
1970. *Archaediscus moelleri* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 894, pl. 5, fig. 7.

The most widespread and important species referable to the group are:

1956 *Archaediscus approximatus* Ganelina
1951 *Archaediscus enormis* Shlykova
1951 *Archaediscus grandiculus* Shlykova
1951 *Archaediscus itinerarius* Shlykova
1873 *Archaediscus karreri* Brady not von Möller, not Rauzer-Chernoussova

*Diagnosis.*—Proloculus followed by tightly coiled tubular chamber with constant deflection angle of 30° in last three whorls. Same wall structure as *Archaediscus* of group *A. chernoussovensis;* inner dark, dense tectum and an outer pseudofibrous layer. Aperture at open end of tube.

*Stratigraphic range and distribution.*—Ubiquitous in the Northern Hemisphere.

Originally described from the Viséan of the Russian Platform, it appears in Early Viséan time and is rather widespread in Middle and Late Viséan. Scarce in the Namurian. Extinct in Middle Westphalian.

*Figured specimens.*—Univ. Montréal 219/29, 222/10.

#### Archaediscus approximatus Ganelina 1956

Plate 27, figures 9, 10

1956. *Archaediscus approximatus* Ganelina. VNIGRI Trudy 98, p. 77, pl. 4, figs. 5, 6.
1964. *Archaediscus approximatus* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 106, pl. 14, figs. 267–269.
1964. *Archaediscus approximatus* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, pl. 2, fig. 20.

*Diagnosis.*—Proloculus very large ($60\mu$ to $100\mu$), followed by three to four whorls, three last ones with constant 30° deviation. Diameter, $350\mu$ to $450\mu$. Width, $200\mu$ to $300\mu$. Flanks convex. Height of lumen in last whorl $60\mu$ to $70\mu$. Wall two layered; inner tectum very thin; outer tectum very thick, coarsely pseudofibrous. Aperture at open end of tube.

*Remarks.*—The species is very close to *Archaediscus karreri* Brady from which it is readily distinguishable by its smaller size and a more compressed outline.

*Stratigraphic range and distribution.*—Originally described from the Aleksin Horizon (latest Viséan) of the Dorobuj Viazme region, it is also known from the same level in Belgium and England. In Alaska, the taxon is present in the Late Viséan Alapah Limestone, but it is also observed in strata as young as the Westphalian Wahoo Limestone.

#### Archaediscus? (Group unknown)

#### Archaediscus? pachytheca Petryk 1971

Plate 27, figure 5

1971. *Archaediscus pachytheca* Petryk. Micropaleontology, v. 17, no. 2, p. 249–251, text fig. 2, figs. 1, 2.

*Diagnosis.*—Test free, lenticular. Proloculus ($50\mu$ and more) followed by three to four whorls of an erratically coiled tubular chamber. Diameter $200\mu$ to $250\mu$. Width approximately $100\mu$. Wall two layered; an inner, very thin, dense tectum and a well-developed outer fibrous layer. Aperture simple, at open end of tube.

*Stratigraphic range and distribution.*—Apparently restricted to the North American Cordillera.

Originally described from the Late Viséan of Alberta. Also known from the Late Viséan of Alaska and the Yukon Territory.

*Figured specimen.*—University of Montréal 203/35.

#### Genus NEOARCHAEDISCUS Mikluko-Maklai 1956

1948. *Archaediscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 11.
1948. *Archaediscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 233 [part].
1948. *Archaediscus* Suleimanov. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 245.
1949. *Archaediscus* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 162, 163.
1950. *Archaediscus* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 83–86 [part].
1953. *Archaediscus* Grozdilova. VNIGRI Trudy 74, p. 102–106 [part].
1954. *Archaediscus* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 43–63 [part].
1956. *Neoarchaediscus* Mikluko-Maklai. VSEGEI Trudy, Ser. Geol., Bull. 12, p. 11 [part].
1956. *Archaediscus* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 41.
1957. ?*Rugosarchaediscus* Mikluko-Maklai. Leningrad Univ. Bull., Ser. Geol. Geography, no. 24 (4), p. 37.
1959. ?*Spirillina* Deleau and Marie. Pub. Serv. Carte Géol. Algérie new ser. Bull. 25, p. 80.
1960. *Neoarchaediscus* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 97, 98.
1961. *Archaediscus* Cummings. Great Britain Geol. Survey Bull. 18, pl. 4 [part].
1962. *Neoarchaediscus* Sossipatrova. VNIGA Trudy 30, sbornik Stat. Paleob. Biostrat., p. 60–62.
1962. *Neoarchaediscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 206–208.
1964. [not] *Neoarchaediscus* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, p. 194, 195, pl. 2, fig. 29.
1964. *Neoarchaediscus* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 130 [part].
1964. *Archaediscus* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, Pt. C, p. C354, C355 [part].
1964. *Brunsia* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, Pt. C, p. C355, C356 [part].
1967. *Archaediscus* Chanton. Soc. Géol. France Bull., 7ème ser. v. 8, p. 37 [part].
1966. *Neoarchaediscus* Sossipatrova. NIIGA Uchennye Zapiski, Paleont. Biostrat., Bull. 11, p. 19, 20.
1969. *Neoarchaediscus* Hewitt and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 78, pl. 2 [part].
1969. *Neoarchaediscus* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12.
1969. *Asteroarchaediscus* Hewitt and Conil. Soc. Belge Géologie, Paléontologie, et Hydrologie Bull., v. 78, pl. 2, fig. 34 (only).
1970. *Neoarchaediscus* Mamet. Canada Geol. Survey Paper 70–21, p. 12.
1970. *Rugosarchaediscus* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 894.
1970. *Neoarchaediscus* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 894 [part].

*Diagnosis*.—Test free. Proloculus followed by tightly, glomospirally coiled tubular chamber. Coiling involute, except for last or two last whorls. Lumen obstructed by pseudofibrous filling in early volutions but open in last whorls. Wall two layered, composed by very thin rudimentary tectum, and well-developed fibrous outer layer.

*Type of genus*.—1954 *Archaediscus incertus* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 60, 61, pl. 7, figs. 14, 15.

Taxa included in the genus *Neoarchaediscus*:

- 1962 *accuratus* Sossipatrova
- 1954 *akchimensis* Grozdilova and Lebedeva
- 1959 *?bacteriformis* Deleau and Marie
- 1966 *bykovensis* Sossipatrova
- 1962 *collatatus* Sossipatrova
- 1953 *latispiralis* Grozdilova
- 1948 *parvus* Rauzer-Chernoussova
- 1948 *parvus regularis* Rauzer-Chernoussova
- 1949 *postrugosus* Reitlinger
- 1949 *subbaschkiricus* Reitlinger
- 1950 *subbaschkiricus grandis* Reitlinger
- 1949 *timanicus* Reitlinger

*Stratigraphic distribution and range*.—Ubiquitous in the Northern and the Southern Hemispheres.

Appears in Zone $16_{inf}$; rapid acme from Zones $16_{sup}$ to 21; slowly eliminated in late Carboniferous.

**Neoarchaediscus parvus (Rauzer-Chernoussova 1948)**

Plate 27, figures 11, 12

1948. *Archaediscus parvus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 233, pl. 16, figs. 9–12.
1951. *Archaediscus parvus* Brazhnikova. Akad. Nauk Ukrain. SSR, Inst. Geol. Trudy, Ser. Strat. Paleont., no. 5, p. 89, 90, pl. 1, figs. 21–24.
1953. *Archaediscus parvus* Grozdilova. VNIGRI Trudy 74, p. 104, pl. 4, figs. 6, 8.
1956. *Archaediscus parvus* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 41, pl. 3, figs. 4, 5.
1956. *Neoarchaediscus parvus* Mikluko-Maklai. VSEGEI Trudy, Ser. Geol., Bull. 12, p. 11.
1961. *Archaediscus parvus* Cummings. Great Britain Geol. Survey Bull. 18, pl. 4.
1970. *Neoarchaediscus parvus* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 894, pl. 5, fig. 11.

*Diagnosis*.—Test free. Proloculus (about 10μ to 15μ) followed by tightly coiled tubular chamber, completely filled by fibrous material in initial three to four whorls. Last whorls are free of secondary deposits. Last coil has tendency to become evolute. Diameter 160μ to 220μ. Width 50μ to 80μ. Periphery rather irregular. Wall thickness 10μ to 15μ in last whorl.

*Stratigraphic range and distribution*.—Originally described from the Early Namurian of the Russian Platform.

In Eurasia, it is a very common form ranging from Late Viséan (Zone $16_{sup}$) to the Namurian. It is also present in the Bashkirian. The taxon has also been reported from the Late Viséan and earliest Namurian Windsor Group of the Canadian Maritime Provinces. In Alaska, the taxon ranges from Zone $16_{sup}$ (Alapah Limestone) to Zone 21 (Wahoo Limestone) where it is scarce.

*Figured specimens*.—USNM 179353, 179354.

**Neoarchaediscus parvus regularis (Suleimanov 1948)**

Plate 27, figures 13–16

1948. *Archaediscus parvus regularis* Suleimanov. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 245, text figs. 3, 4.
1953. *Archaediscus parvus regularis* Grozdilova. VNIGRI Trudy 74, p. 105, pl. 4, figs. 7, 8.
1970. *Neoarchaediscus parvus regularis* Mamet. Canada Geol. Survey Paper 70–21, p. 12, pl. 7, figs. 7, 8.

*Diagnosis*.—Test free. Proloculus followed by tightly coiled tubular chamber, completely filled by fibrous material in three to four initial whorls. Last whorls have an open lumen. Ultimate whorl is usually evolute. Diameter 190μ to 260μ. Width 60μ to 100μ. Periphery smooth. Wall thickness in last whorl 10μ to 15μ. Lumen rather large.

*Stratigraphic range and distribution*.—Originally described from the Namurian of the Russian Platform, it appears in the latest Viséan and is rather abundant in the Early Namurian. The latest occurrence is unknown. The form is cosmopolitan in the Northern Hemisphere.

In Alaska it ranges from Zone 17 (Alapah Limestone) to Zone 21 (Wahoo Limestone) where the taxon is scarce.

*Figured specimens*.—USNM 179355–179357; Univ. Montréal 219/17.

**Neoarchaediscus incertus (Grozdilova and Lebedeva 1954)**

Plate 27, figs. 17–27

1954. *Archaediscus incertus* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 60, pl. 7, figs. 14, 15.
1956. *Archaediscus incertus* Mikluko-Maklai. VSEGEI Trudy, Ser. Geol., Bull. 18, p. 11.
1960. *Neoarchaediscus incertus* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 98, pl. 11, fig. 11.
1961. (not) *Archaediscus incertus* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 215, pl. 2, fig. 8.
1964. *Neoarchaediscus incertus* [part] Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 130, pl. 20, fig. 389 [not 390, not 391].

1964. [not] *Neoarchaediscus incertus* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, p. 194, 195, pl. 2, fig. 29.

1970. *Neoarchaediscus* of the group *N. incertus* Mamet. Canada Geol. Survey Paper 70–21, p. 12, pl. 7, fig. 12.

*Diagnosis.*—Test free. Proloculus very small, followed by tightly coiled tubular chamber filled by fibrous deposits in initial whorls. Outer whorls free of secondary deposits and sygmoidally coiled. Whorls embracing. Diameter 200$\mu$ to 400$\mu$. Width 60$\mu$ to 110$\mu$. Wall thin, ranging from 12$\mu$ to 18$\mu$ in last whorl. Lumen rather high in last whorl, rapidly increasing in height.

*Stratigraphic range and distribution.*—In Eurasia, *Neoarchaediscus incertus* ranges from the latest Viséan (upper part of the Oka Series) to the Bashkirian or the early Moscovian.

The taxon is widespread in the North American realm, where it has comparable range (Mamet, 1968b, c; Mamet and Gabrielse, 1969; Sando and others, 1969).

In Alaska the taxon ranges from Zone $16_{sup}$ (Alapah Limestone) to Zone 21 (Wahoo Limestone).

*Figured specimens.*—USNM 179358–179362; Univ. Montréal 219/15, 219/13, 219/10, 219/19, 219/30, 219/24.

#### Neoarchaediscus subbaschkiricus grandis (Reitlinger 1950)

Plate 27, figure 28

1950. *Archaediscus subbaschkiricus grandis* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 84, 85, pl. 18, figs. 10, 11.

1969. [not] *Asteroarchaediscus subbaschkiricus* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 13, 14, pl. 2, fig. 32, pl. 4, fig. 29.

*Diagnosis.*—Test free. Proloculus followed by tightly coiled tubular chamber filled by fibrous deposits. Outer whorls free of secondary deposits. Last volutions are sygmoidially coiled and embracing. Flanks concave. Diameter 350$\mu$ to 450$\mu$, rarely 480$\mu$. Width 150$\mu$ to 200$\mu$. Wall bilayered, ranging from 15$\mu$ to 20$\mu$ in last whorl.

*Remarks.*—By its general outline, the taxon is very similar to *Neoarchaediscus subbaschkiricus*, but it is at least twice as large. Reitlinger, in its original description, claims that it has a higher diameter to width ratio. However, the type material of that author appears to be very oblique sections, and the "spherical" appearance is due to that obliquity.

*Stratigraphic distribution.*—In the U.S.S.R., the taxon appears to be restricted to the Bashkirian. In Alaska, exclusively present in the Wahoo Limestone (Zones 20 and 21).

*Figured specimen.*—USNM 179363.

#### Genus PLANOSPIRODISCUS Sossipatrova 1962 emend. Mamet

1953. *Archaediscus* Grozdilova and Lebedeva *in* Grozdilova *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 111.

1953. *Archaediscus* Dain *in* Grozdilova *in* Dain and Grozdilova VNIGRI Trudy 74, p. 106.

1954. *Archaediscus*? Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 62 [part].

1956. *Neoarchaediscus* Mikluko-Maklai. VSEGEI Trudy, Ser. Geol., Bull. 12, p. 11.

1962. *Planospirodiscus* Sossipatrova. VNIGA Trudy 30, sbornik Stat. Paleob. Biostrat., p. 63–66.

1964. *Neoarchaediscus* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 130 [part].

1964. *Neoarchaediscus* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, pl. 2, fig. 29.

1966. *Planospirodiscus* Sossipatrova. NIIGA, Uchennye Zapiski, Paleob. Biostrat., Bull. 11, p. 20, 21.

1966. *Planospirodiscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 170, 171.

1967. *Archaediscus* Chanton. Soc. Géol. France Bull., 7ème Sér., v. 8, p. 37 [part].

1967. *Eolasiodiscus* Chanton. Soc. Géol. France Compte Rendu, 7ème Sér. v. 8, no. 4, p. 166 [part].

1969. *Neoarchaediscus* Hewitt and Conil. Soc. Belge Géologie, Paléontologie, et Hydrologie Bull., v. 78, pl. 2 [part].

1970. *Planospirodiscus* Mamet. Canada Geol. Survey Paper 70–21, p. 13.

1970. *Neoarchaediscus* Hallett. 6éme Cong. Avanc. Strat. Carb. Compte Rendu, p. 894 [part].

*Diagnosis.*—Test free. Proloculus followed by a tubular chamber with uncomplete lumen filling. Initial early coils tightly coiled, erratic, followed by evolute, regular whorls. Wall bilayered. Inner tectum very thin, faint, often unconspicuous; outer layer pseudofibrous, clear; in most evolved forms, appears to be nearly hyaline. No umbilical plug.

*Type of genus.*—1962 *Planospirodiscus taimyricus* Sossipatrova. VNIGA Trudy 30, sbornik Stat. Paleob. Biostrat., p. 64, pl. 2, figs. 19–21.

*Remarks.*—As mentioned in the diagnosis, the inner microcrystalline dark layer becomes inconspicuous and the fibrous character of the outer wall tends to disappear in the late Bashkirian to Moscovian *Planospirodiscus*. This evolution of the wall structure is similar to that observed in the *Quasiarchaediscus* phylogeny and confirms the idea that the Archaediscidae are the ancestors of the so-called Carboniferous "Miliolids."

Taxa included in the genus *Planospirodiscus:*

1962 *effetus* Sossipatrova

1953 *gregorii* Dain *in* Grozdilova *in* Dain and Grozdilova

1953 *minimus* Grozdilova and Lebedeva *in* Grozdilova *in* Dain and Grozdilova
1962 *taimyricus* Sossipatrova

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Appears in Zone 16 $_{sup}$ and has a long acme in Namurian time. Disappears slowly in the Moscovian.

**Planospirodiscus minimus (Grozdilova and Lebedeva 1953)**

Plate 27, figures 29–33

1953. *Archaediscus minimus* Grozdilova and Lebedeva *in* Grozdilova *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 111, pl. 4, fig. 15.
1954. *Archaediscus? minimus* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 62, pl. 7, fig. 16.
1956. *Neoarchaediscus minimus* Mikluko-Maklai. VSEGEI Trudy, Ser. Geol., Bull. 12, p. 11.
1962. *Planospirodiscus minimus* Sossipatrova. VNIGA Trudy 30, sbornik Stat. Paleob. Biostrat., p. 64, 65, pl. 5, figs. 23, 24.
1966. *Planospirodiscus minimus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 170, pl. 11, figs. 26, 27.
1966. *Planospirodiscus minimus* Sossipatrova. NIIGA Uchennye Zapiski, Paleont. Biostrat., Bull. 11, p. 21 [part], pl. 3, fig. 6 [not fig. 5].
1970. *Planospirodiscus minimus* Mamet. Canada Geol. Survey Paper 70-21, p. 13, pl. 7, figs. 14, 18.

*Diagnosis.*—Test free. Proloculus followed by one or two erratically coiled whorls. Last three to four coils of tubular chamber are nearly planispiral (slightly sygmoidal) and evolute. Diameter of test 200μ to 350μ. Width 50μ to 80μ. Flanks subparallel to slightly concave. Lumen has about same height as thickness of wall.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Originally described from the Bashkirian of the Urals, it is also abundant in northern Siberia.

Appears in Zone 16 $_{sup}$ (Alapah Limestone) and is very abundant in Zone 18 of that formation. Has also been observed in the Kogruk Formation. Scarce in the Wahoo Limestone.

*Figured specimens.*—USNM 179364; Univ. Montréal 222/8, 222/11, 203/37, 221/31.

**Planospirodiscus taimyricus Sossipatrova 1962**

Plate 27, figures 34–38

1962. *Planospirodiscus taimyricus* Sossipatrova. VNIGA Trudy 30, sbornik Stat. Paleob. Biostrat., p. 64, pl. 5, figs. 19–21.
1962. *Planospirodiscus effetus* Sossipatrova. VNIGA Trudy 30, sbornik Stat. Paleob. Biostrat., p. 65, 66, pl. 5, figs. 15–18.
1966. *Planospirodiscus effetus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 170, 171, pl. 9, fig. 28.

*Diagnosis.*—Test free. Proloculus (15μ to 20μ) followed by very tightly coiled, evoluted, tubular chamber, with slight secondary fibrous filling. Axis of coiling nearly planispiral, except in initial whorl. Diameter of test 120μ to 220μ. Width 40μ to 60μ. Lumen very low. Wall faintly bilayered, dark tectum not exceeding 2μ.

*Stratigraphic range and distribution.*—Originally described from the lower Makarov Formation of the central Taimyr Peninsula (arctic Siberia), *Planospirodiscus taimyricus* is very abundant in the highest part of the Alapah Limestone (Zones 18 and 19) and is scarce in the Wahoo Limestone (Zones 20 and 21).

*Figured specimens.*—USNM 179365–179369.

**Planospirodiscus sp.**

Plate 27, figure 39

*Diagnosis.*—Test free. Proloculus followed by regularly coiled, nearly planispiral, evolute, tubular chamber. Flanks slightly convex. Lumen height equivalent to wall thickness. Diameter of test 280μ. width 80μ. Wall bilayered; an inner thin (2μ to 4μ) dark tectum and an outer faintly "fibrous" hyaline layer.

*Remarks.*—The form is readily distinguished from all known *Planospirodiscus* by its convex flanks. The scarcity of the material (three axial sections) precludes erection of a new taxon.

*Stratigraphic range and distribution.*—Scarce in the upper part of the Alapah Limestone (Zone 18?).

*Figured specimen.*—USNM 179370.

**Genus ASTEROARCHAEDISCUS Mikluko-Maklai 1956**

1936. *Archaediscus* Krestovnikov and Teodorovitch. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 44, Geol. ser. 14 (1), p. 87.
1948. *Archaediscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 11.
1948. *Archaediscus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 232, 233.
1948. *Archaediscus* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 154.
1953. *Archaediscus* Grozdilova and Lebedeva *in* Grozdilova *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 101, 103.
1953. *Archaediscus* Grozdilova *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 100–103 [part].
1954. *Archaediscus* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 58.
1956. *Archaediscus* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 61–66 [part].
1956. *Archaediscus* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 40, 41 [part].
1956. *Asteroarchaediscus* Mikluko-Maklai. VSEGEI Trudy, Ser. Geol., Bull. 12, p. 10.

1960. *Asteroarchaediscus* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 97.
1962. *Asteroarchaediscus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 204–206.
1964. *Archaediscus* [part] Loeblich and Tappan. Treatise Invert. Paleont., Protista, part C, p. C355.
1969. *Asteroarchaediscus* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12–15 [part].
1969. *Asteroarchaediscus* Hewitt and Conil. Soc. Belge Géologie, Paléontologie, et Hydrologie Bull., v. 78, pl. 2 [part].
1970. *Asteroarchaediscus* Mamet. Canada Geol. Survey Paper 70–21, p. 8
1970. *Asteroarchaediscus* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 894.

*Diagnosis.*—Test free. Proloculus followed by irregularly coiled, involute, tubular chamber practically completely obstructed by pseudofibrous filling. Wall calcareous secreted, bilayered; inner dark tectum is faint to inconspicuous, whereas pseudofibrous layer is well developed.

*Remarks.*—The "stellate" appearance and the aberrant fibrous filling are characteristic of the genus. Those characteristics can only be detected in nonrecrystallized carbonates; in highly recrystallized carbonates, distinction between *Neoarchaediscus* and *Asteroarchaediscus* is unfeasible.

Among Moscovian *Asteroarchaediscus* the inner tectum is practically inconspicuous.

*Type of genus.*—1936 *Archaediscus baschkiricus* Krestovnikov and Teodorovitch. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 44, Geol. ser. 14 (1), p. 87, figs. 1–3.

Taxa included in the genus *Asteroarchaediscus*:

1956 *longulus* Malakhova
1948 *ovoides* Rauzer-Chernoussova
1953 *pressulus* Grozdilova and Lebedeva *in* Grozdilova *in* Dain and Grozdilova
1954 *pustulus* Grozdilova and Lebedeva
1948 *rugosus* Rauzer-Chernoussova

*Stratigraphic distribution and range.*—Cosmopolitan in the Northern Hemisphere. Present in Australia.

Appears for the first time in the latest Viséan to earliest Namurian passage beds. The acme at the base of Zone 17 underlines the Namurian in Eurasia.

Same stratigraphic distribution in North America where it occurs in abundance in the middle and upper Chester.

**Asteroarchaediscus of the group A. baschkiricus (Krestovnikov and Teodorovitch 1936)**

Plate 27, figures 40–44

The group is exemplified by:

1935. *Archaediscus baschkiricus* (nom. nud.) Krestovnikov and Teodorovitch. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 43, Geol. ser. 13 (1), p. 84–89.
1936. *Archaediscus baschkiricus* Krestovnikov and Teodorovitch. Moskov. Obshch. Ispytateley Prirody Byull., Otdel. Geol., v. 44, Geol. ser. 14 (1), p. 89, figs. 1–3.
1948. *Archaediscus baschkiricus* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 11, pl. 3, figs. 4–6.
1953. *Archaediscus baschkiricus* Grozdilova. VNIGRI Trudy 74, p. 100, 101, pl. 1, fig. 12.
1953. *Archaediscus rugosus* Grozdilova and Lebedeva *in* Grozdilova *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 103, pl. 4, figs. 1–3.
1956. *Asteroarchaediscus baschkiricus* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, no text, pl. 12, fig. 5.
1956. *Archaediscus baschkiricus* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 40, pl. 3, fig. 3.
1960. *Asteroarchaediscus baschkiricus* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 97, pl. 11, fig. 9.
1962. *Asteroarchaediscus baschkiricus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 204, 205, pl. 7, fig. 12.
1962. [not] *Asteroarchaediscus rugosus* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 205, pl. 9, fig. 3.
1962. [not] *Neoarchaediscus rugosus* Sossipatrova. VNIGA Trudy 30, sbornik Stat. Paleob. Biostrat., p. 61–63, pl. 5, figs. 9, 12–14.
1969. [not] *Asteroarchaediscus baschkiricus* Hewitt and Conil. Soc. Belge Géologie, Paléontologie, et Hydrologie. Bull., v. 78, pl. 2, figs. 34–37.
1969. *Asteroarchaediscus baschkiricus* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12–14, pl. 2, figs. 33, 34, pl. 4, fig. 30.
1970. *Asteroarchaediscus baschkiricus* Mamet. Canada Geol. Survey Paper 70–21, p. 8, pl. 7, fig. 20.
1970. *Asteroarchaediscus baschkiricus* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 894, pl. 5, fig. 14.
1970. *Asteroarchaediscus rugosus* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 894, pl. 5, fig. 15.

*Diagnosis.*—Test free. Proloculus small. Second tubular chamber erratically coiled throughout. Lumen obstructed by secondary pseudofibrous filling. Diameter of test 180$\mu$ to 300$\mu$. Width 80$\mu$ to 120$\mu$. Outline rather irregular, with broadly convex flanks. "Rugose" outline is here considered as a diagenetic feature. Wall bilayered; very thin tectum, often inconspicuous, and an outer thick pseudofibrous layer.

*Stratigraphic range and distribution.*—Ubiquitous in the Namurian and Baschkirian of the Northern Hemisphere.

Probably erroneously reported from the Mikhailov Formation by Krestovnikov and Teodorovitch (1935, 1936). The outburst of *Asteroarchaediscus* of the group *A. baschkiricus* can be used to mark the Viséan-Namurian boundary in western Europe and north Africa (Mamet and others, 1966). Abundant in the Namurian part of the Chester Group and in its chronostratigraphic equivalents in North America (Mamet, 1968b and c; Sando and others, 1969; Petryk and others, 1970).

Abundant in the upper part of the Alapah Limestone (Zones 17 to 19) and present in the Wahoo Limestone (Zones 20 and 21). Observed in the Namurian part of the Kogruk Formation (Zones 17 and 18).

*Numbered specimens.*—USNM 179371–179374; Univ. Montréal 219/20.

#### Genus QUASIARCHAEDISCUS Mikluko-Maklai 1960

1960. *Quasiarchaediscus* Mikluko-Maklai. VSEGEI, part 1, p. 149, 150.
1964. *Quasiarchaediscus* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 48, p. 3–15.
1964. *Eosigmoilina*? [part] Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 48, p. 3–15.
1969. *Quasiarchaediscus* Hewitt and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 78, pl. 2, figs. 38–39.

*Diagnosis.*—Test free. Proloculus followed by tubular chamber coiled in quinqueloculine manner. Wall bilayered?; an inconspicuous inner tectum? and a well-developed hyaline clear layer with ghosts of radial "fibers." Aperture at open end of tube.

*Type of genus.*—1960 *Quasiarchaediscus pamirensis* Mikluko-Maklai. VSEGEI, part 1, p. 149, 150, pl. 25, fig. 6.

*Remarks.*—Considerable difficulties are found when one attempts to separate the genera *Agathammina* Neumayer 1887, *Quasiarchaediscus* Mikluko-Maklai 1960, and *Eosigmoilina* Ganelina 1960.

*Quasiarchaediscus* was erected for archaediscid-"miliolid" transitional forms, in which the pseudofibrous wall is still visible. Moreover, the possible presence of some lumen obstruction is reminiscent of the *Asteroarchaediscus-Neoarchaediscus-Planospirodiscus* lineage.

*Eosigmoilina* also has a miliolid coil with a hyaline wall and faint septation. Thus, Ganelina's genus appears to be very similar to *Agathammina* described from the Namurian of Czechoslovakia. The Czechoslovak material, however, is reported to be nonseptate, whereas *Eosigmoilina* has septa. As the type of *Agathammina* is lost, the problem remains unsolved.

The type of *Eosigmoilina*, *E. explicata* Ganelina 1960, appears to be identical to *Trochammina robertsoni* Brady 1876.

Temporarily, and pending further investigation, *Quasiarchaediscus* will be considered here as a true archaediscid and the ancestor of *Eosigmoilina*. Both genera have the same stratigraphic range.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Appears at the top of the *Eumorphoceras* zone of western Europe. Brief acme in the *Homoceras* Zone (Zone 19).

Same stratigraphic distribution in North America where it characterizes the uppermost Chester (Mamet and others, 1971).

In Alaska, *Quasiarchaediscus* is present in the Alapah-Wahoo transition beds.

#### Quasiarchaediscus? rugosus (Brazhnikova 1964)

Plate 27, figures 45–48

1964. *Eosigmoilina rugosa*. Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 48, p. 12, 13, pl. 3, figs. 7–11, 15 .

*Diagnosis.*—Test free. Proloculus small, followed by tubular second chamber coiled in quinqueloculine manner. Two or three first coils erratically obstructed by secondary deposits. Diameter of test 160$\mu$ to 240$\mu$. Width 80$\mu$ to 110$\mu$. Wall bilayered with very faint tectum and outer hyaline layer. Aperture at open end of tube.

*Stratigraphic range and distribution.*—Namurian of the Donetz Basis (*Homoceras* Zone: unpublished Ukrainian reports restrict it to the top of the *Eumorphoceras* Zone).

Same level in Alaska where it characterizes the passage of the Alapah to the Wahoo Limestone.

*Numbered specimens.*—USNM 179375–179378.

### Family TOURNAYELLIDAE Dain 1953

#### Genus GLOMOSPIRANELLA Lipina in Dain 1953

1953. *Glomospiranella* Lipina *in* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 21.
1953. *Glomospiranella* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 21–26 [part].
1954. *Glomospiranella* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 35 [part].
1955. *Glomospiranella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 44.
1956. *Glomospiranella* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 94.
1956. *Glomospira* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 91 [part].
1959. [not] *Glomospiranella*? Durkina. VNIGRI Trudy 136, p. 141.
1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 45 [part].
1964. *Brunsiina* Loeblich and Tappan. Treatise Invert. Paleont., Protista, part C, p. C340 [part].
1964. *Glomospiranella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 71, 72 [part].

1964. *Disonella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 69.
1965. *Glomospiranella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 58–60.
1965. *Brunsia* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 47 [part].
1966. *Glomospiranella* Ganelina. VNIGRI Trudy 250, p. 70–72.
1966. *Glomospiranella* Aizenberg and Brazhnikova *in* Aizenberg, Brazhnikova, and Rostovceva. Akad Nauk Ukrain. SSR, p. 21.
1968. *Glomospiranella* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 538 [not p. 546].
1969. *Glomospiranella* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 90 [part].
1970. *Glomospiranella* Conil and Lys. Liège Univ. Coll. Mém., v. 55, p. 247 [part].

*Diagnosis.*—Test free. Proloculus followed by irregularly coiled spire. Tubular chamber undivided in initial coil, then divided by pseudosepta. Wall calcareous, secreted, microcrystalline, one layered. No secondary deposits. Aperture at open end of tube.

*Remarks.*—The genus is a link between the nonseptate *Pseudoglomospira* and the tournayellid *Septaglomospiranella.*

*Type of genus.*—1953 *Glomospiranella asiatica* Lipina *in* Dain *in* Dain and Grozdilova. VNIGRI 74, p. 25, pl. 1, fig. 13.

Taxa included in the genus *Glomospiranella*:

1966 *annulata* Ganelina
1964 *horioni* Conil and Lys
1955 *latispiralis* Lipina
1956 *pendula* Malakhova
1955 *rara* Lipina
1956 *subglobosa* Malakhova
1966 *venusta* Ganelina

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern and Southern Hemispheres. Appears in Famennian time; acme in the Tournaisian; extinct in the Viséan.

#### Glomospiranella sp.

Plate 28, figure 1

*Diagnosis.*—Test free. Proloculus followed by erratically coiled spire subdivided by faint pseudosepta. Diameter of test about 400μ to 500μ. Adult specimens have 2½ to 3½ whorls. Wall calcareous secreted, dark one layered, about 15μ in the last whorl. Aperture at open end of tube.

*Stratigraphic range and distribution.*—In Alaska, *Glomospiranella* appears restricted to the Wachsmuth Limestone (mostly in Zone 9).

*Numbered specimen.*—USNM 179379.

### Genus SEPTAGLOMOSPIRANELLA Lipina 1955

1940. *Endothyra* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, ser. geol. 18, no. 5–6, p. 125, 126.
1948. *Endothyra*(?) Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 5, 6.
1950. *Plectogyra* Zeller. Kansas Univ. Paleont. Contr., Protozoa, art. 4, pl. 1, figs. 1, 3–5, pl. 2, figs. 15, 18 [only].
1953. *Glomospira* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 26.
1953. *Glomospiranella* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 22–24.
1955. *Septaglomospiranella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 46, 47.
1956. *Endothyra* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 105 [only].
1957. *Granuliferella* Zeller. Jour. Paleontology, v. 31, no. 4, p. 695 [part].
1958. *Granuliferella* Woodland. Jour. Paleontology, v. 32, no. 5, p. 796, 797 [part].
1959. *Septaglomospiranella* Durkina. VNIGRI Trudy 136, p. 138–141.
1961. *Septaglomospiranella* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 5, p. 64 [part].
1961. *Septaglomospiranella* Poyarkov *in* Purkin, Poyarkov, and Rozanetz. Akad. Nauk Kirgiz. SSR Izv. Ser. Yestestv. i Tekh. Nauk, Bull. 3, no. 4, p. 33, 34.
1962. *Septaglomospiranella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 111.
1963. *Septaglomospiranella* (*Neoseptaglomospiranella*) Lipina *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 226.
1963. *Endothyra*? McKay and Green. Research Council Alberta Bull. 10, p. 45 [part].
1963. *Granuliferella* McKay and Green. Research Council Alberta Bull. 10, p. 45, 46.
1963. *Septaglomospiranella* Reitlinger *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 225, 226.
1964. *Septaglomospiranella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 77 [part].
1964. *Plectogyra*? Conil and Lys. Louvain Univ. Inst. Géol. Mém., no. 23 [part].
1965. *Septaglomospiranella* Chuvashov., no. 23, p. 263 [part]. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 74, p. 49–51 [part].
1965. *Septaglomospiranella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 66, 67.
1966. *Septaglomospiranella* Aizenberg and Brazhnikova *in* Aizenberg, Brazhnikova, and Rostovceva. Akad. Nauk Ukrain. SSR, p. 25, 26.
1966. *Septaglomospiranella* Skipp, Holcomb, and Gutschick. Cushman Found. Foram. Research Spec. Pub. 9, p. 23.
1968. *Septaglomospiranella* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 538 [part], [not] p. 546.
1969. *Chernyshinella* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 224, 225 [part].
1969. *Septaglomospiranella* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 223, 224.
1970. [not] *Septaglomospiranella* Conil and Lys. Liège Univ. Coll. Mém., v. 55, p. 249.

*Diagnosis.*—Test free. Proloculus followed by erratically coiled spire subdivided in initial coils by pseudosepta and by septa in last two coils. Wall calcareous, secreted, microcrystalline, one layered, easily recrystallized. No secondary deposits. Aperture simple, at open end of tube.

*Type of genus.*—1948 *Septaglomospiranella chernoussovensis* new name *pro Endothyra primaeva* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 5, 6, pl. 1, figs. 12–14. Not *Endothyra primaeva* Chernysheva 1940. Moskov. Obshch. Ispytately Prirody Byull., Otdel Geol., v. 48, ser. geol. 18, no. 5–6, p. 125, 126, pl. 2, fig. 9 (=*Septaglomospiranella compressa* invalid new name Lipina 1965. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 63, 64, pl. 13, figs. 7–19).

*Remarks.*—The type of *Septaglomospiranella* was designated as *Endothyra primaeva* Rauzer-Chernoussova 1948 by Lipina. Eight years before, Chernysheva had described the same taxon, which she attributed to Rauzer-Chernoussova but which is obviously very different from that in the 1948 publication. Lipina, in 1965, claimed that Chernysheva's taxon was invalid and renamed it *Septaglomospiranella compressa*. This taxonomic change is unfortunate because it is *Endothyra primaeva* Rauzer-Chernoussova 1948 which had to be renamed.

Taxa included in the genus *Septaglomospiranella*:

1957 *anteflexa* Zeller
1956 *crassiseptata* Malakhova
1953 *endothyroides* Dain *in* Dain and Grozdilova
1957 *granulosa* Zeller
1961 *grozdilovae* Poyarkov
1956 *kynensis* Malakhova
1965 *lastica* Chuvashov
1961 *nana* Reitlinger
1959 *opulenta* Durkina
1959 *parva* Durkina
1940 *primaeva* Chernysheva
1965 *romanica* Lipina
1969 *rossi* Skipp, *in* McKee and Gutschick

*Remarks.*—*Septaglomospiranella primaeva* subsp. *noda* Skipp, Holcomb, and Gutschick ought to be assigned to a new tournayellid genus, as true *Septaglomospiranella* do not have floor deposits.

*Stratigraphic range and distribution.*—Cosmopolitan and abundant in both Northern and Southern Hemispheres.

Derived from *Glomospiranella* in Middle Famennian time, it is usually very abundant in Late Famennian and Tournaisian and progressively eliminated in the Viséan.

#### Septaglomospiranella of the group S. chernoussovensis new name Mamet

Plate 28, figure 2

Group exemplified by the following new taxon:

1948. *Endothyra* (?) *primaeva* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 5, 6, pl. 1, figs. 12–14 (invalid, preoccupied by *Endothyra primaeva* Chernysheva 1940). Here renamed.
1955. *Septaglomospiranella primaeva* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 46, pl. 4, fig. 21.
1962. *Septaglomospiranella primaeva* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 111, pl. 2, figs. 17, 18.
1963. *Septaglomospiranella primaeva primaeva* Reitlinger *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 226.
1965. *Septaglomospiranella* (*Septaglomospiranella*) *primaeva* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 62, pl. 12, figs. 24–26.
1966. *Septaglomospiranella primaeva* Aizenberg and Brazhnikova *in* Aizenberg, Brazhnikova, and Rostovceva. Akad. Nauk Ukrain. SSSR, p. 23, pl. 6, figs. 16–27 [part].
1966. [not] *Septaglomospiranella primaeva* Skipp, Holcomb, and Gutschick. Cushman Found. Foram. Research Spec. Pub. 9, p. 23, pl. 1, figs. 1–9.

*Diagnosis.*—Test free. Proloculus followed by erratically coiled spire. Pseudosepta are present in first coil and true septa restricted to penultimate and ultimate coils. Six to seven pseudochambers in last whorl. Septa short, slanted. Sutures indistinct. Mature tests range from 300$\mu$ to 420$\mu$ for average of 2½ whorls. Wall calcareous secreted, unilayered, about 15$\mu$ thick in last volution. No secondary deposits. Aperture as a high slit at base of apertural face.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

The group is known from the Late Famennian to the Late Tournaisian (and could possibly extend into the Early Viséan). It has a characteristic acme in Middle and Late Tournaisian.

Scarce in Alaska, in Zones 8 and 9 of the Wachsmuth Limestone.

*Figured specimen.*—USNM 179380.

### Genus RECTOSEPTAGLOMOSPIRANELLA Reitlinger 1961

1956. *Ammobaculites* (?) Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 100.
1956. *Spiroplectammina* Lebedeva. VNIGRI Trudy 98, p. 40.
1958. *Granuliferella*? Woodland. Jour. Paleontology, v. 32, no. 5, p. 797.
1960. *Ammobaculites* (?) Lipina. Akad. Nauk SSSR Geol. Inst. Trudy no. 14, p. 128.
1961. *Septaglomospiranella* (*Rectoseptaglomospiranella*)

Reitlinger. Akad. Nauk. SSSR Voprosy Mikropalontologii, no. 5, p. 63.

1962. *Tikhinella*? Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 100, 101.

1963. *Granuliferelloides* McKay and Green. Research Council Alberta Bull. 10, p. 47.

1963. *Rectoseptaglomospiranella* no author *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 226.

1964. *Rectoseptaglomospiranella* Loeblich and Tappan. Treatise Invert. Paleont., Protista, part C, p. C350.

1965. *Septaglomospiranella* (*Rectoseptaglomospiranella*) Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 51.

1965. *Septaglomospiranella* (*Rectoseptaglomospiranella*) Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 72, 73.

1968. *Septaglomospiranella* (*Rectoseptaglomospiranella*) Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 540.

1969. *Granuliferelloides*? Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 227.

*Diagnosis.*—Test free. Proloculus followed by an erratically coiled spire that uncoils in a later stage. Spire divided by pseudosepta. True septation is present in the uncoiled straight portion. Wall calcareous, secreted, one layered, microcrystalline, with scarce agglutinated material? Aperture simple, at open end of straight portion.

*Remarks.*—The type of the genus shows practically no agglutination, whereas most *Rectoseptaglomospiranella* of the Urals and North America have faint agglutination. Tentatively, the genus is kept among the Tournayellidae.

*Type of genus.*—1961 *Septaglomospiranella* (*Rectoseptaglomospiranella*) *asiatica* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 5, p. 63, pl. 6, figs. 3–6.

Taxa included in the genus *Septaglomospiranella*:

- 1965 *angusta* Lipina
- 1956 *attenuata* Malakhova
- 1961 *crassiformis* Reitlinger
- 1961 *elegantula* Reitlinger
- 1958 *granulosa* Woodland
- 1963 *jasperensis* McKay and Green
- 1956 *nalivkini* Malakhova
- 1965 *postromanica* Lipina
- 1965 *posturalica* Lipina

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Uncertain reports in the latest Famennian; short acme in the Middle Tournaisian; rapid extinction in the Late Tournaisian.

#### Rectoseptaglomospiranella nalivkini (Malakhova 1956)

Plate 28, figure 3

1956. *Ammobaculites*(?) *nalivkini* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 100, pl. 4, figs. 6, 7, 11.

1956. *Ammobaculites attenuatus* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 100, pl. 4, figs. 5, 8, 10, 12, 13.

1958. *Granuliferella granulosa* Woodland. Jour. Paleontology, v. 32, no. 5, p. 797, pl. 99, figs. 9, 10.

1963. *Granuliferella granuliferoides* McKay and Green. Research Council Alberta Bull. 10, p. 47, pl. 2, figs. 11, 14, 16; pl. 3, fig. 14.

*Diagnosis.*—Test free. Proloculus followed by erratically coiled spire and straight uncoiled cylindrical portion. Septation primitive in glomospiral part, but well developed in uncoiled part. Diameter of coiled part 300$\mu$ to 450$\mu$. Diameter of uncoiled segment 180$\mu$ to 280$\mu$ in adult forms. Total length of test as much as 1,000$\mu$. Seven chambers in uniserial segment. Wall thick, 25$\mu$ to 45$\mu$, single layered, usually strongly recrystallized, with scarce agglutinated debris (less than 2 percent). Aperture simple, at the end of uncoiled segment.

*Stratigraphic range and distribution.*—The taxon is rather abundant in the North American Cordillera from Zone 7 to 8 (Sando and others, 1969). In Alaska, it is only known from the basal part of the Wachsmuth Limestone (Zone 8).

*Figured specimen.*—Univ. Montréal 199/14.

#### Genus TOURNAYELLA Dain 1953

1879. *Spirillina* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 26–29 [part].

1953. [not] *Tournayella* Lipina *in* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 35.

1953. *Tournayella* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 30–34 [part].

1953. [not] *Tournayella* Malakhova *in* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 35.

1954. *Tournayella* Lebedeva. VNIGRI Trudy 81, p. 239–241 [part].

1954. *Tournayella* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 32–34 [part].

1954. [not] *Tournayella* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., Geol. Ser., Trudy 29, p. 54.

1955. *Tournayella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 34, 35 [part].

1956. *Tournayella* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 102–104 [part].

1959. *Tournayella* Zavjalova. Ukrain. Nauchno-Issled. Geologorazved. Inst. Trudy, Bull. 1, p. 176, 177.

1960. [not] *Tournayella* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 43, 44, pl. 1, figs. 7, 8.

1961. *Tournayella* Pozner and Shlykova. VNIGRI Trudy 179, p. 8, 9 [part].

1962. *Tournayella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 113, 114 [part].
1963. [not] *Tournayella*? McKay and Green. Research Council Alberta Bull. 10, p. 27.
1963. [not] *Tournayella* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 131, 132.
1964. [not] *Tournayella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., 23, p. 78, 79.
1964. *Tournayella* Aizenberg and Brazhnikova. 5ème Cong. Avanc. Strat. Geol. Carbonifère Compte Rendu, p. 270.
1964. *Tournayella* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C339–C340 [part].
1965. *Tournayella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 27–33 [part].
1966. *Tournayella* Skipp, Holcomb, and Gutschick. Cushman Found. Foram. Research Spec. Pub. 9, p. 26–28 [part].
1966. *Tournayella* Ganelina. VNIGRI Trudy 250, p. 73, 74 [part].
1966. *Tournayella* Aizenberg and Brazhnikova *in* Aizenberg, Brazhnikva, and Rostovceva. Akad. Nauk Ukrain. SSR, p. 27–35.
1966. *Tournayella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 108–111 [part].
1968. *Tournayella* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 542.
1969. *Tournayella* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 226 [part].
1969. [not] *Tournayella* Sada. Palaeont. Soc. Japan Trans. and Proc., new ser., no. 75, p. 124–127.

*Diagnosis.* Test free. Proloculus followed by planispirally coiled tubular chamber divided in pseudochambers by pseudosepta. Wall calcareous, secreted, one layered as dark, dense tectum. No agglutination. No secondary deposits. Aperture simple, a low slit at base of apertural face.

*Type of genus.*—1953 *Tournayella discoidea* Dain. VNIGRI Trudy 74, p. 32, pl. 2, figs. 8–17.

Taxa included in the genus *Tournayella*:

1961 *accepta* Pozner and Shlykova
1955 *discoidea angusta* Lipina
1954 *discoidea maxima* Lipina *in* Lebedeva
1954 *pigmea* Lebedeva
1879 *plana* von Möller
1956 *vespaeformis* Malakhova

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Appears in Late Famennian; acme in Middle and Late Tournaisian; scarce in the basal Viséan.

#### Tournayella discoidea Dain 1953

Plate 28, figures 4–7

1953. *Tournayella discoidea* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 32, pl. 2, figs. 8–16 [not 17].
1954. *Tournayella discoidea* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 33, pl. 4, figs. 4, 5.
1955. *Tournayella discoidea* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 34, pl. 2, figs. 33 and 37.
1959. *Tournayella discoidea* Zavjalova. Ukrain. Nauchno-Issled. Geologorazved. Inst. Trudy, Bull. 1, p. 176, 177, pl. 3, figs. 2, 7.
1961. *Tournayella accepta* Pozner and Shlykova. VNIGRI Trudy 179, p. 8, pl. 1, figs. 9, 10.
1962. *Tournayella discoidea* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 113, 114, pl. 2, figs. 22, 23.
1963. *Tournayella discoidea* Pronina. Akad. Nauk SSSR Ural. Fil., Inst. Geol. Trudy 65, p. 131, pl. 2, fig. 2.
1964. [not] *Tournayella* aff. *discoidea* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 78, 79, pl. 10, fig. 199.
1966. *Tournayella discoidea* Aizenberg and Brazhnikova *in* Aizenberg, Brazhnikova, and Rostovceva. Akad. Nauk Ukrain. SSR, p. 27, 28, pl. 9, figs. 3–10.
1966. *Tournayella discoidea* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 109, pl. 5, figs. 8–12 [part].
1966. *Tournayella discoidea* Skipp, Holcomb, and Gutschick. Cushman Found. Foram. Research Spec. Pub. 9, p. 27, pl. 2, figs. 1–9 [part].
1968. ?*Tournayella discoidea* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 542, pl. 4, fig. 46.
1969 *Tournayella discoidea* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 226, pl. 25, figs. 1–9.

*Diagnosis.*—Test free. Proloculus large, followed by tubular, cylindrical, planispirally coiled chamber. Faint pseudoseptation in third and fourth coil. Last coil can have one or two true septa. Diameter of test 300$\mu$ to 450$\mu$ for four whorls. Width 120$\mu$ to 180$\mu$. Three to six pseudochambers are found per whorl. Wall moderately thick, 15$\mu$ to 18$\mu$ in last chamber. Aperture as a low slit at base of apertural face.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern and part of the Southern Hemispheres.

Numerous references from the Middle and Late Tournaisian of Eurasia.

Present in the lower part of the Wachsmuth Limestone (Zones 8 and 9).

*Figured specimens.*—USNM 179381–179384.

#### Genus CARBONELLA Dain 1953

1953. *Carbonella* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 36–38.
1954. *Tournayella* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., Geol. Ser., Trudy 29, p. 55–57 [part].
1954. *Carbonella*? Lebedeva. VNIGRI Trudy 81, p. 242.
1955. *Carbonella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 40.
1956. *Tournayella* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 101 [part].

1960. *Carbonella* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 45, 46.
1961. [not] *Carbonella* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 210.
1964. *Carbonella* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C339, C340 [part].
1965. *Carbonella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 36.
1966. *Carbonella* Ganelina. VNIGRI Trudy 250, p. 86.
1966. [not] *Carbonella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 112–113.
1967. *Carbonella* Conil and Lys. Soc. Géol. Belgique Annales, v. 90, pl. 3, fig. 20.
1971. *Carbonella* Brazhnikova and Vdovenko. Atlas of the Tournaisian fauna in the Donetz Basin, p. 146.

*Diagnosis.*—Test free. Proloculus followed by planispirally coiled tubular chamber. Pseudosepta are present in early coils. Short true septa, oblique to spirotheca are present in last whorl. Secondary deposits as hooks in last chambers. Wall calcareous secreted, one layered, microcrystalline. Aperture as a low slit at base of apertural face.

*Type of genus.*—1953 *Carbonella spectabilis* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 37, pl. 4, figs. 4, 5. 7.

Taxa included in the genus *Carbonella*:

1955 *costata* Lipina
1955 *spectabilis crassa* Lipina

*Stratigraphic range and distribution.*—Present in Eurasia and North America.

Late Tournaisian (Zones 8? and 9).

#### Carbonella spectabilis Dain 1953

Plate 28, figure 8

1953. *Carbonella spectabilis* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 37, pl. 4, figs. 4, 5, 7.
1954. *Tournayella modesta* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., Geol. Ser., Trudy 29, p. 55, pl. 2, fig. 6.
1954. *Carbonella spectabilis* Lebedeva. VNIGRI Trudy 81, p. 242, pl. 1, fig. 7.
1955. *Carbonella spectabilis* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 40, pl. 4, figs. 8, 9.
1966. *Carbonella spectabilis* Ganelina. VNIGRI Trudy 250, p. 86, pl. 6, figs. 6–7.
1967. *Carbonella spectabilis* Conil and Lys. Soc. Géol. Belgique Annales, v. 90, pl. 3, fig. 20.

*Diagnosis.*—Test free. Proloculus followed by planispirally coiled tubular chamber. Pseudosepta gradually increase in size, and last whorl is divided into chambers by true septa. Diameter of test $550\mu$ to $650\mu$. Width about $250\mu$. Thickness of wall gradually increases (as much as $30\mu$ in last coil). Wall calcareous secreted, dark, microcrystalline, one layered. No agglutination. Secondary deposits as hooks in last whorl. Aperture simple, a low slit at base of apertural face.

*Stratigraphic range and distribution.*—Restricted in Eurasia to the latest Tournaisian.

Scarce in Zone 9 of the Wachsmuth Limestone.

*Numbered specimen.*—Univ. Montréal 200/13.

#### Genus SEPTATOURNAYELLA Lipina 1955

1953. *Tournayella* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 34, 35 [part].
1954. *Septatournayella* Lipina *in* Lebedeva. VNIGRI Trudy 81, p. 243, 244. [invol.]
1954. *Tournayella* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 32, 33 [part].
1954. *Endothyra*? Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 88, 89 [part].
1955. *Septatournayella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 37–39 [part].
1955. *Septatournayella* Malakhova *in* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 36.
1957. *Plectogyra* sp. Zeller. Jour. Paleontology, v. 31, no. 4, p. 700, pl. 81, fig. 13 [only].
1958. *Endothyra* Woodland. Jour. Paleontology, v. 32, no. 5, p. 800 [part].
1959. *Septatournayella* Durkina. VNIGRI Trudy 136, p. 142–144.
1960. *Septatournayella* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 44.
1960. *Septatournayella* Bogush and Yuferev. Paleont. Zhur., no. 4, p. 20.
1961. *Septatournayella* Poyarkov *in* Purkin, Poyarkov, and Rozanetz. Akad. Nauk Kirgiz. SSR Izv. Ser. Yestestv. i Tekh. Nauk, Bull. 3, no. 4, p. 32, 33.
1962. *Septatournayella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 115, 116.
1962. *Septatournayella* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 103.
1963. *Septatournayella* (*Septatournayella*) Lipina *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 225.
1963. *Septatournayella* (*Eoseptatournayello*) Lipina *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 225.
1963. [not] *Septatournayella* (*Rectoseptatournayella*) Brazhnikova and Rostovceva *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 226.
1964. *Tournayella* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C339–C340 [part].
1964. *Septatournayella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 78.
1965. *Septatournayella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 43, 44.
1965. *Septatournayella* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 53.
1966. *Septatournayella* Skipp, Holcomb, and Gutschick. Cushman Found. Foram. Research Spec. Pub. 9, p. 25, 26 [part].
1966. *Septatournayella* Aizenberg and Brazhnikova *in* Aizenberg, Brazhnikova, and Rostovceva. Akad. Nauk Ukrain. SSR, p. 28–33.

1966. *Septatournayella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 111, 112.
1966. *Septatournayella* Ganelina. VNIGRI Trudy 250, p. 80, 81.
1967. [not] *Septatournayella*? Conil and Lys. Soc. Géol. Belgique Annales, v. 90, Bull. 4, p. 400, pl. 3, fig. 21.
1967. [not] *Septatournayella* Conil and Lys. Soc. Géol. Belgique Annales, v. 90, Bull. 4, pl. 4, fig. 34.
1968. (?)*Septatournayella* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 544.
1969. *Septatournayella* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 225, 226 [part].
1970. *Septatournayella* Conil and Lys. Liège Univ. Coll., Mém. v. 55, pl. 12, fig. 117.

*Diagnosis.*—Test free. Proloculus followed by planispirally coiled, tubular spire. Septation faint in early coils, growing into true septa in penultimate and ultimate whorl. No secondary deposits. Wall calcareous secreted, dark microcrystalline, one layered. Aperture a low slit at base of apertural face.

*Type of genus.*—1953 *Tournayella segmentata* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 34, 35, pl. 3, figs. 6–8.

Taxa included in the genus *Septatournayella*:

1958 *disca* Woodland
1966 *kennedyi* Skipp, Holcomb, and Gutschick
1959 *lacera* Durkina
1961 *lebedevae* Poyarkov *in* Purkin, Poyarkov, and Rozanetz
1955 *malakhovae* Lipina
1959 *njumylga* Durkina
1959 *potensa* Durkina
1960 *praesegmentata* Bogush and Yuferev
1954 *pseudocamerata* Lipina *in* Lebedeva
1955 *questita* Malakhova *in* Lipina
1955 *rauserae* Lipina
1965 *recida* Lipina

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Abundant from the Late Famennian (*Septatournayella rauserae* Zone) to the Late Tournaisian. Scarce in the Early Viséan.

#### Septatournayella pseudocamerata Lipina in Lebedeva 1954

Plate 28, figures 9-14, 17

1954. *Septatournayella pseudocamerata* Lipina *in* Lebedeva. VNIGRI Trudy 81, p. 243, pl. 1, fig. 12.
1955. *Septatournayella pseudocamerata* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 36, pl. 3, fig. 10.
1962. *Septatournayella pseudocamerata* Lebedeva *in* Kalfina. SNIIGGIMS, Trudy, Bull. 21, p. 103, pl. 1, fig. 10.
1966. *Septatournayella pseudocamerata* Ganelina. VNIGRI Trudy 250, p. 80, pl. 4, figs. 2, 3.
1966. *Septatournayella* cf. *S. pseudocamerata* Skipp, Holcomb, and Gutschick. Cushman Found. Foram. Research Spec. Pub. 9, p. 26, pl. 2, figs. 13, 14.

*Diagnosis.*—Test free. Proloculus large, followed by planispirally coiled tubular spire. Septation faint in early whorls, then increasing in size and becoming true septa in last coil. Diameter of test $700\mu$ to $950\mu$ for adult specimens of 3½ to 5½ whorls. Six to eight chambers in last whorl. Wall calcareous secreted, microcrystalline, one layered, about $25\mu$ to $30\mu$ in last coil. Aperture simple, at base of apertural face.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

An abundant form in the Late Tournaisian of central Asia (Denisov Limestone) and the Urals (Kizel Limestone). Abundant in the Late Tournaisian part of the Wachsmuth Limestone.

*Figured specimens.*—USNM 179385–179389; Univ. Montréal 205/23, 205/24.

### Family FORSCHIIDAE Dain 1953

#### Genus EOFORSCHIA Mamet in Mamet, Mikhailov, and Mortelmans, 1970

1879. *Spirillina* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 26–29 [part].
1953. *Tournayella* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 30–34 [part].
1954. *Tournayella*? Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., Trudy 29, p. 54.
1954. *Tournayella* Lebedeva. VNIGRI Trudy 81, p. 239–241 [part].
1954. *Tournayella* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 32, 34 [part].
1955. *Tournayella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 34, 35 [part].
1956. *Tournayella* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 102–104 [part].
1960. *Tournayella* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 43, 44, pl. 1, figs. 7, 8.
1961. *Tournayella* Pozner and Shlykova. VNIGRI Trudy 179, p. 8, 9 [part].
1962. *Tournayella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 113, 114 [part].
1963. *Tournayella*? McKay and Green. Research Council Alberta Bull. 10, p. 27.
1963. *Tournayella* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 131, 132.
1964. *Tournayella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 78, 79.
1965. *Tournayella* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 27–33 [part].
1966. *Tournayella* Skipp, Holcomb, and Gutschick. Cushman Found. Foram. Research Spec. Pub. 9, p. 26–28 [part].
1966. *Tournayella* Ganelina. VNIGRI Trudy 250, p. 73, 74. [part].
1966. *Tournayella*? Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 110, 111.

1970. *Eoforschia* Mamet *in* Mamet, Mikhailov, and Mortelmans. Soc. Belge Géologie, Paléontologie et Hydrologie, Mém. 9, p. 21.

*Diagnosis.*—Test free, lenticular. Proloculus followed by evolute planispirally coiled tubular chamber. Constrictions present in penultimate and ultimate coils. Wall calcareous, two layered; one slightly agglutinated tectum, and an outer tectorium.

*Remarks.*—The presence of a tectorium and the faint but conspicuous agglutination readily distinguishes this genus from its ancestor *Tournayella*. It can be considered as a primitive Forschiidae and is the root of the Viséan genus *Forschia*.

*Type of genus.*—1953 *Tournayella moelleri* Malakhova *in* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 33, pl. 3, figs. 1–3.

Taxa included in the genus *Eoforschia*:

1956 *fastosa* Malakhova
1955 *gigantea* Lipina
1955 *gigantea minoris* Lipina
1963 *immodica* Pronina
1956 *moelleri uralica* Malakhova
1963 *nonconstricta* McKay and Green
1956 *primaria* Malakhova
1956 *rossica* Malakhova
1879 *subangulata* von Möller
1956 *unica* Malakhova
1966 *verkhojanica* Bogush and Yuferev

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere but more abundant in North America than in Eurasia.

Appears in Zone 9 (latest Tournaisian) and has a Viséan acme. Extinct at the boundary between Zones 15 and 16 $_{inf}$.

**Eoforschia of the group E. moelleri (Malakhova in Dain 1953)**

Plate 28, figures 15, 16, 18.

Group exemplified by:

1953. *Tournayella moelleri* Malakhova *in* Dain *in* Dain and Grozdilova. VNIGRI Trudy 74, p. 33, pl. 3, figs. 1–3.
1954. *Tournayella* (?) *moelleri* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel. Geol., Trudy 29, p. 54, pl. 2, figs. 1, 2, 4.
1954. *Tournayella moelleri* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 33, pl. 4, figs. 9, 10.
1954. *Tournayella* aff. *moelleri* Lebedeva. VNIGRI Trudy 81, p. 240, pl. 1, fig. 9.
1956. *Tournayella primaria* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 104, pl. 4, fig. 8.
1960. *Tournayella moelleri* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 42, 43, pl. 1, figs. 7, 8.
1963. *Tournayella immodica* Pronina. Akad. Nauk SSSR Ural. Fil., Inst. Geol. Trudy 65, p. 132, pl. 2, fig. 4.
1963. *Tournayella moelleri* Pronina. Akad. Nauk SSSR Ural. Fil., Inst. Geol. Trudy 65, p. 131, 132, pl. 2, figs. 3, 7, 8, 9.
1963. *Tournayella* (?) *nonconstricta* McKay and Green. Research Council Alberta Bull. 10, p. 27, pl. 7, figs. 4, 5, pl. 8, figs. 7, 8, pl. 12, fig. 12.
1964. *Tournayella gigantea minoris* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 79, pl. 10, figs. 200–202.
1965. *Tournayella moelleri* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 31, 32, pl. 4, figs. 2–4.
1966. *Tournayella* aff. *subangulata* Skipp, Holcomb, and Gutschick. Cushman Found. Foram. Research Spec. Pub. 9, p. 28, pl. 2, figs. 11, 12, 15 [not pl. 4, fig. 6].
1966. *Tournayella? verkhojanica* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 110, 111, pl. 5, figs. 13, 22.

*Diagnosis.*—Test free, lenticular. Proloculus rather large (50μ to 70μ) followed by an evolute planispirally coiled cylindrical tube. Rate of expansion of spire moderate. Constrictions in penultimate and ultimate whorl. Diameter of test 700μ to 1,300μ for mature forms of five to seven whorls. Very exceptionally, 1,000μ to 1,500μ? for eight whorls. Six to seven pseudochambers in last whorl. Wall grows from very thin in first volution to thick (40μ to 50μ) in last coil. Wall differentiated, two layered, with rather abundant calcareous agglutinated particles. Aperture simple, at open end of tube.

*Stratigraphic range and distribution.*—Known in the Late Tournaisian and the Viséan of the Northern Hemisphere.

Rather widespread at the Tournaisian-Viséan boundary in the Urals. Abundant to very abundant in the upper Osage and Meramec of the American midcontinent. In North America its extinction can be used as a good marker for the Meramec-Chester boundary when the *Brunsia* facies is not present (Sando and others, 1969).

In Alaska, the taxon is known from the lower part of the Wachsmuth Limestone (Zone 9) to the middle part of the Alapah Limestone (boundary between Zones 15 and 16 $_{inf}$).

*Figured specimens.*—USNM 179390–179392.

**Family ENDOTHYRIDAE? Brady 1884**

The endothyrids, in a loose sense, comprise irregularly coiled Fusulinida that have a tectum, a tectum and tectoria, a diapanotheca, or a keriotheca. Hence the different wall structures that are found among the late Carboniferous and Permian fusulinid families are already present in the lower Carboniferous endothyrids. In this report, single-layered endothyrids are temporarily designated as Endothyridae?, two-layered forms (tectum and tectoria) are considered as Endothyridae sensu stricto, whereas forms with more or less developed diaphanotheca are Quasiendothyridae or Globoendothyridae.

#### Genus LATIENDOTHYRA Lipina 1963

1940. *Endothyra* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, ser. geol. 18, no. 5–6, p. 127 [part].
1948. *Endothyra* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 3 [part].
1954. *Endothyra* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 88 [part].
1954. *Endothyra* Lipina *in* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 85.
1954. *Endothyra* Lipina *in* Lebedeva. VNIGRI Trudy 81, p. 251, 252.
1955. *Endothyra* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 65–69 [part].
1956. *Endothyra* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 105–116 [part].
1957. *Plectogyra* Zeller. Jour. Paleontology, v. 31, no. 4, p. 699, 700 [part].
1957. *Granuliferella* Zeller. Jour. Paleontology, v. 31, no. 4, p. 696 [part].
1958. *Endothyra* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 31, p. 14 [part].
1959. *Endothyra* Durkina. VNIGRI Trudy 136, p. 164–169 [part].
1959. *Endothyra* Lipina. VNIGRI Trudy 14, p. 33 [part].
1959. *Endothyra* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 38, p. 94 [part].
1960. *Plectogyra* Bogush and Yuferev. Paleont. Zhur., no. 4, p. 22, 23 [part].
1961. *Plectogyra* Voizhekhovskaia. VNIGA Bull. 24, sbornik Stat. Paleo. Biostrat., p. 27, 28 [part].
1962. *Plectogyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 135–142 [part].
1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 62, 63 [part].
1963. *Granuliferella* McKay and Green. Research Council Alberta Bull. 10, p. 46 [part].
1963. *Latiendothyra* Lipina *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 225.
1963. *Plectogyra* Pronina. Akad. Nauk SSSR Ural. Fil., Inst. Geol. Trudy 65, p. 139 [part].
1963. *Endothyra* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii, Trudy 97, p. 26 [part].
1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 200–203 [part].
1966. *Plectogyra* (*Latiendothyra*) Ganelina. VNIGRI Trudy 250, p. 105–109.
1966. *Endothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 123–125 [part], 129 [part].
1967. *Plectogyra* Conil and Lys. Soc. Géol. Belgique Annales, v. 90, p. 405 [only].
1967. *Endothyra* Armstrong. New Mexico Bur. Mines and Mineral Resources Mem. 20, p. 54 [part].
1968. *Endothyra* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 548–550 [part].
1969. *Endothyra* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 92 [part].
1970. *Endothyra* Conil and Lys. Liège Univ. Coll. Mém., v. 55, figs. 4, 63–65, 67–69, 72–76, 101–103, 105, 106, 131.
1970. *Latiendothyra* Gorecka and Mamet. Rev. Micropaléontologie, v. 13, no. 3, p. 162.
1970. *Endothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 68–70 [part].

*Diagnosis.*—Test free, globular to compressed. Proloculus followed by irregularly coiled spire. Chamber irregularly globose to subglobose, not numerous, usually six to eight in last whorl. Sutures depressed. Septa long, slightly curved. Wall calcareous secreted, one layered. No basal secondary deposits but septal thickenings. Aperture simple at base of apertural face.

*Type of genus.*—1954 *Endothyra latispiralis* Lipina *in* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 88, pl. 10, fig. 12.

Taxa included in the genus *Latiendothyra*:

1959 *advena* Durkina
1959 *agilis* Durkina
1964 alta Conil and Lys (OBJ, infrasubspecific)
1948 *antiqua* Rauzer-Chernoussova
1964 *bulbisepta* Conil and Lys
1970 *?burgaliensis* Bogush and Yuferev
1967 clavaesepta Conil and Lys (OBJ, infrasubspecific)
1959 *decliva* Durkina
1956 *elegia* Malakhova
1964 globosa Conil and Lys (OBJ, infrasubspecific)
1964 imminuta Conil and Lys (OBJ, infrasubspecific)
1959 *?komi* Durkina
1962 *kostobensis* Bogush and Yuferev
1954 *kosvensis* Lipina *in* Lebedeva
1964 *lensi* Conil and Lys
1959 *lytvensis* Malakhova
1955 *minima* Lipina (OBJ, preoccupied 1925 *minima* Lange)
1956 *nebulosa* Malakhova
1970 *neruensis* Bogush and Yuferev
1964 nigra Conil and Lys (OBJ, infrasubspecific)
1966 *notabilis* Ganelina
1956 *obesa* Malakhova
1955 *parakosvensis* Lipina
1958 *parva* Potievskaia (OBJ, preoccupied 1879 *parva* von Möller)
1960 *rectiformis* Bogush and Yuferev
1940 *rjausakensis* Chernysheva
1956 *septima* Malakhova

1959 *silva* Durkina
1956 *singularia* Malakhova
1967 *skippae* Armstrong
1964 struniana Conil and Lys (OBJ, infra-subspecific)
1955 *taimyrica* Lipina
1966 *tortuosa* Ganelina
1960 *turkestanica* Bogush and Yuferev

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere, abundant in Eurasia and in the northern part of the North American Cordillera.

As the most primitive endothyrid, it is derived from the Tournayellidae in the Late Famennian.

**Latiendothyra of the group L. parakosvensis (Lipina 1955)**

Plate 29, figures 6, 14, 16

Group exemplified by:

1955. *Endothyra parakosvensis* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 68, pl. 9, fig. 11, pl. 10, figs. 1–3.
1955. *Endothyra taimyrica* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 69, pl. 10, figs. 4–6.
1957. *Granuliferella tumida* Zeller. Jour. Paleontology, v. 31, no. 4, p. 696 [part], pl. 77, fig. 21, pl. 81, figs. 14–18 [part].
1959. *Endothyra agilis* Durkina. VNIGRI Trudy 136, p. 164, pl. 8, fig. 8.
1959. *Endothyra komi* Durkina. VNIGRI Trudy 136, p. 166, pl. 8, figs. 15–17.
1963. *Latiendothyra parakosvensis* Lipina *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 225.
1963. *Granuliferella tumida* McKay and Green. Research Council Alberta Bull. 10, p. 46 [part], pl. 3, figs. 16–21 [part].
1964. *Plectogyra parakosvensis* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 200 [part], pl. 33, figs. 651–658 [not] 649, 650.
1967. *Plectogyra parakosvensis* clavaesepta Conil and Lys. (OBJ). Soc. Géol. Belgique Annales, v. 90, p. 405, pl. 2, figs. 18, 19.
1968. *Endothyra parakosvensis* clavaesepta minima Conil and Lys. (OBJ). Soc. Géol. Belgique Annales, v. 91, p. 550, pl. 8, figs. 93–95.
1970. *Endothyra parakosvensis* nigra Conil and Lys. (OBJ). Liège Univ. Coll. Mém., v. 55, figs. 4, 74–76, 131 only.
1970. *Endothyra parakosvensis* imminuta Conil and Lys. (OBJ). Liège Univ. Coll. Mém. v. 55, figs. 63–65, 101–103.
1970. *Latiendothyra* of the group *L. parakosvensis* Gorecka and Mamet. Rev. Micropaléontolgie, v. 13, no. 3, p. 162, pl. 3, figs. 12, 13.

*Diagnosis.*—Test free, subglobular. Proloculus followed by streptospirally coiled spirotheca. Sutures well marked. Chambers subrounded. Septa long. Diameter of test ranges from 450$\mu$ to 800$\mu$ for adults having three to four coils and seven to nine chambers in last volution. Spire expands rather rapidly. Septa at low angle from spirotheca, rather blunt. No bascal secondary deposits. Wall calcareous secreted, one layered, 15$\mu$ to 20$\mu$.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Appears in the Late Famennian; present in the Tournaisian.

In Alaska, known in the Wachsmuth Limestone (Zones 8 and 9).

**Latiendothyra kosvensis (Lipina in Grozdilova and Lebedeva 1954)**

Plate 29, figure 15

1954. *Endothyra kosvensis* Lipina *in* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 85, pl. 10, fig. 9.
1954. *Endothyra kosvensis* Lipina *in* Lebedeva. VNIGRI Trudy 81, p. 251, 252, pl. 4, figs. 3, 4.
1955. *Endothyra kosvensis* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 71, pl. 9, figs. 3, 4.
1963. *Latiendothyra kosvensis* Lipina *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 225.
1966. *Plectogyra* (*Latiendothyra*) *kosvensis* Ganelina. VNIGRI Trudy 250, p. 107, 108, pl. 10, figs. 9, 10.

*Diagnosis.*—Test free, globular, slightly compressed. Proloculus followed by irregularly coiled spirotheca. Periphery rounded. Sutures well marked. Chambers subglobular. Septa at 70°–80° from spirotheca. Height of spire increases rapidly in last coil. No basal secondary deposits. Wall calcareous secreted, one layered, around 15$\mu$ in last coil. Aperture a low slit.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere. Found mostly in the Late Tournaisian.

In Alaska is present in the Tournaisian part of the Wachsmuth Limestone.

*Figured specimen.*—USNM 179407.

**Latiendothyra? sp.**

Plate 29, figure 13

*Diagnosis.*—Test free, globular. Proloculus followed by erratically coiled spire. Chambers subglobular, but sutures faintly depressed. Periphery rounded. Diameter of test ranges from 400$\mu$ to 550$\mu$ for adult specimens of 3½ whorls. Usually six to seven chambers in last whorl. Spire expands rapidly. Wall rather thin, around 12$\mu$ in last whorl. Basal secondary deposits not observed.

*Stratigraphic range and distribution.*—This poorly known form is present in the Alapah Limestone (Zone 13).

*Figured specimen.*—USNM 179406.

#### Family ENDOTHYRIDAE Brady 1884

##### Genus ENDOTHYRANELLA Galloway and Harlton 1930

1876. *Haplophragmium* Brady. Paleont. Soc. Pub., v. 30, p. 66.
1927. *Ammobaculites* Cushman and Waters. Cushman Found. Foram. Research Contr., v. 3, pt. 2, p. 108.
1927. *Ammobaculites* Harlton. Jour. Paleontology, v. 1, no. 1, p. 20, 21.
1928. *Ammobaculites* Cushman and Waters. Cushman Found. Foram. Research Contr., v. 4, pt. 2, p. 41.
1928. *Ammobaculites* Waters. Jour. Paleontology, v. 1, p. 274.
1930. *Endothyranella* Galloway and Harlton. Jour. Paleontology, v. 4, p. 27.
1930. *Endothyranella* Galloway and Ryniker. Oklahoma Geol. Survey Circ. 21, p. 13, 14.
1930. *Endothyranella* Plummer. Texas Univ. Bull. 3019, p. 17.
1930. *Endothyranella* Cushman. Cushman Lab. Foram. Research Contr., v. 6, pt. 4, p. 76.
1938. *Endothyranella* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 7, p. 95, 96.
1945. *Endothyranella* Plummer. Texas Univ. Bull. 4401, p. 242.
1950. *Endothyranella* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 37, 38.
1955. *Endothyranella* Marple. Ohio Jour. Sci., v. 55 (2), p. 87.
1956. *Endothyranella* Putria. VNIGRI Trudy 98, p. 370.
1957. *Endothyranella* St. Jean. Indiana Geol. Survey Bull. 10, p. 32.
1958. *Endothyranella* Liszka. Polskie. Towarz. Geol. Rocznik, v. 28, no. 2, p. 157.
1958. *Endothyranella* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 31, p. 16.
1961. *Endothyranella* Cummings. Great Britain Geol. Survey Bull. 18, pl. 1.
1963. *Endothyranella* Rozovskia, Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 53.
1964. *Endothyranella* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 48. p. 37, 38.

*Diagnosis.*—Test free, in two parts; an early endothyroid test, which uncoils uniserially in second stage. Chambers subglobular in endothyroid part. Secondary deposits poorly developed or absent? Wall calcareous secreted, with faint tectoria? Aperture simple.

*Type of genus.*—1927 *Ammobaculites powersi* Harlton. Jour. Paleontology, v. 1, p. 21, pl. 3, fig. 3a–3.

Taxa included in the genus *Endothyranella*:

1930 *armstrongi* Plummer
1930 *armstrongi sobrina* Plummer
1927 *compressa* Cushman and Waters
1958 *cracoviensis* Liszka
1928 *gracilis* Waters
1938 *gracilis* Rauzer-Chernoussova (OBJ, invalid, preoccupied 1928 *Endothyranella gracilis* Waters)
1956 *graciosa* Putria
1927 *inconspicua* Cushman and Waters
1928 *minuta* Waters
1950 *mordovica* Reitlinger
1928 *nitida* Waters
1938 *protracta* Rauzer-Chernoussova
1957 *pugnoidea* St. Jean
1876 *recta* Brady
1928 *stormi* Cushman and Waters
1928 *?texturata* Cushman and Waters

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Long ranging, it appears in the Late Tournaisian and is well known in the late Carboniferous; most references are Moscovian in age.

#### Endothyranella recta (Brady, 1876)

Plate 29, figures 8–10

1876. *Haplophragmium rectum* Brady. Paleont. Soc. London Pub., v. 30, p. 66, pl. 8, figs. 8, 9?
1927. *Ammobaculites rectum* Harlton. Jour. Paleontology, v. 1, p. 20, 21.
1930. *Endothyranella recta* Galloway and Harlton. Jour. Paleontology, v. 4, p. 27.
1938. *Endothyranella gracilis* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 7, p. 95 (preoccupied by *Endothyranella gracilis* Waters 1928).
1950. *Endothyranella gracilis* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 37, pl. 5, fig. 11.
1958. *Endothyranella gracilis* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 31, p. 16, pl. 1, figs. 16, 17.
1961. *Endothyranella recta* Cummings. Great Britain Geol. Survey Bull. 18, pl. 1.
1963. *Endothyranella gracilis* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 53, pl. 6, figs. 8, 9.

*Diagnosis.*—Shell endothyroid, involute in early part, then rectilinear, uniserial in latter. Proloculus followed by slightly streptospiral spirotheca. Endothyroid part consists of two coils, with slightly inflated chambers; diameter of that part about 200$\mu$. Total number of chambers in endothyroid part, around 10. Sutures faintly depressed. Septa long, curved. Rectilinear part consists usually of three to four chambers, exceptionally as many as seven. Width of rectilinear part 100$\mu$ to 140$\mu$. Secondary deposits apparently absent. Wall thin, calcareous, with faint tectoria?, about 10$\mu$. Aperture simple, terminal on inflated apertural face.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Most specimens in this taxon are middle Carboniferous in age, but it is certainly present as early as Middle Viséan in Eurasia.

In Alaska it is known mostly from the junction of the Wachsmuth and Alapah Limestones. It is scarce in younger level of the Alapah Limestone.

*Figured specimens.*—USNM 179401–179403.

**Endothyranella sp.**

Plate 29, figures 11, 12

*Diagnosis.*—Shell endothyroid involute in early part, then rectilinear, uniserial in latter. Proloculus followed by slightly streptospiral spirotheca. Endothyroid part important, usually 2 to 2½ whorls. Diameter of coiled part 350μ to 450μ for a total number of 12 to 15 chambers. Sutures faintly depressed. Septa long, curved, thickened at end. Diameter of rectilinear part as much as 350μ. Most specimens have one to three chambers in rectilinear part. Basal secondary deposits feeble; some thickening of septa. Wall calcareous secreted (the "diaphanotheca" of fig. 11 on pl. 29 is entirely diagenetic), 15μ to 20μ in last whorl. Aperture simple, terminal. Apertural face flattened.

*Comparison.*—No described *Endothyranella* of the literature fit the diagnosis of this Alaskan form. By its dimensions and general morphology, it has some resemblance to *Endothyranella cracoviensis* Liszka. Unfortunately, only the outer characters of the Polish material are known as there are no thin sections of that taxon. Better preserved nonrecrystallized material ought to be found before erecting a formal new species.

*Stratigraphic range and distribution.*—Not found outside Alaska, where it could be endemic.

Present in the lower part of the Wachsmuth Limestone.

*Figured specimens.*—USNM 179404, 179405.

**Genus INFLATOENDOTHYRA Vdovenko 1972**

1954. *Endothyra* Lipina *in* Lebedeva. VNIGRI Trudy 81, p. 254 [part].
1955. *Endothyra* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 54, 55, 59?, 60, 62 [part].
1959. *Endothyra* Durkina. VNIGRI Trudy 136, p. 172 [part].
1961. *Endostaffella* Rozovskaia. Paleont. Zhur., no. 3, p. 20 [part].
1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 45 [part].
1963. *Latiendothyra* Lipina *in* Akad. Nauk SSSR., Koordinat. Kom. mikropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 225 [part].
1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 194, 197, 199 [part].
1966. *Endothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 122 [part].
1966. *Plectogyra* (*Spinoendothyra*) Ganelina. VNIGRI Trudy 250, p. 113 [part].
1967. *Plectogyra* Brazhnikva *in* Brazhnikova and others. Akad. Nauk Ukrain. SSR, Inst. Geol. Trudy, p. 199.
1967. *Plectogyra* Vdovenko. Akad. Nauk SSSR, Voprosy Mikropaleontologii, no. 11, p. 35 [part].
1969. *Endothyra* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 201 [part].
1970. *Endothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdel. Inst. Geologii i Geofiziki, Byull. 60, p. 70.
1971. *Plectogyra* Brazhnikova and Vdovenko. Atlas tournaisian fauna Donetz. Naukova Dumka, p. 192.
1972. *Endothyra* (*Inflatoendothyra*) Vdovenko. Akad. Nauk Ukrain. SSR Dopodivi, sec. B, p. 107.
1973. *Endothyra* (*Inflatoendothyra*) Brazhnikova and Vdovenko. Lower Viséan foraminifers of Ukraine. Naukova Dumka, p. 171–172.

*Diagnosis.*—Test free, compressed. Proloculus followed by irregularly coiled spire. Changes of coiling plane are rapid. Spire increase slow to very slow. Chambers subquadratic as in *Spinoendothyra*. Number of chambers, 8 to 12. Sutures faint. Septa long. Wall calcareous secreted, with faint tectorium. Secondary deposits resorbed. Aperture simple, at base of apertural face.

*Type of genus.*—*Endothyra inflata* Lipina *in* Lebedeva VNIGRI Trudy 81, p. 254, pl. 4, figs. 9–11 (invalid, preoccupied).

Taxa included in the genus *Inflatoendothyra:*

1969 *eospiroides* Skipp *in* McKee and Gutschick
1954 *inflata* Lipina *in* Lebedeva (invalid, preoccupied 1949 *inflata* Morozova)
1955 *multicamerata* Lipina
1955 *?nordvikensis* Lipina
1964 *obtrita* Conil and Lys
1970 *parainflata* Bogush and Yuferev
1955 *recta* Lipina

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere. Abundant at the boundary between the Tournaisian and the Viséan.

**Inflatoendothyra of the group I. multicamerata (Lipina 1955)**

Plate 29, figures 17, 18

*Remarks.*—This group, derived from the spinoendothyrids, is the link towards the dainellids.

Group exemplified by:

1949. [not] *Endothyra inflata* Morozova. Akad. Nauk SSSR Geol. Inst. Trudy 105, no. 35, p. 245, 246, pl. 1, fig. 29.
1954. *Endothyra inflata* Lipina *in* Lebedeva. VNIGRI Trudy 81, p. 254, pl. 4, figs. 9–11 (preoccupied).
1955. *Endothyra paracostifera multicamerata* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 62, pl. 8, figs. 1, 2.
1955. *Endothyra inflata typica* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 54, pl. 6, figs. 2, 4, 5 (preoccupied).
1955. *Endothyra inflata minima* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 55, pl. 6, fig. 6 (twice preoccupied).

1955. *Endothyra inflata maxima* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 55, pl. 6, figs. 7–10 (twice preoccupied).
1959. *Endothyra inflata maxima* Durkina. VNIGRI Trudy 136, p. 172, pl. 10, figs. 1–4.
1961. *Endostaffella inflata* Rozovskaia. Paleont. Zhur., no. 3, p. 20.
1963. *Endothyra* sp. McKay and Green. Research Council Alberta Bull. 10, p. 45, pl. 2, fig. 15.
1963. *Latiendothyra inflata* Lipina *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 225.
1964. *Plectogyra paracostifera multicamerata* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 199, pl. 33, fig. 647.
1964. *Plectogyra librans* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 194, pl. 31, figs. 616, 617 [part].
1966. *Endothyra inflata* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 122, pl. 6, figs. 21–23.
1966. *Plectogyra* (*Spinoendothyra*) *inflata maxima* Ganelina. VNIGRI Trudy 250, p. 113, pl. 12, figs. 3, 4.
1969. *Endothyra eospiroides* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 201, pl. 17, figs. 20, 21, pl. 27, figs. 1–5.

*Remarks.*—*Endothyra eospiroides* Skipp is identical to *Endothyra inflata* Lipina *in* Lebedeva, which is an invalid taxon. Both are considered here as young forms of "*Endothyra*"? *multicamerata* Lipina.

*Diagnosis.*—Test free, lenticular, irregularly compressed laterally. Proloculus followed by irregularly coiled spirotheca. Last whorl uncoils more rapidly. Peripheral margin tightly rounded. Diameter variable, 300$\mu$ to 400$\mu$ for 3½ whorls, 550$\mu$ to 600$\mu$ for 4½ to 5 whorls. Chambers irregular, numerous. In last whorl, 10 chambers for small forms and as many as 12 for adults. Septa slanted. Wall calcareous, secreted, three layered? Basal deposits faint as resorbed protuberances in penultimate and ultimate whorl. Aperture slitlike.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

A characteristic group of the Tournaisian-Viséan passage beds. Also known at the Osage-Meramec boundary.

In Alaska it is present in the Wachsmuth Limestone, usually in Zone 9, and rarely in Zones 10 and 11.

*Numbered specimens.*—USNM 179408; Univ. Montréal 204/27.

#### Genus PRISCELLA Mamet 1974

1936. *Endothyra* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger. Akad. Nauk SSSR, Poliarnia Komissia, Trudy 28, p. 213 [only].
1948. *Endothyra* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 177 [part].
1950. *Plectogyra* Zeller. Kansas Univ. Paleont. Contr., Protozoa, art 4, pl. 2, figs. 10, 11 [only].
1954. *Endothyra* Lebedeva. VNIGRI Trudy 81, p. 269 [part].
1954. *Endothyra* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 106, 107 [part].
1956. *Endothyra* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 41 [part].
1956. *Endothyra* Ganelina. VNIGRI Trudy 98, p. 87 [part].
1958. ?*Granuliferella* Okimura. Hiroshima Univ. Jour. Sci., ser. C, v. 2, no. 3, p. 257 [part].
1958. *Endothyra*(?) Woodland. Jour. Paleontology, v. 32, no. 5, p. 800 [part]
1960. *Endothyra* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 59 [part].
1960. *Plectogyra* Vdovenko. Kiev. Univ. Bull. 3, no. 2, p. 32 [part].
1960. *Endothyra*? Saurin. Ann. Fac. Sci. Univ. Saigon, p. 358.
1961. *Endothyra* Voizhekovskaia. VNIGA Bull. 24, Sbornik Stat. Paleob. Biostrat., p. 27, 28 [part].
1962. *Plectogyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 144, 145 [part].
1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 33 [part].
1963. *Endothyra* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 27 [part].
1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém. v. 23, p. 164 [part], p. 197 [part], p. 206–209 [part], p. 222 [part].
1964. *Plectogyra* Conil and Pirlet. Soc. Belge Géologie Paléontologie et Hydrologie Bull., v. 72, p. 194, 195 [part].
1966. *Endothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 116, 121 [part].
1966. *Plectogyra* Ganelina. VNIGRI Trudy 250, p. 114 [part].
1967. *Endothyra* Armstrong. New Mexico Bur. Mines and Mineral Resources Mem. 20, p. 75 [part].
1969. *Plectogyra* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 47 [part].
1970. *Endothyra* Mamet. Canada Geol. Survey Paper 70–21, p. 92 [part].
1974. *Priscella* Mamet. Jour. For. Res., v. 4, p. 200.

*Diagnosis.*—Test free, lenticular to discoidal. Proloculus followed by slightly streptospiral coil. Variations in spire plane are progressive. Septa long, at high angle from spirotheca, delimiting irregular chambers. Number of chambers ranges from 6 to 11 in last coil. Sutures faintly developed. Wall calcareous secreted, dark, microcrystalline with probable tectoria. No secondary deposits. In some cases, slight basal deposits, resorbed. Aperture a low slit at base of apertural face.

*Remarks.*—By its lack of secondary deposits, *Priscella* is a primitive form, closely linked to *Latiendothyra*. This later genus, however, has a single-layered wall and septal thickenings. *Priscella* has faint tectorial differentiation.

*Type of genus.*—1936 *Endothyra prisca* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger. Akad. Nauk SSSR, Poliarnia Komissia, Trudy 28, p. 213, pl. 6, figs. 7, 8.

*Remarks.*—Although the original description of the type material cites the existence of secondary deposits, reexamination of the types discloses either no deposits or very faint low basal deposits.

Taxa included in the genus *Priscella:*

- 1964 *agathis* Conil and Lys
- 1948 *devexa* Rauzer-Chernoussova
- 1964 devia Conil and Lys (OBJ, infrasubspecific)
- 1960 *eosimilis* Vdovenko
- 1961 *grata* Voizhekovskaia
- 1958 *lanceolata* Woodland
- 1964 *nebulosa* Conil and Lys (OBJ, not 1956 *nebulosa* Malakhova)
- 1964 parva Conil and Lys (OBJ, infrasubspecific)
- 1964 pressa Conil and Lys (OBJ, infrasubspecific)
- 1964 scansa Conil and Lys (OBJ, infrasubspecific)
- 1956 *sulcata* Ganelina
- 1964 ?*waulsorti* Conil and Lys

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Appears in the Tournaisian. Common in the Viséan and the Namurian.

**Priscella prisca (Rauzer-Chernoussova and Reitlinger 1936)**

Plate 29, figures 1–4, 7

1936. *Endothyra prisca* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger. Akad. Nauk SSSR, Poliarnia Komissia, Trudy 28, p. 213, pl. 6, figs. 7, 8.

1954. *Endothyra prisca* Lebedeva. VNIGRI Trudy 81, p. 269, pl. 9, figs. 7, 8.

1956. *Endothyra prisca* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 41, pl. 3, figs. 11, 12.

1958. ?*Granuliferella pauciseptata* Okimura. Hiroshima Univ. Jour. Sci., ser. C, v. 2, no. 3, p. 257, pl. 32, figs. 12, 13, 17.

1958. *Endothyra*? *lanceolata* Woodland. Jour. Paleontology, v. 32, no. 5, p. 800, pl. 101, figs. 1–3.

1960. *Endothyra prisca* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 59, pl. 4, fig. 9.

1960. ?*Endothyra prisca* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 358, pl. 3, figs. 17, 18.

1961. *Plectogyra grata* Voizhekovskaia. VNIGA Bull. 24, Sbornik Stat. Paleob. Biostrat., p. 27, 28, pl. 3, figs. 2–4.

1962. *Endothyra prisca* Bogush and Yuferev. Akad. Nauk SSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 144, 145, pl. 4, fig. 15.

1963. *Endothyra lanceolata* McKay and Green. Research Council Alberta Bull. 10, p. 33, pl. 5, fig. 1 [part].

1964. *Plectogyra prisca* parva Conil and Pirlet (OBJ, infrasubspecific). Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, p. 194, 195.

1964. *Plectogyra prisca* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 206–209 [part], pl. 34, figs. 674, 678, 680, 681, 685, 696, 698 [only].

1964. *Plectogyra agathis* Conil and Lys. Louvain Univ. Inst. Géol Mém., v. 23, p. 164, pl. 23, figs. 454–459.

1966. *Plectogyra prisca prisca* Bogush and Yuferev. Akad Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 116, pl. 6, figs. 5–7.

1966. [not] *Endothyra prisca kirgisana* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 117, pl. 6, figs. 8–10.

1966. *Plectogyra prisca* Ganelina. VNIGRI Trudy 250, p. 114, pl. 12, figs. 5, 6.

1969. *Plectogyra agathis* Pelhate. Soc. Géol Minéral. Bretagne Bull., p. 47, pl. 3, fig. 39 [only].

*Diagnosis.*—Test free, lenticular. Proloculus followed by an asymmetrically coiled spire. Spire has 2½ to 3½ volutions. Chamber irregularly subquadratic, 7 to 9 in last coil (occasionally 6 or 10). Sutures faint. Septa long. Diameter of test $200\mu$ to $360\mu$. Wall calcareous secreted, microgranular, about $10\mu$ to $12\mu$ in last coil. Tectoria poorly developed. No secondary deposits. Aperture slitlike, at base of apertural face.

*Stratigraphic range and distribution.*—Cosmopolitan in the Northern Hemisphere.

Abundant from Zone 9 to the Namurian.

Present to abundant in the Wachsmuth and Alapah Limestones (Zone 9 to 18).

*Figured specimens.*—USNM 179394–179396; Univ. Montréal 203/28, 204/9.

**Priscella devexa (Rauzer-Chernoussova 1948)**

Plate 29, figure 5

1948. *Endothyra devexa* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 177, pl. 5, fig. 7.

1964. *Plectogyra uva* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 222 [part], pl. 38, fig. 773 only.

*Diagnosis.*—Test free, globular. Proloculus followed by slightly asymmetrically coiled spire. Chambers slightly inflated, seven to eight in last coil. Sutures faint. Diameter $300\mu$ to $450\mu$. Wall calcareous secreted, $15\mu$ to $20\mu$. Tectoria poorly developed. No secondary deposits. Aperture a low slit at base of apertural face.

*Stratigraphic range and distribution.*—A scarce form in Eurasia and Alaska. In the U.S.S.R., it is reported from Middle Viséan to Early Namurian.

In Alaska, it is present in the Alapah Limestone from Zones 13 to 16.

*Figured specimen.*—USNM 179397.

#### Genus PLANOENDOTHYRA Reitlinger in Rauzer-Chernoussova and Fursenko 1959

1948. *Endothyra* Brazhnikova and Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 1, Bull. 2, p. 97.
1950. *Endothyra* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 30–32 [part].
1954. *Endothyra* Lebedeva. VNIGRI Trudy 81, p. 245–247, 267–268 [part].
1954. *Quasiendothyra* Lebedeva. VNIGRI Trudy 81, p. 270–273 [part].
1956. *Endothyra* Ganelina. VNIGRI Trudy 98, p. 91, 92 [part].
1957. *Endothyra*? Malakhova. Akad. Nauk SSSR, Gorno-Geol. Inst. Trudy 27, p. 5.
1958. *Planoendothyra* Reitlinger (nom. nud.). Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 57.
1959. *Quasiendothyra* Durkina. VNIGRI Trudy 136, p. 152, 153 [part].
1959. *Endothyra*? Durkina. VNIGRI Trudy 136, p. 171 [part].
1959. *Planoendothyra* Reitlinger *in* Rauzer-Chernoussova and Fursenko. Osnovy Paleont., v. 1, p. 194.
1960. *Quasiendothyra* Bogush and Yuferev. Paleont. Zhur., no. 4, p. 26 [part].
1960. *Eoendothyra*? Mikluko-Maklai. VSEGEI Trudy, pt. 1, p. 141–143 [part].
1961. *Quasiendothyra* Shlykova *in* Pozner and Shlykova. VNIGRI Trudy 179, p. 12 [part].
1961. *Endothyra* Voizhekovskaia. VNIGA Bull. 24, Sbornik Stat. Paleob. Biostrat., p. 22 [part].
1962. *Quasiendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 122, 123 [part].
1962. *Planoendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 123, 124 [part].
1962. *Quasiendothyra* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 44, p. 18–21 [part].
1963. *Planoendothyra* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 60, 61.
1963. *Planoendothyra* Anonymous *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 224.
1964. *Planoendothyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 153 [not 154].
1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 212, 213 [part].
1964. *Quasiendothyra* Loeblich and Tappan. Treatise Invert. Paleont., Protista, part C, p. C346 [part].
1965. *Plectogyra* Solovieva and Krasheninikov. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 9, p. 23, 24.
1966. *Planoendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 143–148 [part].
1967a. [not] *Planoendothyra* Chanton. Soc. Géol. France Bull., 7ème sér., v. 8, p. 39.
1967. *Eoendothyranopsis* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 18, p. 33, 34 [part].
1967. ?*Planoendothyra* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 199.
1967. *Plectogyra* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 200, 210 [part].
1967. *Quasiendothyra* Sada. Palaeont. Soc. Japan Trans. and Proc., new ser., no. 67, no text, pl. 13, fig. 10.
1969. [not] *Planoendothyra*? Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 92.
1969. *Quasiendothyra* Sada. Palaeont. Soc. Japan Trans. and Proc., new ser., no. 75, p. 124.
1969. *Planoendothyra* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 14.
1970. *Planoendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 103 [part].

*Diagnosis.*—Test free, discoidal, compressed laterally. Proloculus followed by erratically coiled spire, then followed by slightly deviating spirotheca. Initial coils involute, then evolute in last two or three whorls. Chambers not numerous, 8 to 11 in last volution. Septa not thickened, as simple continuation of the spirotheca, endothyroid. Secondary deposits basal, or as lateral double projections simulating pseudochomata. Wall calcareous secreted, a tectum. An outer tectorium is present. Aperture simple, a slit at base of apertural face.

*Remarks.*—This Carboniferous genus has often been confused with the Famennian *Quasiendothyra*. It also bears some resemblance to *Urbanella*.

*Type of genus.*—1950 *Endothyra aljutovica* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 34, pl. 5, figs. 4–6.

Taxa included in the genus *Planoendothyra:*

1954 *arta* Lebedeva
1966 ?*bastakkensis* Bogush and Yuferev
1961 *compta* Shlykova
1954 ?*delecta* Lebedeva
1954 ?*diserta* Lebedeva
1954 *evoluta* Lebedeva (OBJ, preoccupied 1950 *evoluta* Reitlinger)
1965 *futila* Solovieva and Krasheninikov
1954 *grata* Lebedeva
1954 *grozdilovae* Lebedeva
1961 ?*honesta* Shlykova
1950 *irinae* Reitlinger
1969 *japonica* Sada
1959 ?*kedrovica* Durkina
1964 *lensi* Conil and Lys
1961 ?*lipinae* Voizhekovskaia (OBJ, preoccupied 1949 *lipinae* Morozova)
1959 ?*longa* Durkina
1960 *menneri* Bogush and Yuferev

1963 *minor* Rozovskaia
1962 obscura Brazhnikova (OBJ, infrasubspecific)
1960 ?*orientalis* Mikluko-Maklai
1954 *parachomatica* Lebedeva
1962 *planispiralis* Bogush and Yuferev
1954 *rotayi* Lebedeva
1959 *rudis* Durkina
1948 *spirilliniformis* Brazhnikova and Potievskaia
1967 *taimyrica* Solovieva
1956 *tatianae* Ganelina
1957 *tulensis* Malakhova
1960 *turlanica* Bogush and Yuferev
1960 *umbonata* Bogush and Yuferev
1961 ?*vicina* Shlykova and Ganelina *in* Shlykova and Pozner

*Stratigraphic range and distribution.*—Eurasia and North America; present in the three foraminiferal realms.

Recorded for the first time in Late Tournaisian? (Malakhova, 1957; Bogush and Yuferev, 1966); scarce in the Viséan; present in Namurian and Moscovian.

In Alaska it is well known from the upper part of the Wachsmuth Limestone, the basal part of the Alapah Limestone, and the oolitic facies of the Wahoo Limestone.

#### Planoendothyra rotayi (Lebedeva 1954)

Plate 30, figures 4, 5

1954. *Endothyra rotayi* Lebedeva. VNIGRI Trudy 81, p. 267, pl. 8, figs. 5, 6, pl. 9, figs. 1, 2.
1962. *Quasiendothyra rotayi typica* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 44, p. 18, 19, pl. 10, figs. 1–3.
1963. *Planoendothyra rotayi* Anonymous *in* Akad. Nauk SSSR, Koordinat. Kom. micropal. Akad. Nauk SSSR Voprŏsy Mikropaleontologii, no. 7, p. 224.
1964. *Plectogyra rotayi* var. rotayi Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 212, 213, pl. 35, fig. 717 [not 715, 716, 718].
1964. [not] *Plectogyra rotayi* var. stricta Conil and Lys (OBJ, infrasubspecific). Louvain Univ. Inst. Géol. Mém., v. 23, p. 213, pl. 36, figs. 719–721.
1966. [not] *Planoendothyra rotayi rotayi* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 143, 144.
1967. *Eoendothyranopsis rotayi taimyrica* Solovieva. VNIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 18, p. 33, 34, pl. 3, figs. 1–4.
1967. *Planoendothyra rotayi* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 199, pl. 7, fig. 11.
1970. [not] *Endothyra rotayi* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 101, pl. 5, fig. 19.

*Diagnosis.*—Test free, discoidal, compressed laterally. Form ratio 1/0.3 to 1/0.5. Proloculus followed by erratically coiled spirotheca, followed by slightly deviating coil. Rate of expansion, rather high. Number of coils 3½ to 4½. One or two first coils involute, then progressively evolute. Proloculus spherical, 40μ to 70μ. Diameter 600μ to 800μ for adult specimens, exceptionally 900μ. Chambers endothyroid, irregular, 10 to 11 in last whorl. Septa long, slanted, 70°–80° from spirotheca. Secondary deposits as lateral double spines, projecting forward from basal edges of chambers and simulating pseudochomates (see fig. 4, pl. 30). Wall calcareous secreted, dense, dark, 15μ to 25μ. Aperture basal, a slit at the base of the apertural face.

*Remarks.*—Although Lebedeva originally indicated a diameter to width ratio of 0.57 to 0.68, she did not publish any well-centered axial section; figure 5 on her plate 8, however, although oblique, certainly suggests a rather laterally compressed test.

*Stratigraphic range and distribution.*—Eurasia and North America. Middle and Late Viséan.

Quite abundant in the upper part of the Wachsmuth Limestone and in the lowermost part of the Alapah Limestone (Middle Viséan Zones 12 and 13).

*Figured specimens.*—USNM 179411; Univ. Montréal 206/5.

#### Genus ENDOTHYRA Phillips 1946?, emend. Brady 1876, emend. ICZN 1965

1843. [not] *Endothyra* Phillips *in* Brown. Elements of fossil conchology, p. 17 (invalid, ICZN opinion 724).
1846. (?)*Endothyra* Phillips. Geol. Polytech. Soc. West Riding, Yorkshire, Proc., v. 2, p. 277–279. (See discussion.)
1854. (?)*Endothyra* Jones *in* Morris. A catalogue of British fossils, p. 35.
1870. *Involutina* Brady. British Assoc. Adv. Sci., London, Rept. 39th Mtg., p. 382 [part].
1872. [not] *Endothyra* Parker and Jones. Ann. Mag. Nat. History, ser. 4, v. 10, p. 269.
1873. *Endothyra* Brady. Scotland Geol. Survey Mem., Explan. Sheet 23, p. 63, 95 (OBJ) [part].
1876. [not] *Endothyra* Jones. Monthly Micros. Jour., v. 15, p. 69, 89.
1876. *Endothyra* Brady. Palaeont. Soc. London Pub., v. 30, p. 90–101 [part].
1877. [not] *Endothyra* Schwager. Uff. Geol. (Royal Comm. Geol. Ital.) Bull., v. 8, p. 22.
1878. *Endothyra* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 25, no. 9, p. 96, 97 [part] [not p. 93–95, not p. 98–101].
1878. [not] *Endothyra* Gümbel. Deutsch. Oster. Alpenverein Zeitschr. Beil. Wien, pt. 1, p. 105.
1879. [not] *Endothyra* von Möller. St. Peterbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 12–20.
1879. [not] *Endothyra* Trautschold. Soc. Imp. Nat. Moscou, nouv. mém., v. 14, p. 45.

1880. [not] *Endothyra* von Möller. Mat. Geol. Russ., v. 9, p. 20–23.
1880. (?)*Endothyra* Bütschli. Klassen und Ordnungen Thier-Reiches, v. 1, alt. 1, p. 211.
1880. (?)*Endothyra* Steinmann. Deutsch. Geol. Gesell. Zeitschr., v. 32, p. 399.
1882. [not] *Endothyra* Whitfield. Am. Mus. Nat. History Bull., v. 1, no. 3, p. 42.
1883. (?)*Endothyra* Jones *in* Griffith and Henfrey. The microscopic dictionary, v. 1, p. 332.
1883. [not] *Endothyra* Schwager *in* von Richthofen. Ergebnisse eigener Reisen, v. 4, Paleont. Teil., abh. 7, p. 148.
1884. [not] *Endothyra* Brady. Challenger Exped., Rept. Zoology, v. 9, p. 67.
1888. [not] *Endothyra* Howchin. Royal Micros. Soc. London Jour., pt. 2, p. 540–542.
1888. [not] *Endothyra* Meunier. Soc. Hist. Nat. Autun Bull., no. 1, p. 235.
1889. [not] *Endothyra* Venukov. Zapiski Mineral. Obshch., ser. 2, no. 25, p. 214.
1905. [not] *Endothyra* Chapman and Howchin. New South Wales Geol. Survey Mem., Palaeontology, no. 14, p. 12.
1915. [not] *Endothyra* Girty. U.S. Geol. Survey Bull. 593, p. 27.
1925. [not] *Endothyra* Lange. Geol.-Mijn. Genoot. Nederland, Geol. Ser., v. 7, no. 3, p. 252.
1927. *Endothyra* Cushman and Waters. Cushman Lab. Foram. Research Contr., v. 3, pt. 2, p. 110.
1927. *Endothyra* Harlton. Jour. Paleontology, v. 1, no. 1, p. 18–20 [part].
1928. [not] *Endothyra* Cushman and Waters. Jour. Paleontology, v. 2, no. 3, p. 360.
1928. [not] *Endothyra* Galloway and Harlton. Jour. Paleontology, v. 2, no. 3, p. 342.
1928. (?)*Endothyra* Waters. Jour. Paleontology, v. 1, no. 2, p. 273.
1930. *Endothyra* Warthin. Oklahoma Geol. Survey Bull. 53, p. 19, 20 [part].
1930. *Endothyra* Cushman and Waters. Texas Univ. Bull. 3019, p. 47.
1930. *Endothyra* Plummer. Texas Univ. Bull. 3019, p. 15, 16 [part].
1930. *Endothyra* Galloway and Ryniker. Oklahoma Geol. Survey Circ. 21, p. 12.
1930. *Endothyra* Lee, Chen, and Chu. Acad. Sinica, Nat. Resources, Inst. Geology Mem. 9, p. 106.
1931. [not] *Endothyra* Thomas. Jour. Paleontology, v. 5, no. 1, p. 40.
1931. [not] *Endothyra* Henbest. Cushman Found. Foram. Research Contr., v. 7, pt. 4, p. 90–93.
1932. *Endothyra* Liebus. Preuss. Geol. Landesanst. Abh., no. 141, p. 165–167 [part].
1933. *Endothyra* Harlton. Jour. Paleontology, v. 7, no. 1, p. 10.
1936. *Endothyra* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger. Akad. Nauk SSSR, Poliarnia Komissia, Trudy 28, p. 207–213 [part].
1937. *Endothyra* Rauzer-Chernoussova and Fursenko. Monographic study Foraminifera from oilfields U.S.S.R., p. 263, 264 [part].
1937. *Endothyra* Lee. Geol. Soc. China Bull., v. 16, p. 101.
1939. *Endothyra* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 51, 52.
1940. [not] *Endothyra* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, Ser. Geol. 18, no. 5–6, p. 125–127.
1940. [not] *Endothyra* Rauzer-Chernoussova *in* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, no. 5–6, p. 124, 125.
1940. *Endothyra* Rauzer-Chernoussova, Beljaev, and Reitlinger. Neft. Geol. Razved. Inst. Trudy 7, p. 40–45 [part].
1942. [not] *Endothyra* Coryell and Rozanski. Jour. Paleontology, v. 16, no. 1, p. 139.
1943. [not] *Endothyra* Cushman and Stainbrook. Cushman Found. Foram. Research Contr., v. 19, p. 77.
1945. *Endothyra* Plummer. Texas Univ. Bull. 4401, p. 237–241 [part].
1947. *Endothyra* Cooper. Jour. Paleontology, v. 21, no. 1, p. 88.
1947. *Endothyra* Scott, Zeller, and Zeller. Jour. Paleontology, v. 21, no. 6, p. 557–562 [part].
1948. [not] *Endothyra* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 182–185.
1948. [not] *Endothyra* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 253–256.
1948. *Endothyra* Brazhnikova and Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 1, Bull. 2, 96–98 [part].
1948. *Endothyra* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 166–178 [part].
1948. [not] *Endothyra* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 3–8.
1948. [not] *Endothyra* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 246, 247.
1949. *Endothyra* Morozova. Akad. Nauk SSSR Geol. Inst. Trudy 105, no. 35, p. 245–247 [part?].
1949. *Endothyra* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 156.
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1950. *Endothyra* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 30–36 [part].
1950. [not] *Endothyra* Zeller. Kansas Univ. Paleont. Pub., Protozoa, art. 4, p. 1–23.
1950. *Plectogyra* Zeller. Kansas Univ. Paleont. Contr., Protozoa, art. 4, p. 1–23 [part], pl. 2, figs. 4–7, 12, 14, 16, 17; pl. 4, fig. 8; pl. 5, figs. 4, 7–9, 12, 13, 18–22.
1951. *Endothyra* Shlykova. VNIGRI Trudy 56, p. 150–159 [part].
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1953. *Endothyra* Henbest. Cushman Found. Foram. Research Contr., v. 4, no. 2, p. 63–65 [part].
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1954. *Endothyra* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 78–110 [part].
1954. [not] *Endothyra* Lipina *in* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 85.
1954. *Endothyra* Lebedeva. VNIGRI Trudy 81, p. 245–269 [part].
1954. [not] *Endothyra* Lipina *in* Lebedeva. VNIGRI Trudy 81, p. 251, 252, 254.
1954. [not] *Endothyra* Sage. Nova Scotia Dept. Mines Mem. 3, p. 114.
1954. *Plectogyra* Sage. Nova Scotia Dept. Mines Mem. 3, p. 114.
1955. [not] *Endothyra* Bykova *in* Bykova and Polenova. VNIGRI Trudy 87, p. 66, 67.
1955. *Endothyra* Marple. Ohio Jour. Sci., v. 55, no. 2, p. 86.
1955. *Endothyra* Lipina. Akad. Nauk SSSR Geol Inst. Trudy 163, no. 70, p. 52–74 [part].
1956. *Endothyra* Ganelina. VNIGRI Trudy 98, p. 86–100 [part].
1956. [not] *Endothyra* Lebedeva. VNIGRI Trudy 98, p. 41–46.
1956. *Endothyra* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 41–44 **[part]** and p. 105–116 [part].
1956. *Endothyra* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 41–46 [part].
1957. *Endothyra* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 107–118 [part].
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1957. [not] *Endothyra* Igo. Tokio Kyoiku Daigaku Sci. Rept.. ser. C, v. 5, no. 47, p. 177–179.
1957. *Endothyra* St.Jean. Indiana Geol. Survey Bull. 10, p. 23–31.
1958. *Endothyra* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 31, p. 13–16 [part].
1958. *Plectogyra* Liszka. Polskie. Towarz. Geol. Rocznik, v. 28, no. 2, p. 157, 166.
1958. *Plectogyra* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 63 [part].
1958. *Endothyra* Orlova. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 127.
1958. *Paraplectogyra*? Okimura. Hiroshima Univ. Jour. Sci., ser. C, v. 2, no. 3, p. 254–256.
1958. [not] *Endothyra* Armstrong. Jour. Paleontology, v. 32, no. 5, p. 973–975.
1958. [not] *Endothyra* Okimura. Hiroshima Univ. Jour. Sci., ser. C, v. 2, no. 3, p. 260.
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1959. [not] *Endothyra* Lipina. VNIGRI Trudy 14, p. 33.
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1960. *Plectogyra* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 53–69 [part].
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1962. *Plectogyra* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 105–108 [part].
1962. *Plectogyrina* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 104.
1962. *Endothyra* Henbest *in* Easton. U.S. Geol. Survey Prof. Paper 348, p. 16, 23 [part].
1963. *Endothyra* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 26, 27 [part], 41–47 [part].
1963. *Plectogyrina* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 48, 49.
1963. *Plectogyra* Anonymous *in* Akad. Nauk SSSR Koordinat. Kom. micropal., Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 224, 225 [part].
1963. [not] *Endothyra* Zeller. Jour. Paleontology, v. 37, p. 502, 503.
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1965. *Plectogyra* Omara and Conil. Soc. Géol. Belgique Annales, v. 88, no. 5, p. 231–235.
1965. [not] *Plectogyra* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 62–73.
1965. *Plectogyra* Skvorzov. Paleont. Zhur., no. 3, p. 25, 26.
1965. *Plectogyra* Solovieva and Krasheninikov. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 9, p. 23, 24.
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1966. *Endothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdelenyi Inst. Geologii i Geofiziki Trudy, p. 115–133 [part].
1966. *Plectogyrina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 133–134.
1966. [not] *Plectogyra* Ganelina. VNIGRI Trudy 250, p. 104–114.
1967. *Plectogyra* Chanton. Soc. Géol. France Bull., 7ème sér., v. 8, p. 39.
1967. *Endothyra* Ross. Jour. Paleontology, v. 41, no. 3, p. 714.
1967. *Plectogyra* Conil and Lys. Soc. Géol. Belgique Annales, v. 90, Bull. 4, p. 402–408 [part].
1967. *Plectogyra* Pelhate. Soc. Géol. France Bull., ser. 7, v. 9, no. 6, p. 900.
1967. *Endothyra* Armstrong. New Mexico Bur. Mines and Mineral Resources Mem. 20, p. 54–56 [part], p. 73–75 [part].
1967. *Quasiendothyra* Conil and Lys. Soc. Géol. Belgique Annales, v. 90, Bull. 4, pl. 3, fig. 22 [only].
1967. *Plectogyra* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 151, 152, 199–220 [part].
1969. *Endothyra* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, no. 1, p. 92–94 [part].
1968. [not] *Endothyra*? Conil and Lys. Soc. Bélge Géologie, Paléontologie et Hydrologie Bull., v. 77, no. 1, p. 73.
1968. *Endothyra* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 546–552 [part].
1969. *Plectogyra* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 47–53 [part].
1969. *Endothyra* Hewitt and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 78, pl. 1, fig. 10 [no text].
1969. *Endothyra* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 11–15.
1969. *Endothyra* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 198–214 [part].
1969. *Plectogyra* Vdovenko. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 11, p. 35–40 [part].
1970. [not] *Endothyra* Conil and Lys. Liège Univ. Coll. Mém. v. 55, p. 258.
1970. *Endothyra* Mamet. Canada Geol. Survey Paper 70–21, p. 34, 35, 93, 94 [part].
1970. *Endothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 69, 70, 100–102 [part].
1970. [not] *Endothyra* Lipina. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 13, p. 22, 23.
1970. *Plectogyra* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 896 [part].

*Diagnosis.*—Test free, irregularly discoidal, compressed laterally. Proloculus followed by irregularly coiled spirotheca. Deviation of coiling axis constant, or by sudden irregularities. Chambers subglobular, irregular. Septa irregular, anteriorly directed, angle from the spirotheca ranging from 50° to 85°. Number of chambers in last coil varying from 7 to 10, exceptionally 6 to 12. Secondary deposits as heavy wall covers and projections of varying size and development. Wall calcareous secreted, a microcrystalline tectum with irregular outer and inner tectoria. Aperture a low slit at base of apertural face.

*Type of genus.*—1846 *Endothyra bowmani* Phillips. Geol. Polytech. Soc. West Riding, Yorkshire, Proc., v. 2, p. 279, pl. 7, fig. 1, as emended by Brady 1876, Paleont. Soc. London Pub., v. 30, p. 92–94, pl. 5, figs. 1, 2, 4, not 3.

As with concepts of many widely used 19th century taxa, the *Endothyra* concept has considerably varied. The earliest reference and illustration of the genus is by Phillips in Brown (1843) : plate 6, figure 2, shows an equatorial section of a regularly coiled test, which could be *Eostaffella, Pseudoendothyra,* or *Mediocris* in modern terminology [St. Jean (1957) claimed that the form could be referred to *Millerella* or *Profusulinella,* but there are obviously no true fusulinids in the Viséan of Great Britain]. Phillips' material is lost, and the International Commission of Zoological Nomenclature (ICZN) (Opinion 724, 1965) suppressed this specific name, placing it in the "Official Index of Rejected and Invalid Specific Names in Zoology."

In 1846, Phillips published another figuration and conception of *Endothyra bowmanni* (corrected *bowmani* by Brady, 1876) ; the figure shows an askew coiled form which could belong to *Globoendothyra* or *Omphalotis* in modern terminology. Although the type is lost and although Phillips gave no description of the wall structure, cursory examination of the Great Scar Limestone near Settle, Yorkshire, from which Phillips obtained his material, shows a profusion of massive *Globoendothyra* and *Omphalotis* that match Phillips' 1846 illustration.

As Phillips' types were already lost at the time of Brady's studies, the concept of the genus was still open to discussion. Brady (1876) published five figures joining specimens from Brankamshall Quarry

(Lanarkshire) and specimens from the Salem Limestone of central Indiana [now *Globoendothyra baileyi* (Hall)]. The Lanarkshire fauna for a century has usually been referred to as typical of the genus, but Brady's concept of the genus was extremely wide because he included in it *Endothyra globulus* (now *Globoendothyra*), *Endothyra ammonoides* (now *Loeblichia*), *Endothyra crassa* (now *Endothyranopsis*), *Endothyra radiata* (now *Eostaffella*), and *Endothyra ornata* (now *Pseudoendothyra*).

Mikhailov (1939) was the first author to realize that obvious differences existed between Phillips' 1846 *bowmani* and Brady's interpretation; he renamed Brady's form *Endothyra bradyi.*

In 1950, E. J. Zeller claimed that *Endothyra* Phillips in Brown 1843 had priority over *Endothyra* Phillips 1846 and hence that the genus was characterized by a planispiral coil. He renamed the askew form *Plectogyra.* (See *Globoendothyra* for discussion of this taxon.) As arguments developed (Henbest, 1953; St. Jean, 1957), a number of petitions were presented to the International Commission of Zoological Nomenclature (Henbest, 1962; Rozovskaia, 1962). Meanwhile, D. E. Zeller (1963) proposed a neotype for *Endothyra bowmani* that was published in the "Journal of Paleontology," while Loeblich and Tappan designated another neotype in the "Treatise of Invertebrate Paleontology" (1964).

In 1965, China (Opinion 724) suppressed *Endothyra bowmani* Phillips in Brown 1843 and declared valid the specific name *bowmani* (emend. of *bowmanni*) Phillips (1846), "as published in the binomen *Endothyra bowmani,* as interpreted by the neotype designated by Loeblich and Tappan, 1964" (British Museum of Natural History, P. 41665, *ex* P. 35440).

As results of this decision (1) *Endothyra sensu* Zeller 1963 is dismissed, (2) a "plectogyroid" type of coil is identical to an "endothyroid" coil, (3) *Endothyra bradyi* of Mikhailov is a synonym of *Endothyra bowmani* Phillips emend. Brady. The last point is, as we have shown, debatable because Phillips' type was most probably a *Globoendothyra* or an *Omphalotis.* However, Loeblich and Tappan's designation having been validated, only confusion would arise if the controversy was continued, and the ICZN decision will be accepted here.

The confusion has not ceased, however, with China's decision because most authors still use "*Endothyra*" or "*Plectogyra*" in an extremely loose way. Even Loeblich and Tappan, the very authors of *Endothyra's* neotype, include in the genus (1964) *Endothyra* sp. Zeller 1950 (fig. 262, 4 and 5), which is an *Eoendothyranopsis*, and *Endostaffella* Rozovskaia, which ought to be assigned to the Eostaffellidae. *Plectogyra* or *Endothyra* in Conil and Lys (1964 et seq.) include no fewer than 14 different genera and belong to four families.

Taxa included in the genus *Endothyra* sensu stricto:

1966 ?*abramovi* Bogush and Yuferev
1964 *acantha* Conil and Lys
1949 *achomata* Kireeva
1947 *acuta* Cooper
1963 *affecta* Rozovskaia
1964 alta Conil and Lys (OBJ, infrasubspecific)
1958 ?*altilis* Orlova
1959 *alviterna* Durkina
1951 *amplis* Shlykova
1956 *apposita* Ganelina
1967 *arctica* Ross
1964 *blatoni* Conil and Lys
1846 ?*bowmani* Phillips (not 1843 *bowmani* Phillips *in* Brown)
1876 *bowmani sensu* Brady (=1939 *bradyi* Mikhailov)
1964 *calcar* Conil and Lys
1959 *cara* Durkina
1964 *chariessa* Conil and Lys
1961 *coarta* Voizhekovskaia
1949 *compressa* Reitlinger (OBJ, preoccupied)
1936 *compressa* Rauzer-Chernoussova and Reitlinger
1964 crustata Conil and Lys (OBJ, infrasubspecific)
1956 *cuneata* Malakhova
1964 *delepinei* Conil and Lys
1964 dilatata Conil and Lys (OBJ, infrasubspecific)
1945 *distensa* Plummer
1958 ?*donetziana* Potievskaia
1958 *eminens* Potievskaia
1953 *excellens* Zeller
1947 *excentralis* Cooper
1956 *explicata* Ganelina
1956 ?*expressa* Ganelina
1956 *fausta* Malakhova
1954 *fomichaensis* Lebedeva
1956 *geniculata* Ganelina
1958 *gigantea* Okimura
1951 *graciosa* Brazhnikova
1961 *honesta* Shlykova *in* Pozner and Shlykova.

1949 *inflata* Morozova (not 1955 *inflata* Lipina)
1964 inops Conil and Lys (OBJ, infrasubspecific)
1950 *inusitata* Reitlinger
1950 *irregularis* Reitlinger
1957 *irregularis* Zeller (OBJ, preoccupied)
1964 *kaisini* Conil and Lys
1957 *kennethi* St. Jean
1953 *kentuckyensis* Zeller
1948 *kirgisana* Rauzer-Chernoussova
1958 ?*kleina* Woodland
1965 *koksarekensis* Skvorzov
1956 *latissima* Malakhova
1951 *lenociniosa* Shlykova
1958 *longiseptata* Okimura
1948 *magna* Rauber-Chernoussova
1958 *massanae* Okimura
1948 *maxima* Brazhnikova and Potievskaia
1953 *maxima* Zeller (OBJ, preoccupied)
1928 *media* Waters
1950 *minuta* Reitlinger (OBJ, preoccupied, 1948 *minuta* Lipina)
1964 mosanae Conil and Lys (OBJ, infrasubspecific)
1950 *mosquensis* Reitlinger (OBJ, preoccupied, 1948 *mosquensis* Rauzer-Chernoussova)
1964 *mucronata* Conil and Lys
1964 *munita* Conil and Lys (OBJ, preoccupied, 1961 *munita* Voizhekovskaia)
1948 *obsoleta* Rauzer-Chernoussova
1959 *omraensis* Durkina
1928 *ovata* Waters
1953 *pandorae* Zeller
1951 *pannusaeformis* Shlykova
1930 *paucilocula* Cushman and Waters
1948 *pauciseptata* Rauzer-Chernoussova
1962 *parasamarica* Bogush and Yuferev
1958 *parva* Potievskaia (OBJ, preoccupied 1879, *parva* von Möller)
1970 *pepeljaevi* Bogush and Yuferev
1953 *phrissa* Zeller
1964 *pietoni* Conil and Lys
1964 *porrecta* Conil and Lys (OBJ, infrasubspecific)
1956 *posneri* Ganelina
1948 ?*prokirgisana* Rauzer-Chernoussova
1956 *pseudobradyi* Brazhnikova
1956 *pulchra* Brazhnikova and Potievskaia *in* Brazhnikova
1959 *rauserae* Durkina
1961 *reitlingerae* Voizhekovskaia
1964 *rostrata* Conil and Lys
1930 *rotaliformis* Warthin
1928 *rothrocki* Harlton
1950 *rzhevica* Reitlinger
1957 *rugosa* Zeller
1967 *scabra* Conil and Lys
1966 *settedabanica* Bogush and Yuferev
1936 *similis* Rauzer-Chernoussova and Reitlinger
1950 *simplex* Reitlinger (OBJ, preoccupied, 1878 *simplex* Gümbel)
1964 submissa Conil and Lys (OBJ, infrasubspecific)
1956 *sulcata* Ganelina
1956 *superba* Malakhova
1953 *tantala* Zeller
1957 ?*teres* St. Jean
1959 *timanica* Durkina
1968 *torta* Conil and Lys
1957 *tortilis* St. Jean
1964 turgescens Conil and Lys (OBJ, infrasubspecific)
1964 vara Conil and Lys (OBJ, infrasubspecific)
1966 *verkhojanica* Bogush and Yuferev
1953 *versabilis* Zeller

The following taxa have been referred to *Endothyra* but ought to be transferred to:

*Banffella:*
1963 *banffensis* McKay and Green

*Birectoendothyra:*
1970 *shlykovae* Lipina

*Brunsiina:*
1948 *krainica* Lipina

*Chernyshinella:*
1948 *glomiformis* Lipina
1954 *oldae* Grozdilova and Lebedeva
1956 *polymorpha* Malakhova
1956 *uralica* Malakhova

Neanic *Cribrospira* and related forms:
1964 ampla Conil and Lys (OBJ, infrasubsubspecific)
1964 ?brevisepta Conil and Lys (OBJ, infrasubsubspecific)
1948 ?*convexa* Rauzer-Chernoussova (part!)
1964 ?crescens Conil and Lys (OBJ, infrasubsubspecific)
1964 *exelikta* Conil and Lys

1964 ?stricta Conil and Lys (OBJ, infrasubspecific)

*Dainella:*
- 1962 *chomatica* Dain *in* Brazhnikova
- 1888 *cussyensis* Meunier
- 1964 denticulata Conil and Lys (OBJ, infrasubspecific)
- 1964 *exuberans* Conil and Lys
- 1964 *fleronensis* Conil and Lys
- 1964 intricata Conil and Lys (OBJ, infrasubspecific)
- 1964 stricta Conil and Lys (OBJ, infrasubspecific)
- 1964 *versata* Conil and Lys

*Endostaffella:*
- 1954 *barzassiensis* Lebedeva
- 1948 ?*reliqua* Rauzer-Chernoussova
- 1951 ?*tantilla* Shlykova
- 1960 *zakharovi* Bogush and Yuferev

*Endothyranopsis:*
- 1963 *arrecta* McKay and Green
- 1936 *compressa* Rauzer-Chernoussova and Reitlinger
- 1948 ?*convexa* Rauzer-Chernoussova (part)
- 1964 *foeda* Conil and Lys
- 1948 *intermedia* Rauzer-Chernoussova
- 1948 *mosquensis* Rauzer-Chernoussova
- 1957 ?*nevadaensis* Zeller
- 1936 *pechorica* Rauzer-Chernoussova and Reitlinger
- 1948 *rossica* Rauzer-Chernoussova
- 1936 *sphaerica* Rauzer-Chernoussova and Reitlinger
- 1959 *substricta* Durkina
- 1956 *umbonata* Ganelina

*Eoendothyranopsis:*
- 1957 *macra* Zeller
- 1961 *originis* Voizhekovskaia
- 1958 *prodigiosa* Armstrong
- 1963 *robusta* McKay and Green
- 1961 *scitula* Toomey
- 1957 *spiroides* Zeller
- 1957 *symmetrica* Zeller (OBJ, preoccupied by 1949 *symmetrica* Morozova)
- 1957 *utahensis* Zeller
- 1963 *zelleri* McKay and Green (OBJ, =1961 *scitula* Toomey)

*Eostaffella:*
- 1876 *radiata* Brady
- 1888 ?*tateana* Howchin

*Globoendothyra:*
- 1954 *antoninae* Grozdilova and Lebedeva
- 1956 *archaediscoidea* Ganelina
- 1959 *arguta* Durkina
- 1864 *baileyi* Hall
- 1969 ?*bridgensis* Skipp *in* McKee and Gutschick
- 1958 ?*bullata* Woodland
- 1964 *callosa* Conil and Lys
- 1956 *celsa* Ganelina
- 1956 *dorogobuzhica* Ganelina
- 1959 *elegantula* Durkina
- 1860 *globulus* d'Eichwald
- 1969 ?*gutschicki* Skipp *in* McKee and Gutschick
- 1954 *inconstans* Grozdilova and Lebedeva
- 1963 *incrassata* McKay and Green
- 1948 *ishimica* Rauzer-Chernoussova
- 1956 *korbensis* Ganelina
- 1954 *magna* Grozdilova and Lebedeva (OBJ, preoccupied by 1948 *magna* Rauzer-Chernoussova)
- 1948 ?*mirifica* Rauzer-Chernoussova
- 1948 *numerabilis* Vissarionova
- 1954 *nevkiensis* Lebedeva
- 1956 *ovalis* Ganelina
- 1948 *parva* Chernysheva (OBJ, preoccupied 1879 *parva* von Möller)
- 1948 *paula* Vissarionova
- 1950 ?*plectogyra* Zeller
- 1954 *tomiliensis* Grozdilova

*Haplophragmella:*
- 1879 *panderi* von Möller
- 1964 *solida* Conil and Lys

*Inflatoendothyra:*
- 1969 *eospiroides* Skipp *in* McKee and Gutschick
- 1954 *inflata* Lipina *in* Lebedeva (OBJ, preoccupied 1949 *inflata* Morozova)
- 1964 *librans* Conil and Lys
- 1955 ?*nordvikensis* Lipina
- 1964 *obtrita* Conil and Lys
- 1970 *parainflata* Bogush and Yuferev
- 1955 *recta* Lipina

*Latiendothyra* and related forms:
- 1956 ?*abnormis* Malakhova
- 1959 *advena* Durkina
- 1959 *agilis* Durkina
- 1964 alta Conil and Lys (OBJ, infrasubspecific)
- 1948 *antiqua* Rauzer-Chernoussova
- 1964 *bulbisepta* Conil and Lys
- 1970 *burgaliensis* Bogush and Yuferev
- 1959 *decliva* Durkina
- 1961 *distinct* Shlykova *in* Pozner and Shlykova
- 1964 globosa Conil and Lys (OBJ, infrasubspecific)
- 1964 imminuta Conil and Lys (OBJ, infrasubspecific)

1957 *inflata* Zeller (OBJ, preoccupied 1949 *inflata* Morozova)
1959 *karakasikae* Durkina
1962 *kostobensis* Bogush and Yuferev
1954 *kosvensis* Lipina *in* Lebedeva
1962 *lata* Bogush and Yuferev
1954 *latispiralis* Lipina *in* Lebedeva
1964 *lensi* Conil and Lys
1959 *lytvensis* Malakhova
1970 *neruensis* Bogush and Yuferev
1964 nigra Conil and Lys (OBJ, infrasubspecific)
1966 *notabilis* Ganelina
1956 *obesa* Malakhova
1955 *parakosvensis* Lipina
1958 *parva* Potievskaia (OBJ, preoccupied 1879 *parva* von Möller)
1966 *quaesita* Ganelina
1960 *rectiformis* Bogush and Yuferev
1940 *rjausakensis* Chernysheva
1956 *septima* Malakhova
1959 *silva* Durkina
1956 *singularia* Malakhova
1967 *skippae* Armstrong
1964 struniana Conil and Lys (OBJ, infrasubspecific)
1956 ?*subrotunda* Malakhova
1966 *tortuosa* Ganelina
1957 ?*tumesepta* Zeller
1960 *turkestanica* Bogush and Yuferev

*Loeblichia:*
1876 *ammonoides* Brady

*Mediocris:*
1954 *mediocriformis* Lebedeva

*Nanicella:*
1931 *gallowayi* Thomas

*Omphalotis:*
1964 *callosa* Rostovceva *in* Reitlinger (OBJ, invalid)
1888 *circumplicata* Howchin
1956 ?*excelsa* Ganelina
1948 ?*exilis* Rauzer-Chernoussova
1963 ?*fominae* Rozovskaia
1956 ?*frequentata* Ganelina
1964 *fusca* Conil and Lys
1951 *glomeralis* Shlykova
1951 ?*infrequentis* Shlykova
1964 ?*introjactans* Conil and Lys
1956 *involuta* Brazhnikova
1951 *irenae* Shlykova
1948 *koktjubensis* Rauzer-Chernoussova
1936 *minima* Rauzer-Chernoussova and Reitlinger (OBJ, preoccupied by 1925 *minima* Lange)
1936 *omphalota* Rauzer-Chernoussova and Reitlinger
1948 *samarica* Rauzer-Chernoussova
1956 *secunda* Malakhova
1956 *volynica* Brazhnikova

*Paraendothyra:*
1964 *cummingsi* Conil and Lys

*Planoendothyra:*
1950 *aljutovica* Reitlinger
1954 ?*delecta* Lebedeva
1950 *evoluta* Reitlinger (not 1954 *evoluta* Lebedeva)
1965 *futila* Solovieva and Krasheninikov
1950 *irinae* Reitlinger
1964 *lensi* Conil and Lys
1961 ?*lipinae* Voizhekovskaia (OBJ, preoccupied 1949 *lipinae* Morozova)
1959 ?*longa* Durkina
1960 ?*menneri* Bogush and Yuferev
1954 *rotayi* Lebedeva
1948 *spirilliniformis* Brazhnikova and Potievskaia
1956 *tatianae* Ganelina
1961 ?*vicina* Shlykova and Ganelina *in* Pozner and Shlykova

*Priscella:*
1964 *agathis* Conil and Lys
1948 *devexa* Rauzer-Chernoussova
1964 devia Conil and Lys (OBJ, infrasubspecific)
1956 *nebulosa* Malakhova
1964 parva Conil and Lys (OBJ, infrasubspecific and preoccupied)
1964 pressa Conil and Lys (OBJ, infrasubspecific
1936 *prisca* Rauzer-Chernoussova and Reitlinger
1964 scansa Conil and Lys (OBJ, infrasubspecific)
1964 ?*waulsorti* Conil and Lys

*Pseudoendothyra:*
1876 *ornata* Brady

*Quasiendothyra* and related forms:
1959 *absoluta* Durkina
1952 *bella* Chernysheva
1940 *communis* Rauzer-Chernoussova *in* Chernysheva
1959 *dentata* Durkina
1956 *klubovi* Lebedeva
1948 *kobeitusana* Rauzer-Chernoussova

1956 *konensis* Lebedeva
1956 *mirabilis* Chernysheva
1959 ?*orbiculata* Durkina
1959 *radiosa* Malakhova
1955 *regularis* Lipina (OBJ preoccupied 1948 *regularis* Rauzer-Chernoussova)
1959 ?*sazonovi* Durkina
1959 ?*tantula* Durkina
1956 *tengisica* Lebedeva
1956 *umbilicata* Lebedeva

*Septabrunsiina:*
1957 *anteflexa* Zeller
1964 *limburgi* Conil and Lys
1948 *minuta* Lipina
1957 *taedia* Zeller

*Septaglomospiranella:*
1956 *crassiseptata* Malakhova
1954 *kartzevae* Lebedeva
1956 *kynensis* Malakhova
1956 *margarita* Malakhova
1940 *primaeva* Chernysheva (and 1948 "*primaeva*" Rauzer-Chernoussova)
1964 *rudis* Conil and Lys

*Skippella:*
1964 *arctata* Conil and Lys
1961 *magna* Voizhekovskaia (OBJ preoccupied 1948 *magna* Rauzer-Chernoussova)
1969 *redwallensis* Skipp *in* McKee and Gutschick
1948 *staffelliformis* Chernysheva
1955 ?*transita* Lipina

*Spinoendothyra:*
1954 *accurata* Vdovenko
1956 ?*analoga* Malakhova
1956 *apta* Malakhova
1956 *bellicosta* Malakhova
1960 *brevivoluta* Lipina
1954 ?*calmiussi* Vdovenko
1956 *concava* Malakhova
1956 *corona* Malakhova
1954 *costifera* Lipina *in* Grozdilova and Lebedeva
1967 *hirsuta* Conil and Lys
1956 *mammata* Malakhova
1954 *media* Vdovenko (OBJ, preoccupied 1928 *media* Waters)
1963 ?*morroensis* McKay and Green
1954 ?*paracostifera* Lipina *in* Grozdilova and Lebedeva
1969 *paraspinosa* Skipp *in* McKee and Gutschick
1954 ?*paraukrainica* Lipina *in* Grozdilova and Lebedeva
1960 ?*piluginensis* Lipina
1964 plagia Conil and Lys (OBJ, infrasubspecific)
1955 *recta* Lipina
1961 *speciosa* Shlykova *in* Pozner and Shlykova
1940 *spinosa* Chernysheva
1954 *tenuiseptata* Lipina *in* Lebedeva
1960 *volgensis* Lipina

*Spinotournayella:*
1957 *tumula* Zeller (holotype)

*Tournayella:*
1956 *beata* Malakhova

*Tuberendothyra:*
1955 ?*crassitheca* Lipina
1955 *magna Lipina* (OBJ, preoccupied 1948 *magna* Rauzer-Chernoussova)
1969 *safonovae* Skipp *in* McKee and Gutschick
1957 *superlata* Malakhova
1957 "*tumula*" Zeller (part)
1959 ?*turbida* Durkina

*Urbanella:*
1948 *reliqua* Rauzer-Chernoussouva

*Zellerina:*
1927 *ameradaensis* Harlton
1915 *discoidea* Girty

The following taxa ought to be grouped as a new Endothyranopsidae genus:
1950 ?*eostaffeloides* Reitlinger
1950 *lata* Reitlinger

The following taxa cannot be identified by the author; they are based on random cuts, or the constitution of their wall is not known:
1954 *admiranda* Lebedeva
1959 *angusta* Durkina (OBJ, preoccupied 1955 *angusta* Lipina)
1954 *arcuata* Grozdilova and Lebedeva
1960 *banphitensis* Saurin
1949 *bashkirica* Morozova
1960 *belmasarica* Bogush and Yuferev
1942 *bunkerae* Coryell and Rozanski
1960 *cistula* Saurin
1964 *compacta* Conil and Lys
1888 *conspicua* Howchin
1961 *corallovajaensis* Voizhekovskaia
1964 *cuneisepta* Conil and Lys
1959 *demini* Durkina
1960 *delicata* Saurin
1964 *demissa* Conil and Lys
1962 *fluctata* Bogush and Yuferev
1961 *formosa* Shlykova *in* Pozner and Shlykova

1964 *freyri* Conil and Lys
1964 *gibbera* Conil and Lys
1961 *gentilis* Shlykova and Ganelina *in* Pozner and Shlykova
1928 *grandis* Waters
1961 *grata* Voizhekovskaia
1955 *infirma* Lipina
1961 *inopinata* Shlykova *in* Pozner and Shlykova
1961 *juncta* Voizhekovskaia
1959 *komi* Durkina
1960 *laotiana* Saurin
1958 *lanceolata* Woodland
1966 *lenensis* Bogush and Yuferev
1870 *macella* Brady
1965 *miassica* Malakhova
1925 *minima* Lange
1959 *mylvica* Durkina
1954 *nevkiensis* Lebedeva
1870 *obliqua* Brady
1949 *occidentalis* Morozova
1949 *octocamerata* Morozova
1960 *orgailysaica* Bogush and Yuferev
1962 *parasamarica* Bogush and Yuferev
1954 *paucicamerata* Lipina
1964 *pauli* Conil and Lys
1959 *peculiara* Durkina
1954 *perfida* Lebedeva
1956 *persimilis* Malakhova
1964 *perundata* Conil and Lys
1960 *pithensis* Saurin
1959 *polita* Durkina
1961 *poljarica* Voizhekovskaia
1964 *producta* Conil and Lys
1955 ?*pseudominuta* Lipina
1960 *punctum* Saurin
1960 *pusilla* Saurin
1878 *radiifera* Gümbel
1959 *resida* Durkina
1959 *rigida* Durkina
1928 *rotunda* Cushman and Waters
1949 *rotundata* Morozova
1964 *saleti* Conil and Lys
1949 *saschkinae* Morozova
1961 *shlykovae* Voizhekovskaia
1878 *simplex* Gümbel
1956 *stalinogorski* Ganelina
1966 *strobilata* Bogush and Yuferev
1960 *supera* Saurin
1876 *subtilissima* Brady
1962 *talassica* Bogush and Yuferev
1960 *trema* Saurin
1960 *triangularis* Saurin
1936 *tschernovi* Rauzer-Chernoussova and Reitlinger
1959 *tuberiformis* Durkina
1958 *turgida* Woodland
1959 *uchtovensis* Durkina
1964 *valida* Conil and Lys
1966 *wjasmensis* Ganelina
1961 *zlobini* Voizhekovskaia

*Stratigraphic range and distribution.*—Although reported from the Devonian, *Endothyra* as previously defined occurs for the first time in the Late Tournaisian. Earlier forms ought to be assigned to *Latiendothyra*, *Quasiendothyra*, and other species. Very abundant in the Viséan and Namurian. Still present in the Moscovian. Last occurrence, probably in the Permian.

The genus is cosmopolitan, occurring in Eurasia, North America, Australia, and Africa.

**Endothyra of the group E. bowmani Phillips 1846?, emend. Brady 1876**
**Plate 31, figures 14–16**

Group exemplified by:

1846. (?)*Endothyra bowmani* Phillips. Geol. Polytech. Soc. West Riding, Yorkshire, Proc., v. 2, p. 279, pl. 7, fig. 1. (See discussion.)
1876. *Endothyra bowmani* Brady. Palaeont. Soc. London Pub., v. 30, p. 92–94, pl. 5, fig. 1, 2, 4 [not 3].
1878. [not] *Endothyra bowmani* von Möller. St. Petersbourg Acad. Imp. Sci. Mém, sér. 7, v. 25, no. 9, p. 96, 97, pl. 4, fig. 3 a–b, pl. 12, fig. 2 a–b.
1905. [not] *Endothyra bowmani* Chapman and Howchin. New South Wales Geol. Survey Mem., Palaeontology, no. 14, p. 12, pl. 1, fig. 13 a–c.
1927. (?)*Endothyra bowmani* Cushman and Waters. Cushman Lab. Foram. Research Contr., v. 3, pt. 2, p. 110, pl. 22, fig. 8 a–b.
1927. [not] *Endothyra bowmani* Harlton. Jour. Paleontology, v. 1, no. 1, p. 18, pl. 2, fig. 3 a–d.
1930. [not] *Endothyra bowmani* Lee, Chen, and Chu. Acad. Sinica, Nat. Res. Inst. Geol., Mem. 9, p. 106, pl. 5, fig. 14.
1932. [not] *Endothyra bowmani* Liebus. Preuss. Geol. Landesanst. Abh., new ser, no. 141, p. 166, pl. 10, figs. 22–24.
1933. [not] *Endothyra bowmani* Harlton. Jour. Paleontology, v. 7, no. 1, p. 10, pl. 2, fig. 4.
1936. *Endothyra bowmani* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger. Akad. Nauk SSSR, Poliarnia Komissia, Trudy 28, p. 212, 213.
1939. *Endothyra bradyi* Mikhailov (OBJ). Leningrad Geol. Trust Symp. no. 3, p. 51, 52, pl. 4, figs. 1,2.
1940. (?)*Endothyra bowmani* Rauzer-Chernoussova, Beljaev, and Reitlinger. Neft. Geol. Razved. Inst. Trudy 7, p. 44, 45, pl. 7, fig. 10.
1948. [not] *Endothyra bradyi maxima* Brazhnikova and Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 1, Bull. 2. p. 97, 98, pl. 1, fig. 2.

1949. [not] *Endothyra bradyi compressa* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 156, pl. 1, fig. 6 a–b.

1950. (?)*Endothyra bowmani* Termier and Termier. Paleont. Marocaine, Invertébrés Ere Primaire, Pt. 1, p. 35, pl. 1, fig. 18? [not 19, 20].

1954. [not] *Endothyra bradyi bradyi* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 107, 108, pl. 12, figs. 5, 6.

1954. (?)*Endothyra bowmani* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 110, pl. 12, fig. 8.

1956. [not] *Endothyra bradyi* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst., Trudy 24, no. 3, p. 42, pl. 3, figs. 14, 15.

1956. (?)*Endothyra bradyi* Putria. VNIGRI Trudy 98, p. 369, pl. 1, figs. 5, 6.

1956. (?)*Endothyra pulchra* Brazhnikova and Potievskaia *in* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 43, pl. 11, fig. 5.

1956. [not] *Endothyra bradyi* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, no text, pl. 4, fig. 1.

1957. *Endothyra bradyi* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 107, 108, pl. 2, figs. 9–11.

1960. [not] *Endothyra bowmani* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 53, pl. 3, fig. 6.

1960. [not] *Plectogyra bradyi* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 65, pl. 5, fig. 8.

1960. (?)*Plectogyra bradyi* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 363, pl. 4, fig. 1.

1960. *Plectogyra bradyi* Voloshina and Reitlinger *in* Rauzer-Chernoussova and Fursenko. Osnovy Paleontologii, v. 1, no text, pl. 5, fig. 11.

1963. [not] *Endothyra bradyi* Rozovskaia. Akad Nauk SSSR Inst. Paleontologii Trudy 97, p. 42, pl. 1, fig. 8.

1964. *Plectogyra bradyi bradyi* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 168, pl. 24, figs. 478–480 (part).

1964. *Plectogyra bradyi* alta Conil and Lys (OBJ, infrasubspecific). Louvain Univ. Inst. Géol. Mém., v. 23, p. 168, pl. 24, figs. 473–474.

1964. *Endothyra bowmani* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, part C, p. C346, fig. 262–2 [only].

1964. [not] *Plectogyra bradyi* Saurin. Archives Géol. Viêtnam, v. 6, p. 55–56, pl. 3, figs. 11, 14, 15.

1965. [not] *Plectogyra bradyi* Omara and Conil. Soc. Géol. Belgique Annales, v. 88, no. 5, p. 231, pl. 2, figs. 10, 11.

1966. *Endothyra* ex. gr. *bradyi* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 126, pl. 7, figs. 8–10.

1968. [not] *Endothyra bradyi pulchra* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 552, pl. 9, figs. 104, 105.

1969. (?)*Endothyra bradyi* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12, pl. 2, figs. 14, 15.

1969. [not] *Plectogyra bradyi* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 48, pl. 3, figs. 42, 43.

1970. *Endothyra bradyi* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 102, pl. 6, fig. 6.

1970. *Plectogyra bradyi* Hallett. 6ème Cong. Avanc. Strat. Carbonifère, Compte Rendu, p. 896, pl. 6, fig. 1.

1970. *Endothyra bowmani* Mamet. Canada Geol. Survey Paper 70–21, pl. 6, figs. 1–3.

*Diagnosis of the group.*—Test free, irregularly discoidal, compressed laterally. Proloculus followed by erratically coiled spirotheca. Umbilical depressions well marked. Chambers subglobular, irregular. Septa irregular, anteriorly curved, the angle from spirotheca being very variable. Number of chambers small, seven to eight in last coil. Secondary deposits as heavy floor covers and poorly developed projections in last three chambers. Wall calcareous secreted, a tectum, with poorly developed outer and inner tectoria(?). Aperture a low slit at base of apertural face.

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America. Common.

The group occurs for the first time in the Tournaisian-Viséan transition beds where it is always very scarce. Widespread from the Middle Viséan to the Late Namurian. In North America the commonest taxa referable to the group are *Endothyra bowmani* sensu stricto and *Endothyra excentralis* Cooper.

**Endothyra bowmani Phillips 1846?, emend. Brady 1876, emend. ICZN 1965**

Plate 31, figure 14, 15

For the synonymy, see the group.

*Diagnosis.*—Test free, irregularly discoidal, compressed laterally. Form ratio 1/0.3 to 1/0.5. Proloculus spherical, important, $50\mu$ to $60\mu$, followed by an irregularly coiled spirotheca with continuous deviation of coil axis; deviation is generally in one direction although it is often oscillating in last coil. Rate of expansion moderate. Diameter for adult specimens $450\mu$ to $650\mu$. Umbilical depression marked, irregular. Chamber subglobular, irregular. Sutures well defined, but not deep. Seven to eight chambers in last whorl. Septa irregular, long, anteriorly directed, 70°–80° from spirotheca. Secondary deposits as continuous floor covers and heavy projection, often resorbed, in ultimate and penultimate chambers. Wall calcareous secreted, $18\mu$ to $22\mu$ in last chamber; a dark dense tectum, a rather variable inner tectorium, and a very poorly defined outer tectorium.

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America.

Abundant from Zone 13 (middle Meramec equivalent) to Zone 18 (upper Chester equivalent) in North America. Scarce, higher in the middle Carboniferous.

In Alaska and the Yukon Territory, a widespread taxon in the Alapah Limestone. Observed in the Wahoo Limestone, where it is scarce.

*Figured specimens.*—USNM 179430, 179431.

**Endothyra of the group E. similis Rauzer-Chernoussova and Reitlinger in Rauzer-Chernoussova, Beljaev, and Reitlinger 1936**

Plate 32, figures 2, 3

Group exemplified by:

1936. *Endothyra similis* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger. Akad. Nauk SSSR, Poliarnia Komissia, Trudy 28 p. 211, 212, pl. 6, figs. 5, 6.

1948. *Endothyra similis magna* Rauzer-Chernoussova. Akad. Nauk SSSR Inst. Geol. Trudy 62, no. 19, p. 177, pl. 5, fig. 5.

1951. *Endothyra similis amplis* Shlykova. VNIGRI Trudy 56, p. 156, pl. 3, figs. 4–6.

1954. *Endothyra similis similis* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 104, pl. 13, fig. 2.

1954. *Endothyra similis amplis* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 104, pl. 13, fig. 3.

1954. *Endothyra similis* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., Geol. Ser., Trudy 29, no. 1, p. 58, pl. 1, figs. 14–16.

1956. *Endothyra similis* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, pl. 6, figs. 4–6.

1960. *Plectogyra similis amplis* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 61, pl. 5, fig. 2.

1960. *Plectogyra similis* Grozdilova and Lebedeva. VNIGRI Trudy 150, pl. 4, figs. 10, 11.

1960. (?)*Plectogyra similis* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 360, pl. 3, figs. 11–13.

1961. (?)*Plectogyra similis* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 220, pl. 6, fig. 7.

1962. (?)*Plectogyra similis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 139, 140, pl. 4, fig. 12.

1963. *Plectogyra similis* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 137, pl. 4, figs. 2–4.

1964. *Plectogyra similis* crustata Conil and Lys (OBJ, infrasubspecific). Louvain Univ. Inst. Géol. Mém., v. 23, p. 216, figs. 728–732.

1964. *Plectogyra similis* inops Conil and Lys (OBJ, infrasubspecific). Louvain Univ. Inst. Géol. Mém., v. 23, p. 217, 218, figs. 737, 738.

1964. *Plectogyra similis* turgescens Conil and Lys (OBJ, infrasubspecific). Louvain Univ. Inst. Géol. Mém., v. 23, p. 218, 219, figs. 741–747.

1964. (?)*Plectogyra similis* Saurin. Archives Géol. Vietnam, v. 6, p. 46, 47, pl. 2, fig. 13.

1966. *Endothyra* cf. *similis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 133, pl. 8, fig. 9.

1967. *Plectogyra similis* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 200, pl. 8, fig. 10, p. 201, pl. 12, figs. 9, 10, p. 203, pl. 15, figs. 15, 16.

1969. *Endothyra similis* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 11, pl. 1, fig. 1, p. 15, pl. 4, figs. 54–56.

1969. *Plectogyra similis* Vdovenko. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 11, p. 36–40, pl. 1, fig. 8, pl. 2, fig. 12.

1970. *Endothyra* of the group *E. similis* Mamet. Canada Geol. Survey Paper 70–21, p. 94, pl. 6, figs. 6–8.

*Diagnosis of the group.*—Test free, irregularly discoidal, compressed laterally. Proloculus followed by irregularly coiled spirotheca, with oscillating deviation. Chambers subquadratic to subglobular, irregular, 7 to 10 in last whorl. Septa anteriorly curved, 70°–85° from the spirotheca. Secondary deposits as low continuous floor covers. Wall calcareous secreted, a tectum with poorly defined inner and outer tectoria. Aperture a low slit at base of apertural face.

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America.

First occurrence in the Late Tournaisian; common in the Viséan and the basal middle Carboniferous.

Quite abundant in the Wachsmuth and the Alapah Limestones. Scarce in the Wahoo Limestone and the Kogruk Formation.

*Figured specimens.*—USNM 179434, 179435.

**Endothyra similis Rauzer-Chernoussova and Reitlinger 1936**

Plate 32, figures 2, 3

For the synonymy, see the group.

*Diagnosis.*—Test free, irregularly discoidal, compressed laterally. Form ratio 1/0.4 to 1/0.6. Proloculus 30$\mu$ to 50$\mu$, followed by irregular oscillating spirotheca. Diameter 400$\mu$ to 600$\mu$ for adults of three to four whorls. Chambers subquadratic, irregular, 8 to 10 in last whorl. Septa long, anteriorly directed, 75°–85° from spirotheca. Secondary deposits as low, continuous floor covers. Wall calcareous secreted, 15$\mu$ to 20$\mu$, a tectum with faint tectoria. Aperture a low slit.

*Stratigraphic distribution.*—Eurasia, north Africa, Australia, and North America.

Late Tournaisian? to middle Carboniferous. Common in the Tethys.

Mostly observed from the Alapah Limestone of Alaska, but also present in the Wachsmuth and Wahoo Limestones.

*Figured specimens.*—USNM 179434, 179435.

#### Endothyra paramosquensis Mamet, new name

Plate 32, figure 1

1950. *Endothyra mosquensis* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 33, pl. 6, figs. 3, 4, 12. (Fig. 4 is designated here.)
1948. [not] *Endothyra crassa mosquensis* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 167, pl. 4, fig. 3.
1964. *Plectogyra mosquensis* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 195, 196, pl. 31, figs. 623–625.
1969. *Endothyra mosquensis* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 13, pl. 3, figs. 1, 2.

*Diagnosis.*—Test free, discoidal, compressed laterally. Form ratio 1/0.4 to 1/0.5. Proloculus 30$\mu$ to 50$\mu$, followed by deviating spirotheca. As deviation oscillates, coil appears rather regular. Diameter 350$\mu$ to 500$\mu$ for three whorls. Chambers irregular, few, seven to eight in last coil. Rate of expansion small to moderate. Sutures faint. Septa arcuate forwards, long, 70°–85° from spirotheca. Secondary deposits as heavy, low floor covers. Wall calcareous secreted, 15$\mu$ to 18$\mu$, a tectum with inconspicuous tectoria(?). Aperture a low slit.

*Stratigraphic range and distribution.*—Eurasia and North America.

Reported from the middle Carboniferous of the U.S.S.R. and the Late Viséan of Belgium.

Present in the Wahoo Limestone in Alaska and the Yukon Territory.

*Figured specimen.*—USNM 179433.

#### Family ENDOTHYRIDAE? or GLOBOENDOTHYRIDAE?
#### Transitional form between Latiendothyra? and Globoendothyra?

Plate 32, figure 4

*Diagnosis.*—Test free, discoidal, subglobose. Umbilical depressions poorly expressed. Proloculus followed by slightly erratically coiled spirotheca. Rate of expansion moderate. Diameter 500$\mu$ to 650$\mu$ for 3½ to 4 whorls. Seven to eight chambers in last whorl. Chamber subglobular to globular. Septa anteriorly curved, with secondary tip thickenings. Floor deposits absent (or very faint?). Wall calcareous secreted, a tectum with poorly defined diaphanotheca. Aperture a low slit at base of apertural face.

*Remark.*—By its general morphology, this taxon is a *Latiendothyra*, but the presence of a faint diaphanotheca indicates a *Globoendothyra.*

*Stratigraphic range and distribution.*—Known only from the Tournaisian-Viséan passage beds; hence restricted to the middle part of the Wachsmuth Limestone of Alaska.

*Figured specimen.*—Univ. Montréal 205/25.

#### Family GLOBOENDOTHYRIDAE Reitlinger 1959

#### Genus DAINELLA Brazhnikova 1962

1940. *Nanicella* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, Ser. Geol. 18, no. 5–6, p. 127.
1948. *Eostaffella* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 224, 225.
1954. *Eostaffella* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 122, 123 [part].
1959. *Endothyra* Durkina. VNIGRI Trudy 136, p. 173 [part].
1962. *Dainella* Dain *in* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 44, p. 23.
1962. *Dainella* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 44, p. 23–27.
1962. *Dainella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 142.
1963. *Dainella* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 28 [part].
1963. *Dainella* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 135.
1964. *Dainella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 148, 149.
1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 186, 187 [part], p. 211 [part], p. 213 [part], p. 224 [part].
1964. *Plectogyra* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pl. 1, figs. 15, 16 [no text].
1966. [not] *Dainella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 142.
1966. *Dainella*? Conil and Lys. Soc. Géol. Belgique Annales, v. 89, Bull. 6, p. 221.
1966. *Dainella* Ganelina. VNIGRI Trudy 250, p. 101 [part].
1967. *Dainella* Conil and Lys. Soc. Géol. Belgique Annales, v. 90, Bull. 4, pl. 2, figs. 15–17.
1968. *Endothyra*? Conil and Lys. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, no. 1, p. 73.
1968 ?*Dainella* Conil and Lys. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, no. 1, p. 73.
1968. *Dainella* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 546.
1969. *Dainella*? Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 92.
1969. [not] *Dainella* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull 28, p. 11.
1970. *Dainella* Gorecka and Mamet. Rev. Micropaléontologie, v. 13, no. 3, p. 162.
1971. *Dainella* Brazhnikova and Vdovenko. Atlas of the Tournaisian fauna in the Donetz Basin, p. 184.

*Diagnosis.*—Test free, globular to ellipsoidal, slightly compressed. Proloculus followed by streptospiral coil. Coiling changes abrupt, up to 90°. Number of chambers variable, 8 to 12 or 13 in last whorl. Sutures faint. Wall two layered, one microcrystalline tectum and an inner poorly developed, thin, irregular diaphanotheca. Secondary deposits as massive pseudochomata. Aperture a low slit at base of apertural face.

*Type of genus.*—1962 *Dainella chomatica* Dain *in* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 44, p. 23, pl. 10, fig. 9; pl. 11, figs. 1–3.

Taxa included in the genus *Dainella:*

1966 *amenta* Ganelina
1962 *chomatica* Dain *in* Brazhnikova
1966 *cognata* Ganelina
1888 *cussyensis* Meunier
1940 *dainae* Chernysheva
1962 *elegantula* Brazhnikova
1964 *exuberans* Conil and Lys
1964 fleronensis Conil and Lys (OBJ, infrasubspecific)
1968 *florenensis* Conil and Lys (sic)
1966 manifesta Ganelina
1962 ?*rectiformis* Bogush and Yuferev
1948 *tujmasensis* Vissarionova
1964 versata Conil and Lys (OBJ, infrasubspecific)

*Remarks.*—In the original description of the genus, Brazhnikova reports the wall as one layered, but close examination of the taxa listed above shows the consistent presence of a faint diaphanotheca. *Dainella* is therefore classified here as a very primitive Globoendothyridae.

The type of the genus is usually credited by the Russian authors and by Conil and Lys (1964) to *Endothyra*(?) *chomatica* Dain 1940, pl. 12, figs. 1–4. To the author's knowledge, a description of this taxon has never been formally published. The first valid publication is by Brazhnikova (1962) which reproduced, with Dain's permission, the original description from the files of the Catalogue of Foraminifera of the U.S.S.R. Academy of Science (Akad. Nauk Ukrain. SSR).

*Stratigraphic range and distribution.*—A widespread form in Eurasia. It appears at the base of Zone 10 and is therefore one of the most reliable taxa for recognition of the base of the Viséan. Abounds in Early and Middle Viséan of Europe; extinct in Late Viséan.

Very scarce in the Viséan of North America (Mamet and Skipp, 1970 a and b).

#### Dainella anivikensis Mamet, n. sp.

Plate 33, figures 1–18

*Diagnosis.*—Test free, globular, slightly compressed. Umbilical depressions feeble. Proloculus very important (up to 120$\mu$) followed by streptospiral coil. Plane of coiling changes abruptly. Eight to 10 chambers in last whorl. Sutures faint. Septa slightly curved, long. Diameter of test 580$\mu$ to 750$\mu$ for adult specimens (3½ to 4 whorls). Wall two layered; a microcrystalline tectum with very poorly developed diaphanotheca, easily recrystallized, giving to the wall a granular appearance. Thickness of wall 18$\mu$ to 25$\mu$ in last coil. Secondary deposits well developed, as massive, heavy pseudochomata. Aperture a low slit at base of apertural face.

*Comparison.*—By its morphology, this new species is closely related to *Dainella elegantula* Brazhnikova and *D. chomatica* Brazhnikova. It is, however, readily distinguished by its very big proloculus.

*Stratigraphic range and distribution.*—Abundant in Alaska in Zones 12 and 13. Characterizes the Wachsmuth-Alapah junction.

*Numbered specimens.*—USNM 179446–179461; Univ. Montréal 205/34, 205/35.

#### Genus GLOBOENDOTHYRA Reitlinger in Rauzer-Chernoussova and Fursenko 1959

1860. *Nonionina* d'Eichwald. Lethaea Rossica, v. 1, p. 350.
1864. *Rotalia* Hall. Albany Inst. Trans., v. 4, p. 24, 34.
1876. *Endothyra* Brady. Paleont. Soc. London Pub., v. 30, p. 92–94 [part].
1878. *Endothyra* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 25, no. 9, p. 98–101 [part].
1879. [not] *Endothyra* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 15–17.
1880. [not] *Endothyra* von Möller. Mat. Geol. Russ., v. 9, p. 20–23.
1882. *Endothyra* Whitfield. Am. Mus. Nat. History Bull., v. 1, no. 3, art. 5, p. 42.
1888. *Endothyra* Howchin. Royal Micros. Soc. London Jour., pt. 2, p. 541 [part].
1931. *Endothyra* Henbest. Cushman Found. Foram. Research Contr., v. 7, pt. 4, p. 90–93.
1939. *Endothyra* Mikhailov. Leningrad Geol. Trust Symp. no. 3, pl. 2, fig. 12 [only].
1940. *Endothyra* Rauzer-Chernoussova, Beljaev, and Reitlinger. Neft. Geol. Razved. Inst. Trudy 7, p. 40, 41 [part].
1948. *Endothyra* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 247 [part].
1948. *Endothyra* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 5 [part].
1948. *Endothyra* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 182–185.
1948. ?*Endothyra* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 179 [only].
1950. ?*Plectogyra* Zeller. Kansas Univ. Paleont. Contr., Protozoa, art 4, p. 3, 15, 16 [part], pl. 2, fig. 2; pl. 3, fig. 2, 12; pl. 4, figs. 1, 6 [only] (See discussion.)
1951. *Endothyra* Shlykova. VNIGRI Trudy 56, p. 154, 155 [part].
1954. *Endothyra* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 94–97 [part].
1954. *Endothyra* Lebedeva. VNIGRI Trudy 81, p. 260–262 [part].
1954. *Endothyra* Grozdilova *in* Lebedeva. VNIGRI Trudy 81, p. 264, 265.
1956. *Endothyra* Ganelina. VNIGRI Trudy 98, p. 95–99 [part].

1956. *Endothyra* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, no text, pl. 5, fig. 6; pl. 6, fig. 1.
1956. *Endothyra* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 43 [part].
1957. *Endothyra* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik, 2, p. 115 [part].
1957. *Plectogyra* Zeller. Jour. Paleontology, v. 31, no. 4, p. 697–700 [part].
1958. *Globoendothyra* Reitlinger (OBJ, nom. nud.). Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 57.
1959. *Globoendothyra* Reitlinger *in* Rauzer-Chernoussova and Fursenko. Osnony paleontologii, v. 1, p. 196.
1959. *Endothyra* Durkina. VNIGRI Trudy 136, p. 181–183 [only].
1960. *Globoendothyra* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 67–70.
1961. *Globoendothyra* Voizhekovskaia. NIIGA, Bull. 24, p. 36, 37.
1962. *Globoendothyra* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 110, 111.
1962. *Globoendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 150–152.
1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 32, 36 [part].
1963. *Globoendothyra* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 49, 50.
1964. *Globoendothyra* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, p. 194, 195, pl. 3, fig. 39.
1964. *Globoendothyra* Saurin. Archives Géol. Viêtnam, v. 6, p. 59–64 [part].
1964. *Endothyranopsis* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, p. C352 [part].
1964. *Endothyra* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, p. C345, C346 [part].
1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 172 [part], p. 181 [part].
1964. *Globoendothyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 151, 152.
1966. *Globoendothyra*? Conil and Lys. Soc. Géol. Belgique Annales, v. 89, Bull. 6, p. 221 [part].
1966. *Globoendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 135.
1966. *Globoendothyra* Ganelina. VNIGRI Trudy 250, p. 115, 116.
1967. *Globoendothyra* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 199–201.
1967. *Globoendothyra* Vdovenko. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy., p. 21–24.
1967. [not] *Globoendothyra* Saurin. Archives Géol. Viêtnam, v. 10, p. 114, 115.
1968. *Globoendothyra* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 548–554.
1969. *Globoendothyra* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 94.
1969. *Plectogyra* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 53 [only].
1969. *Endothyra* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 198–209 [part].
1969. *Globoendothyra* Hewitt and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 78, pl. 1, figs. 11, 12.
1969. [not] *Endothyra* (*Globoendothyra*) Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 209, 210.
1969. *Globoendothyra* Vdovenko. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 11, p. 35–40.
1970. *Globoendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 102.
1970. *Globoendothyra* Mamet. Canada Geol. Survey Paper 70–21, p. 11.

*Diagnosis.*—Test free, subrounded to nautiloid. Proloculus followed by involute erratically coiled spire. In more advanced species, coiling tends to be more regular in last two whorls; it remains oscillating, however. Septa endothyroid, slightly curved forward, delimiting irregular, subglobose chambers. Number of chambers in last whorl, 7 to 11. Septa are simple continuations of the spirotheca and show no thickening. Secondary deposits, low, continuous, on chamber floor, with more prominent blunt projection in last chamber. Wall calcareous secreted, a tectum with clear diaphanotheca. Aperture a low slit at base of apertural face.

*Remarks.*—As the diaphanotheca is very fragile, the wall is often recrystallized and has a granular appearance (often confused in the literature with agglutination).

*Type of genus.*—1860 *Nonionina globulus* d'Eichwald. Lethaea Rossica, v. 1, p. 350, pl. 22, fig. 17 a–c [=1959 *Globoendothyra pseudoglobulus* Reitlinger *in* Rauzer-Chernoussova and Fursenko. Osnovy Paleont., v. 1, p. 196, new name for 1878 *Endothyra globulus* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 25, no. 9, p. 98–101, pl. 4, fig. 4 a–e; pl. 13, figs. 1–4; not 1879 *Endothyra globulus* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 15–17, pl. 1, figs. 1–2; not 1880 *Endothyra globulus* von Möller. Mater. Geol. Russ., v. 9, p. 23, pl. 1, figs. 1 a–d and 2. As suggested by Rozovskaia (1963), there appears to be no basic distinction between 1878 *Endothyra globulus* von Möller and 1860 *Nonionina globula* d'Eichwald. Because both drawings are idealized, the case remains unclear.].

*Remarks.*—It is possible that *Plectogyra* Zeller 1950 has a diaphanotheca and hence that it would have priority over *Globoendothyra*. Examination of Zeller's type is inconclusive, however because its wall is completely recrystallized. Moreover, Zeller erected the genus on the basis of its coiling characteristic, which is now accepted to be that of *Endothyra*. Because he included in *Plectogyra* taxa that would be placed in at least three families and a dozen genera and because the holotype is recrystallized, *Globoendothyra* is used here as an expediency.

Taxa included in the genus *Globoendothyra:*

1954 *antoninae* Grozdilova and Lebedeva
1956 *archaediscoidea* Ganelina
1954 *arcuata* Grozdilova and Lebedeva
1961 *arctica* Voizhekovskaia
1959 *arguta* Durkina
1864 *baileyi* Hall
1969 ?*bridgensis* Skipp *in* McKee and Gutschick
1964 *callosa* Conil and Lys
1956 *celsa* Ganelina
1964 *delmeri* Conil and Lys
1966 *dilatata* Ganelina
1956 *dorogobuzhica* Ganelina
1959 ?*elegantula* Durkina
1964 *fusca* Conil and Lys
1969 ?*gutschicki* Skipp *in* McKee and Gutschick
1954 *inconstans* Grozdilova and Lebedeva
1948 *ishimica* Rauzer-Chernoussova
1956 *korbensis* Ganelina
1954 *magna* Grozdilova and Lebedeva (OBJ, preoccupied, 1948 *magna* Rauzer-Chernoussova)
1948 ?*mirifica* Rauzer-Chernoussova
1962 *mrassuensis* Lebedeva *in* Kalfina
1962 *mykutzkyi* Lebedeva *in* Kalfina
1954 *nevkiensis* Lebedeva
1948 *numerabilis* Vissarionova
1964 *ordinata* Conil and Lys
1967 *orelica* Vdovenko
1956 *ovalis* Ganelina
1948 *parva* Chernysheva (OBJ, preoccupied, 1878 *parva* von Möller
1948 *paula* Vissarionova
1950 ?*plectogyra* Zeller
1954 *tomiliensis* Grozdilova *in* Lebedeva
1957 *torquida* Zeller
1961 ?*tumida* Voizhekovskaia
1967 *ukrainica* Vdovenko

Three main groups can be recognized: the small, thin-walled to medium-thick-walled *Globoendothyra* of the group *G. tomiliensis* with few chambers per volution; the medium-sized, medium-thick-walled *Globoendothyra* of the group *G. baileyi* with numerous chambers; and the large to enormous, thick-walled *Globoendothyra* of the group *G. globulus.* Diaphanotheca and pores are poorly developed in the *baileyi* group, better developed in the *tomiliensis* group, and very conspicuous in the *globulus* group.

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America. Common.

An abundant taxon in the Tethyan, North American and Siberian-Alaskan realms.

Occurs for the first time in Early Viséan (primitive forms could exist in the latest Tournaisian?); abundant in Viséan and Namurian; scarce in Moscovian.

**Globoendothyra of the group G. baileyi (Hall 1864)**
Plate 32, figures 5–7

Group exemplified by:

1864. *Rotalia baileyi* Hall. Albany Inst. Trans., v. 4, p. 24, 34.
1876. *Endothyra bowmani* Brady. Palaeont. Soc. London Pub., v. 30, p. 92, 93 [part], pl. 5, fig. 3 [only].
1882. *Endothyra baileyi* Whitfield. Am. Mus. Nat. History Bull., v. 1, no. 3, p. 42, art. 5, pl. 9, figs. 34–36.
1931. *Endothyra baileyi* Henbest. Cushman Found. Foram. Research Contr., v. 7, pt. 4, p. 90–93.
1950. *Plectogyra* sp. Zeller. Kansas Univ. Paleont. Contr., Protozoa, art. 4, p. 15, 16, pl. 2, fig. 2; pl. 3, figs. 12–14.
1963. ?*Endothyra* sp. McKay and Green. Research Council Alberta Bull. 10, pl. 9, fig. 15.
1969. ?*Endothyra baileyi* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 198–199, pl. 17, figs. 28, 29; pl. 23, figs. 11, 12, 14, 15, 18, 19; pl. 24, figs. 13, 14.
1969. *Globoendothyra baileyi* Hewitt and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie, v. 78, pl. 1, figs. 11, 12.

*Diagnosis of the group.*—See *Globoendothyra.*

*Diagnosis of the Alaskan taxa.*—Test free, subrounded, slightly compressed laterally, with poorly defined umbilici. Proloculus followed by erratically coiled spire. Diameter 600$\mu$ to 1,200$\mu$ for adults which have 3½ to 4½ volutions. Nine to ten chambers in last whorl, exceptionally 8 or 11. Septa endothyroid, curved forward, delimiting subglobose chambers. Septa 20$\mu$ to 30$\mu$ thick, as spirotheca. Secondary deposits low, as floor covers, with a prominent projection in last chamber. Wall calcareous secreted. Tectum, with a poorly defined diaphanotheca. Aperture a low slit.

*Remarks.*—The species *Globoendothyra baileyi* is very common in the Early and Middle Viséan of the American midcontinent, but it appears to be very scarce in the Cordillera. Cordilleran counterparts are smaller, thinner, with fewer chambers. They are probably geographic variants, or could perhaps be a new species. At any rate, *Endothyra baileyi* Skipp, *E. baileyi bridgensis* Skipp, and *E. baileyi poloumera* Skipp all belong to the same group.

*Stratigraphic range and distribution.*—Eurasia and North America.

Dominant *Globoendothyra* group in Early and Early Middle Viséan time. Widespread in the American Cordillera [Debolt Formation of British Columbia (Zones 10 to 12), Turner Valley Formation of Alberta (Zones 10 and 11), and so forth].

In Alaska and the Yukon Territory, abundant in the middle and upper part of the Wachsmuth Limestone (Zones 10 to 12).

*Figured specimens*.—USNM 179436–179438.

#### Globoendothyra of the group G. tomiliensis (Grozdilova in Lebedeva 1954)

Plate 32, figures 8–14; plate 34, figures 1–6.

Group exemplified by:

1954. *Endothyra tomiliensis* Grozdilova *in* Lebedeva. VNIGRI Trudy 81, p. 264, 265, pl. 7, fig. 6, pl. 8, fig. 1.
1962. *Globoendothyra tomiliensis* Lebedeva *in* Kalfina. SNIIG-GIMS, Bull. 21, p. 110, pl. C2, fig. 12.

*Diagnosis*.—Test free, subglobular, compressed laterally, with distinct umbilici. Coiling involute, asymmetrical throughout. Diameters range from 600μ to 1,200μ, for three to five whorls. Chambers globular, asymmetrical, rounded, seven to eight in the last coil. Septa endothyroid, curved, 25μ to 35μ. Secondary deposits low, as floor covers, with projection in the last chamber. Wall calcareous secreted, a tectum with a well-defined diaphanotheca. Aperture a low basal slit.

*Stratigraphic range and distribution*.—Eurasia, north Africa, and North America

Common in Middle and Late Viséan. Scarce in the Namurian.

Abundant in Alaska in the uppermost part of the Wachsmuth and the lower part of the Alapah Limestone.

#### Globoendothyra paula (Vissarionova 1948)

Plate 32, figures 8–14; plate 34, figures 1–6

1948. *Endothyra paula* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 184, pl. 6, figs. 8, 9.
1948.? *Endothyra globulus* var. *parva* Chernysheva (OBJ, preoccupied by 1879 *Endothyra parva* von Möller). Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 247, pl. 18, figs. 5, 6.
1950. ?*Plectogyra plectogyra* Zeller. Kansas Univ. Paleont. Contr., Protozoa, art. 4, p. 15, 16, pl. 3, fig. 2.
1957. *Plectogyra* sp. Zeller. Jour. Paleontology, v. 31, no. 4, pl. 75, fig. 15; pl. 80, figs. 22, 23 [only].
1963. *Endothyra* sp. McKay and Green. Research Council Alberta Bull. 10, pl. 6, figs. 16, 19; pl. 8, fig. 2; pl. 9, figs. 7, 15.
1963. *Endothyra incrassata* McKay and Green. Research Council Alberta Bull. 10, p. 32, pl. 7, figs. 10, 11, 17.
1962. [not] *Globoendothyra parva* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 151, 152, pl. 5, fig. 5.
1969. ?*Endothyra plectogyra* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, pl. 26, figs. 13, 14, 17, 18.

*Diagnosis*.—Test free, subglobular, compressed laterally, with faint umbilici. Proloculus followed by erratically coiled spirotheca. Diameter 600μ to 850μ, exceptionally, as much as 1 mm. Width 500μ to 650μ, for 3½ to 4 volutions. Chambers subrounded, seven to eight in last whorl. Septa endothyroid, curved, oblique, 20μ to 25μ. Aperture a low basal slit.

*Stratigraphic range and distribution*.—Eurasia, north Africa, and North America.

Reported from the Middle Viséan to the Namurian in the Russian Platform. A common taxon in the St. Louis and Ste. Genevieve Limestones of the American midcontinent. Also abundant in the American Cordillera in the Middle and the Late Viséan. Scarce in the Namurian.

In Alaska, a common species in the uppermost Wachsmuth Limestone and in the lower and middle part of the Alapah Limestone.

*Figured specimens*.—USNM 179439–179445; 179462–179467.

### Family GLOBOENDOTHYRIDAE? Reitlinger 1959
### Genus SKIPPELLA Mamet 1974

1948. *Endothyra* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 246 [part].
1950. *Endothyra* Zeller. Kansas Univ., Paleont. Contr., Protozoa, art. 4, no text, pl. 3, fig. 14 [only].
1954. *Endothyra* Lebedeva. VNIGRI Trudy 81, p. 260 [only].
1954. *Parastaffella* Grozdilova *in* Lebedeva. VNIGRI Trudy 81, p. 275–280 [part].
1955. ?*Endothyra* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 73 [part].
1958. *Endothyra* Woodland. Jour. Paleontology, v. 32, no. 5, p. 802 [part].
1961. *Endothyra* Voizhekovskaia. NIIGA, Bull. 24 Sbornik Stat. Paleob. Biostrat., p. 21 [part].
1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 31 [part].
1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 166 [part].
1967. *Eoendothyranopsis* Brazhnikova and Rostovceva *in* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 12–15 [part].
1968. *Eoendothyranopsis*? Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 548.
1969. *Endothyra* (*Globoendothyra*) Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 210.
1970. *Endothyra* Mamet. Canada Geol. Survey Paper 70–21, p. 92 [part].
1974. *Skippella* Mamet. Jour. Foram. Research, v. 4, no. 4, p. 201.

*Diagnosis*.—Test free, discoidal, laterally compressed. Axial outline as in *Eoendothyranopsis*. Umbilici poorly defined. Proloculus followed by erratically coiled spirotheca, then by two or three regular

Dominant *Globoendothyra* group in Early and Early Middle Viséan time. Widespread in the American Cordillera [Debolt Formation of British Columbia (Zones 10 to 12), Turner Valley Formation of Alberta (Zones 10 and 11), and so forth].

In Alaska and the Yukon Territory, abundant in the middle and upper part of the Wachsmuth Limestone (Zones 10 to 12).

*Figured specimens.*—USNM 179436–179438.

**Globoendothyra of the group G. tomiliensis (Grozdilova in Lebedeva 1954)**

Plate 32, figures 8–14; plate 34, figures 1–6.

Group exemplified by:

1954. *Endothyra tomiliensis* Grozdilova *in* Lebedeva. VNIGRI Trudy 81, p. 264, 265, pl. 7, fig. 6, pl. 8, fig. 1.
1962. *Globoendothyra tomiliensis* Lebedeva *in* Kalfina. SNIIG-GIMS, Bull. 21, p. 110, pl. C2, fig. 12.

*Diagnosis.*—Test free, subglobular, compressed laterally, with distinct umbilici. Coiling involute, asymmetrical throughout. Diameters range from 600$\mu$ to 1,200$\mu$, for three to five whorls. Chambers globular, asymmetrical, rounded, seven to eight in the last coil. Septa endothyroid, curved, 25$\mu$ to 35$\mu$. Secondary deposits low, as floor covers, with projection in the last chamber. Wall calcareous secreted, a tectum with a well-defined diaphanotheca. Aperture a low basal slit.

*Stratigraphic range and distribution.*—Eurasia, north Africa, and North America

Common in Middle and Late Viséan. Scarce in the Namurian.

Abundant in Alaska in the uppermost part of the Wachsmuth and the lower part of the Alapah Limestone.

**Globoendothyra paula (Vissarionova 1948)**

Plate 32, figures 8–14; plate 34, figures 1–6

1948. *Endothyra paula* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 184, pl. 6, figs. 8, 9.
1948.? *Endothyra globulus* var. *parva* Chernysheva (OBJ, preoccupied by 1879 *Endothyra parva* von Möller). Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 247, pl. 18, figs. 5, 6.
1950. ?*Plectogyra plectogyra* Zeller. Kansas Univ. Paleont. Contr., Protozoa, art. 4, p. 15, 16, pl. 3, fig. 2.
1957. *Plectogyra* sp. Zeller. Jour. Paleontology, v. 31, no. 4, pl. 75, fig. 15; pl. 80, figs. 22, 23 [only].
1963. *Endothyra* sp. McKay and Green. Research Council Alberta Bull. 10, pl. 6, figs. 16, 19; pl. 8, fig. 2; pl. 9, figs. 7, 15.
1963. *Endothyra incrassata* McKay and Green. Research Council Alberta Bull. 10, p. 32, pl. 7, figs. 10, 11, 17.
1962. [not] *Globoendothyra parva* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 151, 152, pl. 5, fig. 5.
1969. ?*Endothyra plectogyra* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, pl. 26, figs. 13, 14, 17, 18.

*Diagnosis.*—Test free, subglobular, compressed laterally, with faint umbilici. Proloculus followed by erratically coiled spirotheca. Diameter 600$\mu$ to 850$\mu$, exceptionally, as much as 1 mm. Width 500$\mu$ to 650$\mu$, for 3½ to 4 volutions. Chambers subrounded, seven to eight in last whorl. Septa endothyroid, curved, oblique, 20$\mu$ to 25$\mu$. Aperture a low basal slit.

*Stratigraphic range and distribution.*—Eurasia, north Africa, and North America.

Reported from the Middle Viséan to the Namurian in the Russian Platform. A common taxon in the St. Louis and Ste. Genevieve Limestones of the American midcontinent. Also abundant in the American Cordillera in the Middle and the Late Viséan. Scarce in the Namurian.

In Alaska, a common species in the uppermost Wachsmuth Limestone and in the lower and middle part of the Alapah Limestone.

*Figured specimens.*—USNM 179439–179445; 179462–179467.

**Family GLOBOENDOTHYRIDAE? Reitlinger 1959**
**Genus SKIPPELLA Mamet 1974**

1948. *Endothyra* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 246 [part].
1950. *Endothyra* Zeller. Kansas Univ., Paleont. Contr., Protozoa, art. 4, no text, pl. 3, fig. 14 [only].
1954. *Endothyra* Lebedeva. VNIGRI Trudy 81, p. 260 [only].
1954. *Parastaffella* Grozdilova *in* Lebedeva. VNIGRI Trudy 81, p. 275–280 [part].
1955. ?*Endothyra* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 73 [part].
1958. *Endothyra* Woodland. Jour. Paleontology, v. 32, no. 5, p. 802 [part].
1961. *Endothyra* Voizhekovskaia. NIIGA, Bull. 24 Sbornik Stat. Paleob. Biostrat., p. 21 [part].
1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 31 [part].
1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 166 [part].
1967. *Eoendothyranopsis* Brazhnikova and Rostovceva *in* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 12–15 [part].
1968. *Eoendothyranopsis*? Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 548.
1969. *Endothyra* (*Globoendothyra*) Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 210.
1970. *Endothyra* Mamet. Canada Geol. Survey Paper 70–21, p. 92 [part].
1974. *Skippella* Mamet. Jour. Foram. Research, v. 4, no. 4, p. 201.

*Diagnosis.*—Test free, discoidal, laterally compressed. Axial outline as in *Eoendothyranopsis*. Umbilici poorly defined. Proloculus followed by erratically coiled spirotheca, then by two or three regular coils. Periphery smooth, subrounded, not keeled. Three and a half to five volutions in adult specimens. Eight to 12 chambers in last whorl. Chambers irregular, sutures well defined. Septa endothyroid, irregular, 50°–75° from spirotheca. Secondary deposits as projections curved forward formed in ultimate chamber and residual in penultimate chamber. Wall calcareous secreted with poorly defined diaphanotheca. Pores probably present. Aperture a low slit at base of apertural face.

*Remarks*.—The genus is transitional between *Globoendothyra* and *Eoendothyranopsis*. It is readily distinguished from these genera by its coiling in two parts.

*Type of genus*.—1969 *Endothyra* (*Globoendothyra*) *redwallensis* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 210, pl. 26, figs. 3–12, 15, 16?.

Taxa included in the genus *Skippella:*

- 1964 *arctata* Conil and Lys
- 1967 *donica* Brazhnikova and Rostovceva
- 1967 evoluta Brazhnikova and Rostovceva (OBJ, infrasubspecific)
- 1963 *flatile* McKay and Green
- 1958 *hamula* Woodland
- 1961 ?*juliusi* Voizhekovskaia
- 1967 lata Brazhnikova and Rostovceva (OBJ, infrasubspecific)
- 1961 *magna* Voizhekovskaia (OBJ, preoccupied 1948 *magna* Rauzer-Chernoussova)
- 1969 *redwallensis* Skipp *in* McKee and Gutschick
- 1948 *staffeliformis* Chernysheva
- 1955 ?*transita* Lipina

*Stratigraphic range and distribution*.—Scarce in Eurasia. Common in North America.

Although reported by Chernysheva (1948) from the "Late Tournaisian," the genus develops only in Viséan time. It has a short acme in Middle Viséan time. Last occurrence in earliest Late Viséan.

**Skippella cf. S. redwallensis (Skipp in McKee and Gutschick 1969)**

Plate 30, figures 1–3, 6, 12

1954. *Endothyra* ex gr. *crassa* Lebedeva. VNIGRI Trudy 81, p. 260, pl. 6, fig. 4.

1969. *Endothyra* (*Globoendothyra*) *redwallensis* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 210, pl. 26, figs. 3–12, 15, 16?.

*Diagnosis*.—Test free, discoidal, laterally compressed with poorly defined umbilici. Proloculus $30\mu$ to $50\mu$, followed by erratically coiled spirotheca. Later two or three coils regular, planispiral, involute. Diameter $600\mu$ to $900\mu$, $700\mu$ in average. Form ratio 1/0.45 to 1/0.55. Expansion of the coil in two parts: glomospiral part, tight; planispiral part, moderate. Chambers irregular, endothyroid, with septa at 50°–60° from spirotheca. Septa medium to long, irregular in shape, with possible tip thickenings. Number of chambers variable, 9 to 12. Secondary deposits poorly developed, a more or less resorbed anteriorly curved spine in last chamber. Wall calcareous secreted, $20\mu$ to $25\mu$, with a poorly defined diaphanotheca. Pores present. Aperture a slit at base of apertural face.

*Remarks*.—The forms observed in Alaska usually have a slightly but consistently lower number of chambers than in the material described by Skipp (1969).

In equatorial section, the American material is closely allied to *Skippella staffeliformis* described by Chernysheva; it differs only by a smaller form ratio.

*Stratigraphic range and distribution*.—Central Asia and North America (mostly in the western Cordilleran).

Late Early and Middle Viséan.

In Alaska and the Yukon Territory, it is abundant in the uppermost part of the Wachsmuth Limestone and the basal part of the Alapah Limestone (Zones 12 and 13).

*Figured specimens*.—USNM 179409, 179410; Univ. Montréal 205/38, 206/3.

**Family ENDOTHYRANOPSIDAE Reitlinger 1959**

**Genus EOENDOTHYRANOPSIS Reitlinger and Rostovceva 1966**

1950. *Endothyra* Zeller. Kansas Univ. Paleont. Contr.. Protozoa, art. 4, p. 3 [part]. pl. 3, figs. 1, 3, 6–11, 13; pl. 4, figs. 3–5, 10–14 [only].

1954. *Parastaffella* Grozdilova *in* Lebedeva. VNIGRI Trudy 81, p. 275–277 [part].

1954. *Parastaffella* Lebedeva. VNIGRI Trudy 81, p. 277–280 [part].

1957. *Endothyra* Zeller. Jour. Paleontology, v. 31, no. 4, p. 700–702 [part].

1958. *Endothyra* Armstrong. Jour. Paleontology, v. 32, no. 5, p. 973–975.

1958. *Endothyra* Woodland. Jour. Paleontology, v. 32, no. 5, p. 799–802 [part].

1961. *Endothyra* Voizhekovskaia. NIIGA, Bull. 24, Sbornik Stat. Paleob. Biostrat., p. 17–21 [part].

1961. *Endothyra* Skipp. U.S. Geol. Survey Prof. Paper 424–C, p. C241 [part].

1961. *Mediocris* Rozovskaia. Paleont. Zhur., no. 3, p. 20 [part].

1961. *Endothyra* Toomey. Cushman Found. Foram. Research Contr., v. 12, pt. 1, p. 26.

1962. *Pseudoendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 157 [part].

1962. *Pseudoendothyra* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 113.

1963. *Paramillerella* Anisgard and Campau. Cushman Found. Foram. Research Contr., v. 14, pt. 3, p. 102–107 [part].

tion. Septa of medium length, anteriorly directed, 65°–80° from the spirotheca. Wall dark, fine grained, with a poorly defined, discontinuous diaphanotheca; $15\mu$ to $22\mu$ in thickness. Pores probably present? Basal deposits poor, usually as single curved projection in last chamber. Aperture a low slit at base of apertural face.

*Remarks.*—Zeller (1957) originally included in his *spiroides* taxon, specimens reaching 1 mm in diameter; these are considered to be an independent species belonging to the "*spiroides* group."

*Stratigraphic range and distribution.*—Quite abundant in the Salem Limestone of the American midcontinent. Quite abundant in the North American Cordillera. In Alaska, present in the middle and upper part of the Wachsmuth Limestone (Zones 10? to 12).

*Figured specimens.*—USNM 179415, 179416.

**Eoendothyranopsis hinduensis (Skipp in McKee and Gutschick 1969)**

Plate 30, figures 7, 10, 11

1957. *Endothyra spiroides* Zeller. Jour. Paleontology, v. 31, no. 4, p. 702 [part], pl. 76, figs. 6, 7 [only].
1969. *Eomillerella hinduensis* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 219, pl. 27, figs. 19, 20, 22, 24.

*Diagnosis.*—Test free, discoidal, with well-marked umbilics. Form ratio around 1/0.5. Proloculus round, $20\mu$ to $40\mu$, followed by a planispiral, completely involute spirotheca. Diameter $700\mu$ to $1{,}000\mu$ (exceptionally more) for four to five volutions. Rate of uncoiling moderate. Periphery subrounded. Chambers, 12 to 13, exceptionally 14, in last volution. Septa of moderate length, anteriorly directed, 65°–80° from spirotheca. Wall dark, calcareous secreted, fine grained with poorly defined diaphanotheca, $15\mu$ to $28\mu$. Pores probably present? Basal deposits poorly developed, with anteriorly directed projection in last chamber. Aperture low, simple, crescentiform, at base of apertural face.

*Stratigraphic range and distribution.*—Observed, up to now, only in North America.

Quite abundant in upper part of the Salem Limestone and time equivalents in the midcontinent. Present in the Cordilleran in Early? and Middle Viséan.

*Figured specimens.*—USNM 179412–179414.

**Eoendothyranopsis of the group E. rara (Grozdilova in Lebedeva 1954)**

Plate 31, figures 2–9

Group exemplified by:

1954. *Parastaffella rara* Grozdilova *in* Lebedeva. VNIGRI Trudy 81, p. 275, 276, pl. 10, fig. 7 [not 6].
1954. *Parastaffella pressa* Grozdilova *in* Lebedeva. VNIGRI Trudy 81, p. 276, 277, pl. 10, fig. 5 [holotype crushed].
1962. *Pseudoendothyra rara* Lebedeva *in* Kalfina. SNIIGGIMS Bull. 21, p. 113.
1963. *Mediocris pressa* Rozovskaia. Akad. Nauk SSSR Inst. Paleont. Trudy 97, p. 32.
1963. *Mediocris rara* Rozovskaia. Akad. Nauk SSSR Inst. Paleont. Trudy 97, p. 32.
1964. *Eoendothyranopsis pressus* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 8, p. 52.
1966. *Eoendothyranopsis pressa* Reitlinger and Rostovceva *in* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontology, no. 10, p. 55, 56.
1967. *Eoendothyranopsis subtilis* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 18, p. 31, 32, pl. 1, figs. 4, 5, pl. 2, figs. 6, 7.
1970. [not]*Eoendothyranopsis rara* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 104.

*Diagnosis.*—Group is recognized by its smaller number of chambers (usually 9 to 10), form ratio ranging from 1/0.3 to 1/0.5, and well-defined diaphanotheca. Secondary deposits are poorly developed.

*Remarks.*—*Eoendothyranopsis pressa,* the type species of which is crushed, is considered synonymous with *E. rara.*

*Stratigraphic range and distribution.*—Eurasia and North America.

Abundant in the Kuznetz-North American realm.

Occurs for the first time in Middle Viséan, where it has a rapid and characteristic acme. Extinct in middle Late Viséan at the Zones $15\text{-}16_{\text{inf}}$ boundary.

*Figured specimens.*—USNM 179419, 179420, 179422, 179426.

**Eoendothyranopsis scitula (Toomey 1961)**

Plate 31, figures 4, 6–8

1950. *Endothyra* sp. Zeller. Kansas Univ. Paleont. Contr., Protozoa, art. 4, no text, pl. 3, figs. 7, 8, 10, 11; pl. 4, figs. 3, 10, 14; pl. 6, fig. 8b.
1957. *Endothyra symmetrica* Zeller. Jour. Paleontology, v. 31, no. 4, p. 701, pl. 75, figs. 14, 18, 19; pl. 78, figs. 8, 9; pl. 80, fig. 6 [not 1949 *Endothyra symmetrica* Morozova].
1958. *Endothyra symmetrica* Woodland. Jour. Paleontology, v. 32, no. 5, p. 800, pl. 101, figs. 7, 9 [not 10].
1961. *Endothyra scitula* Toomey. Cushman Found. Foram. Research Contr., v. 12, pt. 1, p. 26.
1961. *Endothyra* cf. *E. symmetrica* Skipp. U.S. Geol. Survey Prof. Paper 424–C, p. C241.
1963. *Endothyra zelleri* McKay and Green. Research Council Alberta Bull. 10, p. 41, 42, pl. 7, figs. 7, 12–14.
1969. *Eomillerella scitula* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 220, 221, pl. 26, figs. 7–12, 14 [not 13].
1970. [not] *Plectogyra symmetrica* Hallet. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, v. 3, p. 896, pl. 6, fig. 6.

*Diagnosis.*—Test free, discoidal, laterally compressed, with well-marked umbilics. Form ratio

1/0.5 to 1/0.65. Proloculum ($25\mu$ to $35\mu$) followed by involute planispirally coiled spirotheca. Maximum diameter for adult specimens ranges from $450\mu$ to $700\mu$ and from 4 to 4½ whorls. Periphery subrounded. Rate of expansion moderate. Nine to 10 chambers in last whorl, exceptionally 8. Septa oblique, endothyroid, 50°–70° from spirotheca. Wall calcareous secreted, fine grained with well-defined "clear layer;" $15\mu$ to $22\mu$. Thin pores conspicuous. Basal deposits low; an anteriorly directed projection in last chamber and a resorbed spine in penultimate chamber. Aperture low, crescentiform, basal.

*Remarks.*—In equatorial section, *Eoendothyranopsis scitula* is identical to *Eoendothyranopsis rara;* these taxa can only be separated by an axial section; *scitula* has a higher form ratio and more rounded periphery. Because both taxa are known in the same zone, it is possible that they could be mere geographic variants.

*Stratigraphic range and distribution.*—Abundant in the late Middle and earliest Late Viséan of North America, in the St. Louis Limestone of the midcontinent, and in its time equivalents in the Cordillera. It is therefore a useful index for recognizing the middle part of the Meramec Group in North America (Petryk and others, 1970).

In Alaska and the Yukon Territory, the species is present in the lower part of the Alapah Limestone.

*Figured specimens.*—USNM 179421, 179423–179425.

**Eoendothyranopsis of the group E. ermakiensis (Lebedeva 1954)**

Plate 31, figure 10

Group exemplified by:

1954. *Parastaffella ermakiensis* Lebedeva. VNIGRI Trudy 81, p. 279, 280, pl. 11, figs. 1, 4 [not 5].
1957. *Endothyra sp.* Zeller. Jour. Paleontology, v. 31, no. 4, no text, pl. 75, fig. 16.
1963. *Endothyra* sp. McKay and Green. Research Council Alberta Bull. 10, no text, pl. 6, fig. 13.
1966. *Eoendothyranopsis ermakiensis* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 10, p. 57.
1970. [not] *Eoendothyranopsis ermakiensis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 104, pl. 8, fig. 6.

*Diagnosis.*—Group characterized by subglobose axial section (form ratio ranging from 1/0.6 to 1/0.9), a very well defined diaphanotheca with conspicuous pores, and well-defined secondary deposits simulating pseudochomata.

*Remarks.*—The phylogenic development of *Eoendothyranopsis* is strikingly similar to that of *Endothyranopsis* although they do not have the same age. Hence the group *Eoendothyranopsis ermakiensis* in its most advanced forms (*Eoendothyranopsis utahensis* Zeller) shows a characteristic thickening of the septa, similar to that observed in *Endothyranopsis crassa.*

*Stratigraphic range and distribution.*—Eurasia and North America.

Occurs for the first time in Zone 13. Short acme in Zones 14 and 15 and extinct at the boundary between Zones 15 and $16_{inf}$ when the *Brunsia* facies is not present.

*Figured specimen.*—USNM 179427.

**Eoendothyranopsis ermakiensis (Lebedeva 1954)**

Plate 31, figure 10

*Synonymy.*—See above, exemplifying the group.

*Diagnosis.*—Test free, discoidal, subglobose, with faint umbilics. Form ratio 1/0.6 to 1/0.7. Proloculus big ($50\mu$ to $100\mu$) followed by involute planispirally coiled spirotheca. Rate of expansion moderate. Periphery round, smooth. Four to five whorls in adult specimens. Diameter $700\mu$ to $1{,}000\mu$. Nine to 11 chambers in last whorl. Septa endothyroid, simple continuation of the wall, 65°–80° from spirotheca. Secondary deposits well marked, as heavy, thick, double hooks simulating pseudochomata. Hooks present in last chamber. Wall calcareous secreted, $20\mu$ to $25\mu$ with well-defined "clear layer." Pores present. Aperture crescentiform, at base of apertural face.

*Stratigraphic range and distribution.*—Eurasia and North America.

Occurs for the first time in Zone 13, where it is scarce. Abundant in Zones 14 and 15. Rapid extinction at the boundary between Zones 15 and $16_{inf}$.

*Figured specimen.*—USNM 179427.

**Eoendothyranopsis? sp.**

Plate 31, figures 12–13

*Diagnosis.*—Test free, discoidal, laterally compressed. Umbilics faintly depressed. Form ratio 1/0.3 to 1/0.35. Proloculus $40\mu$ to $50\mu$, followed by involute, tightly coiled spire. Periphery subrounded. Four to five whorls in mature specimens. Diameter $400\mu$ to $600\mu$. Eleven to 12 chambers in last whorl. Septa cuneiform, pointed, very oblique, 45°–60° from spirotheca. Secondary deposits not known. Wall calcareous secreted $15\mu$ to $20\mu$, with poorly defined diaphanotheca. Aperture crescentiform, a low slit at base of apertural face.

*Remarks.*—This species is obviously transitional between *Eoendothyranopsis* of the group *E. spiroides* and *Banffella.* Because only three well-oriented sections are known and because the existence of secondary deposits remains debatable, the nomenclature remains open.

*Stratigraphic range and distribution.*—Not reported in the literature, and the taxon was observed by the author for the first time.

Present in Alaska at the base of the Alapah Limestone (Zone 13). This position further confirms the hypothesis that it is a link between the Zones 10 to 12 *Eoendothyranopsis spiroides* group and the Zones 14 and 15? *Banffella.*

*Figured specimens.*—USNM 179428, 179429.

#### Endothyranopsidae?

Plate 31, figures 1, 11

*Diagnosis.*—Test free, discoidal, laterally compressed, with well-defined umbilici. Proloculus spherical, 35μ to 55μ, followed by involute erratically coiled first coil, then by regular involute spirotheca. Chambers subquadratic, 11 to 12 in last coil of adult specimens. Maximum diameter 450μ to 500μ for 3½ to 4 whorls. Periphery subrounded. Rate of expansion moderate. Septa oblique, 50°–60° from spirotheca. Wall calcareous, fine grained, dark, a tectum, 8μ to 12μ. No diaphanotheca or pores visible. Basal deposit as single anteriorly curved projection. Aperture low, crescentiform, basal.

*Remarks.*—By its morphology, this taxon is very similar to *Eoendothyranopsis* of the group *E. spiroides* and to *Skippella.* However, that it would be an Endothyranopsidae is doubtful, because no diaphanotheca is visible. No similar forms have been described from the literature. Only four good specimens are known of this puzzling taxon whose taxonomy remains open.

*Stratigraphic range and distribution.*—Not reported in the literature.

Presently only known from the upper part of the Wachsmuth Limestone and from the basal part of the Alapah Limestone (Middle Viséan Zones 12 and 13).

*Figured specimens.*—USNM 179417, 179418.

#### Genus ENDOTHYRANOPSIS Cummings 1955

1870. *Involutina* Brady *in* Moore. British Assoc. Adv. Sci., London, Rept., 39th Mtg., p. 379, 382.

1876. *Endothyra* Brady. Paleont. Soc. London Pub., v. 30, p. 97.

1878. *Endothyra* von Möller. St. Petersbourg Acad. Imp. Sci. Mém. sér. 7, v. 25, no. 9, p. 93–95 [only].

1880. *Endothyra* von Möller. Mat. Geol. Russ., v. 9, p. 19, 20.

1889. *Endothyra* Venukov. Zapiski Mineral. obshchestva, ser. 2, no. 25, p. 214.

1936. *Endothyra* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger. Akad. Nauk SSSR, Poliarnia Komissia, Trudy 28, p. 208–210.

1948. *Endothyra* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 166–168.

1950. *Endothyra*? Zeller. Kansas Univ. Paleont. Contr., Protozoa, art. 4, no text, pl. 3, fig. 4 [only].

1954. *Endothyra* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 91–93.

1954. *Endothyra* Lebedeva. VNIGRI Trudy 81, p. 259, 260.

1955. *Endothyranopsis* Cummings. Washington Acad. Sci. Jour., v. 45, no. 1, p. 1.

1956. *Endothyra* Ganelina. VNIGRI Trudy 98, p. 99, 100.

1956. *Endothyra* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, no text, pl. 6, figs. 4, 5, 8.

1956. *Endothyra* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 43.

1957. *Plectogyra* Zeller. Jour. Paleontology, v. 31, no. 4, p. 697 [part], p. 700 [part].

1957. *Endothyra* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 113, 114.

1958. ?*Endothyranopsis* Fomina. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 121–123.

1959. *Endothyra* Durkina. VNIGRI Trudy 136, p. 183–186 [part].

1959. *Endothyranopsis* Voloshina and Reitlinger *in* Rauzer-Chernoussova and Fursenko. Osnovy Paleontologii, Part 1, p. 113, 114.

1960. *Endothyranopsis* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 72–77.

1961. *Plectogyra* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 221 [part].

1961. *Endothyranopsis* Cummings. Great Britain Geol. Survey Bull. 18, p. 121.

1961. *Endothyranopsis* Voizhekovskaia. NIIGA, Bull. 24, p. 39.

1962. *Endothyranopsis* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 111.

1962. *Endothyranopsis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 152, 153.

1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 30 [part], p. 37 [part].

1963. *Endothyranopsis* Rozovskaia. Akad. Nauk SSR Inst. Paleontologii Trudy 97, p. 28, 54–58.

1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém. v. 23, p. 187 [part], p. 192 [part].

1964. *Endothyranopsis* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 150.

1964. *Endothyranopsis* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, p. 194, 195, pl. 3, fig. 38.

1964. *Endothyranopsis* Loeblich and Tappan. Treatise Invert. Paleont., Protista, p. C352 [part].

1965. *Endothyranopsis* Okimura. Hiroshima Univ. Geol. Rept., no. 14, p. 258–262 [part].

1967. *Endothyranopsis* Brazhnikova *in* Brazhnikova and others. Akad. Nauk Ukrain. SSR Geol. Inst. Trudy, p. 152, 153.

1967. *Endothyranopsis* Brazhnikova and others. Akad. Nauk Ukrain. SSR Geol. Inst. Trudy, p. 201.

1967. *Endothyranopsis* Brazhnikova and Rostovceva. Akad. Nauk Ukrain. SSR Geol. Inst. Trudy, p. 15, 16 [part].

1968. *Endothyranopsis* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 546–554 [part].

1968. *Endothyranopsis* Mamet. Rev. Micropaléontologie, v. 11, no. 3, p. 134.
1969. *Endothyranopsis* Dvorak and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, p. 94.
1969. *Endothyranopsis* Solovieva. NIIGA, Uchennye Zapiski Paleont. Biostrat., Bull. 28, p. 12.
1969. *Endothyranopsis* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 215, 216.
1969. *Endothyranopsis* Vdovenko. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 11, p. 35–40 [part].
1969. *Plectogyra* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 49 [part].
1970. *Endothyranopsis* Mamet. Canada Geol. Survey Paper 70–21, p. 35, 36.
1970. *Endothyranopsis* Hallet. 6ème Cong. Avanc. Strat., Carb., Compte Rendu, p. 898.

*Diagnosis.*—Test free, discoidal to globular. Proloculus followed by planispiral, involute, rapidly expanding coil. Small axial deviation in the primitive forms. Septa anteriorly directed; in phylogenic development they show a characteristic progressive thickening and become as much as three times thicker than spirotheca. No (or very faint) secondary deposits. Wall calcareous secreted, thinly perforated, hence fragile and often recrystallized. Primary aperture, a low slit at base of apertural face. Secondary intraseptal apertures developed in most advanced forms.

*Type of genus.*—1870 *Involutina crassa* Brady *in* Moore. British Assoc. Adv. Sci., London, Sept., 39th Mtg., p. 379–382.

Taxa included in the genus *Endothyranopsis:*

1963 *arrecta* McKay and Green
1936 *compressa* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger
1948 *convexa* Rauzer-Chernoussova [part]
1969 *eocompressa* Skipp *in* McKee and Gutschick
1964 *foeda* Conil and Lys
1965 *hirosei* Okimura
1948 *intermedia* Rauzer-Chernoussova
1964 *kuhnei* Conil and Lys
1948 *mosquensis* Rauzer-Chernoussova
1957 ?*nevadaensis* Zeller
1936 *pechorica* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger
1967 *plana* Brazhnikova *in* Brazhnikova and others
1948 *rossica* Rauzer-Chernoussova
1936 *sphaerica* Rauzer-Chernoussova and and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger
1959 ?*substricta* Durkina
1956 *umbonata* Ganelina

*Remarks.*—Considered feminine by most of the authors and recorded as such by the British Museum of Natural History.

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America.

Very abundant in the Tethys. Scarcer in North America.

Occurs for the first time in Middle Viséan, and is of paramount importance for the zonation of the Late Viséan and earliest Namurian. Scarce in Middle Namurian. Last recorded occurrence Late Namurian?

**Endothyranopsis compressa (Rauzer-Chernoussova and Reitlinger 1936)**

Plate 34, figures 7–10

1936. *Endothyra crassa* var. *compressa* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger. Akad. Nauk SSSR, Poliarna Komissia, Trudy 28, p. 209, pl. 6, figs. 1, 2.
1948. *Endothyra crassa compressa* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 166, pl. 4, figs. 5–7.
1948. *Endothyra crassa rossica* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 167.
1949. [not] *Endothyra bradyi compressa* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 156, pl. 1, fig. 6 a–b.
1954. *Endothyra compressa* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 93, pl. 9, fig. 4.
1954. *Endothyra compressa* Lebedeva. VNIGRI Trudy 81, p. 259, 260, pl. 6, figs. 2, 3.
1957. *Plectogyra* sp. Zeller. Jour. Paleontology, v. 31, no. 4, pl. 80, fig. 10 [only].
1957. *Endothyra crassa compressa* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 113, 114, pl. 2, figs. 23–25.
1959. *Endothyra compressa* Durkina. VNIGRI Trudy 136, p. 185, 186, pl. 14, figs. 2, 3.
1960. *Endothyranopsis compressus* Grozdilova and Lebedva. VNIGRI Trudy 150, p. 73, 74, pl. 7, fig. 1.
1961. *Endothyranopsis compressus* Cummings. Great Britain Geol. Survey Bull. 18, p. 121.
1963. *Endothyra arrecta* McKay and Green. Research Council Alberta Bull. 10, p. 30, pl. 9, figs. 9, 10, pl. 10, fig. 11.
1963. *Endothyranopsis compressa* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 57, pl. 10, figs. 3–9, pl. 11, figs. 1, 2.
1964. *Endothyranopsis crassus* var. *compressa* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 150, pl. 22, figs. 436, 437.
1965. *Endothyranopsis compressus* Okimura. Hiroshima Univ. Geol. Rept., no. 14, p. 260, 261, pl. 21, figs. 5–7.
1967. [not] *Endothyranopsis compressus plana* Brazhnikova *in* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, p. 152, 153, pl. 49, figs. 1–4, 10, 11.

1967. *Endothyranopsis compressus* var. *compressa* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, p. 201, pl. 12, figs. 2, 3.
1969. *Plectogyra* aff. *campinei* Pelhate. Soc. Géol. Minéral Bretagne Bull., p. 49, pl. 4, fig. 46.
1969. *Endothyranopsis compressa* Solovieva. NIIGA Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12, pl. 1, figs. 14–16.
1969. *Endothyranopsis compressa compressa* Vdovenko. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 11, p. 35, pl. 2, fig. 13.
1969. *Endothyranopsis eocompressa* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 215, 216 [part], pl. 28, figs. 16, 17, 19, 20 [only], [not the holotype, fig. 22].
1970. *Endothyranopsis compressa* Hallet. 6ème Cong. Avanc. Strat. Carl., Compte Rendu, p. 898, pl. 7, fig. 4, not 3.

*Diagnosis.*—Test free, discoidal, subglobular. Proloculus followed by planispiral, involute, rather rapidly expanding coil. First volution askew to erratic. Diameter 500μ to 800μ (exceptionally more) for mature shells, 300μ to 400μ for immature forms of three whorls. Ratio of height to width ranges from 1.5 to 1.25. Septa endothyroid, anteriorly directed, simple continuation of spirotheca, with practically no thickening. Six to nine chambers in last whorl (usually seven to eight). No secondary deposits. Wall calcareous secreted, with poor development of very thin pores, 15μ to 25μ in thickness. Aperture a low slit at base of apertural face. No known secondary apertures.

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America. Very common in the Tethys.

First occurrence in Middle Viséan (reports of this species in earlier strata are erroneous) and very abundant from Zone 13 and upwards.

It appears to be the ancestral form of the *Endothyranopsis hirosei–Endothyranopsis crassa–Endothyranopsis sphaerica* lineage, and is therefore of particular importance for the zonation of the Viséan.

In Alaska, the species is known in the basal and middle part of the Alapah Limestone and in the Kogruk Formation.

*Figured specimens.*—USNM 179468–179470; Univ. Montréal 206/6.

#### Family PSEUDOENDOTHYRIDAE Mamet in Mamet, Mikhailov, and Mortelmans 1970

#### Genus PSEUDOENDOTHYRA Mikhailov 1939

1873. *Endothyra* Brady. Scotland Geol. Survey Mem., Explan. sheet 23, p. 63 (OBJ) [part].
1876. *Endothyra* Brady. Palaeont. Soc. London Pub., v. 30, p. 99 [only].
1877. ?*Fusulinella* von Möller. Neues Jahrb. Mineralogie, Geologie u. Paläontologie, p. 144–146.
1878. *Fusulinella* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 25, no. 9, p. 111–114.
1879. *Fusulinella* von Möller. St. Petersburg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 22.
1880. *Fusulinella* von Möller. Mat. Geol. Russ., v. 9, p. 31, 36 [part].
1924. *Fusulinella* Colani. Géol. Indochine Service Mém., v. 11, pt. 1, p. 76 [only].
1927. *Endothyra* Harlton. Jour. Paleontology, v. 1, no. 1, p. 20 [part].
1928. *Orobias* Galloway and Harlton. Jour. Paleontology, v. 2, no. 3, p. 348–352 [part].
1934. *Staffella* Dutkevitch. Trudy NGRI, ser. A, no. 36, p. 22–26 [part].
1939. *Pseudoendothyra* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 54, 55.
1947. *Staffella* Thompson. Jour. Paleontology, v. 21, no. 2, p. 157–159.
1948. *Parastaffella* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 242.
1948. *Parastaffella* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 218–219.
1948. *Parastaffella* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 14.
1949. *Parastaffella* Rauzer-Chernoussova. Akad. Nauk SSSR Paleont. Inst. Trudy 20, p. 250, 251.
1950. *Endothyra* Termier and Termier. Paléont. Marocaine, Invertébrés Ere Primaire, Pt. I, p. 35 [part].
1950. *Parastaffella* Grozdilova and Lebedeva. VNIGRI Trudy 50, p. 22–25.
1951. *Parastaffella* Shlykova. VNIGRI Trudy 56, p. 144–151.
1951. *Parastaffella* Rauzer-Chernoussova and others. Akad. Nauk SSSR Geol. Inst. Trudy Ministerstvo Neftyanoy promyshlennosti SSSR, p. 143–151.
1954. *Parastaffella* Lebedeva. VNIGRI Trudy 81, p. 275–281 [part].
1954. *Parastaffella* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 131–143.
1956. *Staffella* Putria. VNIGRI Trudy 98, p. 394 [part].
1956. *Parastaffella* Putria. VNIGRI Trudy 98, p. 393.
1956. *Parastaffella* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 53.
1956. *Parastaffella* Ganelina. VNIGRI Trudy 98, p. 52–54.
1957. *Parastaffella* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 175–178.
1957. *Paramillerella* Igo. Tokyo Kyoiku Daigaku Sci. Rept., ser. C, v. 5, no. 47, p. 180, 181 [part].
1959. *Pseudoendothyra* Mikluko-Maklai, Rauzer-Chernoussova, and Rozovskaia *in* Rauzer-Chernoussova and Fursenko. Osnovy Paleontologii, v. 1, p. 207.
1959. *Pseudoendothyra* Durkina. VNIGRI Trudy 136, p. 206–218.
1960. *Parastaffella* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 369, 370.
1960. *Pseudoendothyra* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 100, 101.
1961. *Pseudoendothyra* Vdovenko. Kiev Univ. Visnik. Ser. geol. geograph., no. 4, p. 26–28.
1961. *Millerella* Cummings. Great Britain Geol. Survey Bull. 18, p. 117, 119 [part].
1962. *Pseudoendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 156.

1963. *Pseudoendothyra* Bogush. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 70, 71.
1963. *Pseudoendothyra* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 139–141 [part].
1963. *Pseudoendothyra* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 51, 52.
1963. *Parastaffella* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 50, 51.
1963. *Parastaffella* (*Parastaffelloides*) Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 50, 51.
1963. *Pseudoendothyra* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 70–89 [part].
1964. *Pseudoendothyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 243–245.
1964. *Pseudoendothyra* Saurin. Archives Géol. Viêtnam, v. 6, p. 68, 69.
1965. *Pseudoendothyra* Skvorzov. Paleont. Zhur., no. 3, p. 26, 27.
1965. *Parastaffella* van Ginkel. Leidse Geol. Meded., v. 34, p. 21–29 [part].
1966. *Pseudoendothyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 152 [part].
1966. [not] *Pseudoendothyra* (*Eoparastaffella*) Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 200, 201.
1967. *Pseudoendothyra* (*Pseudoendothyra*) Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 201.
1967. *Pseudoendothyra* Saurin. Archives Géol. Viêtnam, no. 10, p. 136–139 [part].
1967. *Pseudoendothyra* Ross. Jour. Paleontology, v. 41, no. 3, p. 715, 716.
1969. *Pseudoendothyra* Vdovenko. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 11, p. 35–40.
1969. *Pseudoendothyra* Solovieva. NIIGA, Uchennye Zapiski Paleont. Biostrat. Bull. 28, p. 13, 14.
1970. *Pseudoendothyra* Mamet. Canada Geol. Survey Paper 70–21, pl. 5, fig. 9.
1970. *Pseudoendothyra* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 900.

*Diagnosis.*—Test free, lenticular, laterally compressed, with well-defined umbilics. Proloculus followed by involute, planispirally coiled spirotheca. Periphery slightly keeled, at least in early coils. First volution may be slightly askew. Chambers subquadratic, numerous, more than 12 in last whorl and to as many as 20 to 22 in the most advanced forms. Septa nearly straight, slight curvature forward, 70°–90° from spirotheca. Secondary deposits as low to massive pseudochomata. Wall calcareous secreted, a diaphanotheca with very poorly defined tectoria(?). Aperture a low slit, crescentiform, at base of apertural face.

*Type of genus.*—1879 *Fusulinella struvii* von Möller. St. Petersbourg Acad. Imp. Sci. Mém. sér. 7, v. 27, no. 5, p. 22, pl. 5, figs. 4 b, c, not a? (type designated by Mikhailov, 1939).

*Remarks.*—*Parastaffella* 1948 is here temporarily considered a synonym of *Pseudoendothyra;* it was erected on the same type as *Pseudoendothyra, Fusulinella struvii,* but on another figure. As Rauzer-Chernoussova did not rename her type, the genus does not comply to the ICZN rules. Moreover, at the time of the designation, von Möller's specimens had already been destroyed, and it is impossible to check to what extent Reitlinger's assumption (1963), that von Möller's *struvii* did include several genera, is true. As no neotype has been proposed for *Pseudoendothyra* or *Parastaffella,* it is taxonomically safe to consider them as equivalent, but this treatment is illogical as it includes, in one single taxon, forms with outside keels and forms with outside subrounded periphery.

Taxa included in the genus *Pseudoendothyra:*

1954 *affixa* Grozdilova and Lebedeva
1878 *bradyi* von Möller
1963 *grandis* Reitlinger
1948 *illustria* Vissarionova
1954 *inoptata* Grozdilova and Lebedeva
1949 *keltmensis* Rauzer-Chernoussova
1963 *parasphaerica* Reitlinger
1954 *raja* Grozdilova and Lebedeva
1963 stricta Reitlinger (OBJ, infrasubspecific)
1963 *umbo* Rozovskaia

The following taxa are temporarily reported to the genus:

1959 *afflientia* Durkina
1948 *angulata* Rauzer-Chernoussova
1959 *arcuata* Durkina
1963 *bella* Rozovskaia
1957 *biconvexa* Golubsov
1963 *bona* Rozovskaia
1967 *britishensis* Ross
1956 *candida* Ganelina
1965 *cantabrica* van Ginkel
1959 *carbonica* Durkina
1951 *composita* Dutkevitch *in* Rauzer-Chernoussova and others
1951 *concinna* Shlykova
1963 *conspicua* Rozovskaia
1962 *constricta* Bogush and Yuferev
1963 *continens* Rozovskaia
1950 *corpulenta* Grozdilova and Lebedeva
1963 *crassa* Rozovskaia
1934 *dagmarae* Dutkevitch
1950 *deformica* Grozdilova and Lebedeva
1963 *densa* Rozovskaia
1963 *directa* Rozovskaia

1959 *dobrynini* Durkina
1927 *elegans* Harlton
1947 *expansa* Thompson
1963 *expleta* Pronina
1949 *fraudulenta* Rauzer-Chernoussova
1963 *grandiosa* Rozovskaia
1963 *heteromorpha* Bogush
1951 *intermedia* Shlykova
1934 *ivanovi* Dutkevitch
1954 *jazvensis* Grozdilova and Lebedeva
1959 *juventa* Durkina
1959 *juxta* Durkina
1959 *kerka* Durkina
1961 *kilevatica* Vdovenko
1963 *kremenskensis* Rozovskaia
1959 *kyrtajolis* Durkina
1950 *lata* Grozdilova and Lebedeva
1963 lata Reitlinger (*OBJ*, infrasubspecific)
1934 *leei* Dutkevitch
1957 *lenticularis* Golubsov
1956 *luminosa* Ganelina
1934 *mathildae* Dutkevitch
1959 *moderata* Durkina
1960 *nana* Saurin
1959 *nautiliformis* Durkina
1959 *noda* Durkina
1954 *opinata* Grozdilova and Lebedeva
1876 *ornata* Brady
1951 *poststruvei* Rauzer-Chernoussova
1934 *preobrajenskyi* Dutkevitch
1954 *pritonensis* Grozdilova and Lebedeva
1959 *probata* Durkina
1948 *propinqua* Vissarionova
1963 *regina* Rozovskaia
1963 *rezwoi* Bogush
1965 *rhomboidea* Skvorzov
1951 *sagittaria* Shlykova
1959 *shlykovae* Durkina
1959 *spectata* Durkina
1951 *sublimis* Shlykova
1951 *subrhomboides* Rauzer-Chernoussova
1951 *suppressa* Shlykova
1954 *tcherjaevae* Grozdilova and Lebedeva
1951 *timanica* Rauzer-Chernoussova
1963 *tumida* Pronina
1924 *umbilicata* Colani
1951 *umbilicata* Rauzer-Chernoussova (OBJ, preoccupied by 1924 *umbilicata* Colani)
1951 *umbonata* Rauzer-Chernoussova
1954 *triznae* Lebedeva
1951 *variabilis* Rauzer-Chernoussova
1954 *visherensis* Grozdilova and Lebedeva
1965 *vlerki* van Ginkel
1959 *vytchegda* Durkina

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America. Common.

Occurs for the first time in Early Viséan and is derived from *Eoparastaffella*. Common and highly diversified in the Tethys from Middle Viséan to Moscovian. Scarce in Late Carboniferous (?) and Early Permian (?). Present in North America in the Chester Group of the midcontinent and in the Pennsylvanian. Much less diversified than in the Tethys.

**Pseudoendothyra britishensis Ross 1967**

Plate 34, figures 20, 21

1967. *Pseudoendothyra britishensis* Ross. Jour. Paleontology, v. 41, no. 3, p. 715, pl. 79, figs. 6, 8–10 [not 7].

*Diagnosis.*—Test free, lenticular, laterally compressed, with faint umbilici. Proloculus large, 70$\mu$ to 90$\mu$, followed by involute regular, planispirally coiled spirotheca. Outside periphery subrounded with faint subquadratic or keeled outline in first two coils. Diameter 500$\mu$ to 750$\mu$ for five volutions. Form ratio 1/0.45 to 1/0.55 for adult specimens. Chambers subquadratic, numerous, regular, 18 to 20 in last coil. Septa nearly straight, 75°–85° from spirotheca and of same thickness (20$\mu$ to 30$\mu$). Secondary deposits well developed, as regular pseudochomata. Wall characterized by thin poorly developed diaphanotheca. Presence of tectoria hypothetical. Aperture a low slit at base of apertural face.

*Stratigraphic range and distribution.*—Originally reported from uncertain stratigraphic position near Trout Lake, British Mountains, Yukon Territory. Not reported in the Russian literature.

A very common form in the uppermost Alapah and the Wahoo Limestones of Alaska. Particularly abundant in the oolitic facies of the Wahoo Limestone. Apparent range, Zones 18 to 21.

*Figured specimens.*—USNM 179472, 179473.

**Pseudoendothyra ornata Brady 1876**

Plate 34, figure 19

1873. *Endothyra ornata* Brady (nom. nud.). Scotland Geol. Survey Mem., Explan. Sheet 23, p. 63.
1876. *Endothyra ornata* Brady. Palaeont. Soc. London Pub., v. 30, p. 99, pl. 6, figs. 1–4 [idealized].
1879. *Fusulinella struvii* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 22, pl. 5, figs. 4 b-c (type of *Pseudoendothyra* Mikhailov 1939).
1880. (?) *Fusulinella struvii* von Möller. Mat. Geol. Russ., v. 9, p. 31-36, pl. 2, fig. 1; pl. 5, fig. 4.
1939. *Pseudoendothyra struvii* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 54, 55, pl. 4, figs. 3–6.

1948. *Parastaffella struvei* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 218, pl. 13, figs. 1–3, 5.
1948. *Parastaffella struvei* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 14, pl. 3, figs. 12, 13.
1950. *Endothyra ornata* Termier and Termier. Paléont. Marocaine, Invertébrés Ere Primaire, Pt. 1, p. 35, pl. 1, fig. 22 [not 21].
1950. *Parastaffella struvei* Grozdilova and Lebedeva. VNIGRI Trudy 50, p. 22, 23, pl. 3, fig. 1.
1951. *Parastaffella struvei suppressa* Shlykova. VNIGRI Trudy 56, p. 148–149, pl. 1, figs. 8–10.
1954. *Parastaffella struvei* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 131, 132, pl. 14, fig. 22.
1954. *Parastaffella* aff. *struvei* Lebedeva. VNIGRI Trudy 81, p. 278, pl. 10, figs. 8, 9.
1956. *Parastaffella struvei* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 53, pl. 8, fig. 1.
1957. (?)*Parastaffella struvei* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 174–176, pl. 8, fig. 18–20.
1960. (?)*Parastaffella struvei* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 369, 370.
1961. *Millerella ornata* Cummings. Great Britain Geol. Survey Bull. 18, p. 117, 119.
1963. *Pseudoendothyra struvei* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 71, 72, pl. 12, figs. 21–24.
1963. *Pseudoendothyra directa* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 73, pl. 12, figs. 30–32.
1963. *Pseudoendothyra struvei suppressa* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, pl. 12, figs. 25–29.
1964. (?)*Pseudoendothyra struvei* Saurin. Archives Géol. Viêtnam, v. 6, p. 69, pl. 7, fig. 4? [part].
1964. (?)*Pseudoendothyra struvei* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 244, 245, pl. 41, figs. 862, 863.
1967. (not) *Pseudoendothyra struvei* Saurin. Archives Géol. Viêtnam, v. 10, p. 136, pl. 3, figs. 18, 19, 22.
1970. (?)*Pseudoendothyra struvii* Hallett. 6ème Cong. Avanc. Strat. Carb., Compte Rendu, p. 900, pl. 8, figs. 5, 6.

*Diagnosis.*—Test free, discoidal, with well-defined umbilici. Proloculus small, 15μ to 30μ, followed by involute, regular, planispirally coiled spirotheca. Outer periphery keeled; inner whorls subquadratic to subkeeled. Diameter 450μ to 600μ for adult specimens of 4½ whorls. Chambers subquadratic, numerous, 15–17 in last spire. Septa nearly straight, 80° from spirotheca. Secondary deposits as poorly developed pseudochomata. Wall calcareous secreted, with well-defined diaphanotheca, 10μ to 18μ. Tectoria problematical. Aperture a low slit at base of apertural face.

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America. Common.

Present from Viséan to Namurian; last occurrence unknown.

Present in Alaska from Chester to Atoka time equivalents, but rather scarce except in the Wahoo Limestone, where it is locally common.

*Figured specimen.*—Univ. Montréal 220/28.

### Family EOSTAFFELLIDAE Mamet in Mamet, Mikhailov, and Mortelmans 1970

#### Genus EOSTAFFELLA Rauzer-Chernoussova 1948

1876. *Endothyra* Brady. Palaeont. Soc. London Pub., v. 30, p. 95–98 [only].
1936. *Staffella* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger. Akad. Nauk SSSR, Poliarnia Komissia, Trudy 28, p. 179, 180.
1944. *Millerella* Thompson. Kansas Geol. Survey Bull. 52, p. 427–429 [part].
1945. *Millerella* Thompson. Kansas Geol. Survey Bull. 60, p. 46, 47 [part].
1947. *Millerella* Cooper. Jour. Paleontology, v. 21, no. 1, p. 82 [part].
1948. *Staffella* (*Eostaffella*) Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 15–18 [part].
1948. *Eostaffella* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 233–237 [part].
1948. *Eostaffella* Brazhnikova and Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 1, Bull. 2, p. 92.
1948. *Eostaffella* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 219–224 [part].
1948. *Eostaffella* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 234–237 [part].
1949. *Eostaffella* Kireeva. Geol. Inst. Trudy, Biuro Glavno Uprovlenie Radzvedkam. Bull. 6, p. 29–31.
1950. *Eostaffella* Grozdilova and Lebedeva. VNIGRI Trudy 50, p. 13–20 [part].
1951. *Eostaffella* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 5, p. 91, 92.
1951. *Eostaffella* Rauzer-Chernoussova and others. Akad. Nauk SSSR Geol. Inst. Trudy Ministerstvo Neftyanoy promyshlennosti SSSR, p. 49–66 [part].
1951. *Eostaffella* Ganelina. VNIGRI Trudy 56, p. 188–196 [part].
1951. *Paramillerella* Thompson. Cushman Found. Foram. Research Contr., v. 2, pt. 4, p. 115.
1952. *Millerella* Kanmera. Kyushu Univ. Fac. Sci. Mem., ser. D, v. 3, no. 4, p. 170–175 [part].
1954. *Eostaffella* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 114–128 [part].
1954. *Eostaffella* Lebedeva. VNIGRI Trudy 81, p. 272–274 [part].
1956. *Eostaffella* Ganelina. VNIGRI Trudy 98, p. 108–117 [part].
1956. *Eostaffella* Putria. VNIGRI Trudy 98, p. 378–382 [part].
1956. *Eostaffella* Malakhova. Akad. Nauk SSSR Ural Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 51–53 [part].

1956. *Eostaffella* Brazhnikova. Akad. Nauk Ukrain. SSSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 67–72 [part].
1957. *Millerella* Igo. Tokyo Kyoiku Daigaku Sci. Rept., ser. C, v. 5, no. 47, p. 175–177 [part].
1957. *Eostaffella* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 161–172 [part].
1958. *Eostaffella* Sheng. Paleont. Sinica, no. 143, new ser. 8, fasc. 7, p. 70–72 [part].
1958. *Eostaffella* Orlova. Akad. Nauk SSSR, Voprosy Mikropaleontologii, no. 2, p. 127, 128.
1959. *Eostaffella* Durkina. VNIGRI Trudy 136, p. 190–201 [part].
1960. *Eostaffella* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 121, 122 [part].
1960. *Eostaffella* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 366, 367 [part].
1961. *Eostaffella* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 222–224 [part].
1962. *Eostaffella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 163–180 [part].
1962. *Eostaffella* Chang. Acta Paleont. Sinica, v. 10, no. 4, p. 439–441 [part].
1963. *Eostaffella* Anisgard and Campau. Cushman Found. Foram. Research Contr., v. 14, pt. 3, p. 99–108 [part].
1963. *Millerella* Lehman. Cushman Found. Foram. Research Contr., v. 4, no. 2, p. 74, 75 [part].
1963. *Eostaffella* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 31, 32 [part].
1963. *Endothyra* Zeller. Jour. Paleontology, v. 37, p. 502, 503 [part].
1963. *Eostaffella* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 142–145 [part].
1964. *Eostaffella* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, p. 194, 195 [part].
1964. *Eostaffella* Sada. Hiroshima Univ. Jour. Sci., Ser. C, v. 4, no. 3, p. 230, 231.
1964. *Eostaffella* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 48, p. 42–46.
1964. *Eostaffella* Saurin. Archives Géol. Viêtnam, v. 6, p. 65–67 [part].
1964. *Eostaffella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 234–237 [part].
1964. ?*Millerella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 240–242.
1965. *Eostaffella* Solovieva and Krasheninikov. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 9, p. 27–30.
1965. *Millerella* van Ginkel. Leidse Geol. Meded., v. 34, p. 32–34, 41, 59 [part].
1966. [not] *Eostaffella* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 153.
1967. *Eostaffella* Saurin. Archives Géol. Viêtnam, v. 10, p. 116–129 [part].
1967. *Eostaffella* Sada. Palaeont. Soc. Japan Trans. and Proc., new series, no. 67, p. 144, 145.
1968. *Eostaffella* Mamet. Rev. Micropaléontologie, v. 11, no. 3, p. 134.
1969. [not] *Eostaffella* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 53.
1969. *Eostaffella* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 13, 14.
1969. [not] *Eostaffella* Hewitt and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 78, pl. 1, figs. 4–6.
1969. *Eostaffella* Sada. Palaeont. Soc. Japan Trans. and Proc., new series, no. 75, p. 120, 121.
1970. *Eostaffella* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 900.
1970. *Eostaffella* Mamet. Canada Geol. Survey Paper 70–21, p. 11.

*Diagnosis.*—Test free, lenticular, laterally compressed. Proloculus followed by involute planispirally coiled spirotheca. Periphery slightly keeled, at least in early coils. First whorl often slightly glomospiral. Umbilicus depressed. Chambers subquadratic, numerous, 12 to 20 in last whorl. Septa nearly straight, at 70°–90° from spirotheca. Secondary deposits, low to massive pseudochomata, or as slight thickenings of septa. Wall a microcrystalline dense tectum with very poorly defined inconsistent tectoria. Aperture simple, a slit at base of apertural face.

*Type of genus.*—1948 *Staffella* (*Eostaffella*) *parastruvei* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 15, pl. 3, figs. 16–18.

Taxa included in the genus *Eostaffella:*

1956 *accepta* Ganelina
1948 *acuta* Rauzer-Chernoussova
1950 *acuta* Grozdilova and Lebedeva (OBJ, preoccupied 1948 *acuta* Rauzer-Chernoussova)
1951 *acutiformis* Kireeva *in* Rauzer-Chernoussova and others
1949 *acutissima* Kireeva
1944 *advena* Thompson
1954 *amabilis* Grozdilova and Lebedeva
1944 *ampla* Thompson
1956 *angularis* Brazhnikova
1949 *angusta* Kireeva
1956 *asalina* Malakhova
1951 *chomatifera* Kireeva *in* Rauzer-Chernoussova and others
1951 *chusovensis* Kireeva *in* Rauzer-Chernoussova and others
1945 "*circuli*" Thompson (part)
1962 *citata* Bogush and Yuferev
1951 *compressa* Brazhnikova
1951 *constricta* Ganelina
1957 *crassa* Golubsov
1956 *depressa* Putria
1949 *donbassica* Kireeva

1962 *endothyroidea* Chang
1954 *enormis* Grozdilova and Lebedeva
1950 *exilis* Grozdilova and Lebedeva
1956 *galinae* Ganelina
1956 *gruenwaldti* Malakhova
1962 *hohsienica* Chang
1948 *ikensis* Vissarionova
1949 *infirma* Kireeva
1957 *inflata* Golubsov
1945 *inflecta* Thompson
1958 *intermedia* Sheng
1957 *kanmerai* Igo
1948 *kasakhstanica*? Rauzer-Chernoussova
1951 *kashirica* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others
1951 *korobchevi* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others
1959 *lancetiformis* Durkina
1949 *lata* Kireeva
1954 *lenticula* Grozdilova and Lebedeva
1950 *lepida* Grozdilova and Lebedeva
1949 *lepidaeformis* Kireeva
1951 *ljudmilae* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others
1949 *minima* Kireeva
1964 *minuta* Potievskaia
1948 *minutissima* Rauzer-Chernoussova
1951 *mixta* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others
1948 *mosquensis* Vissarionova
1951 *mstaensis* Ganelina
1956 *oblonga* Ganelina
1959 *oldae* Durkina
1948 *ovoidea* Rauzer-Chernoussova
1956 *ovoidea* Brazhnikova and Potievskaia *in* Brazhnikova (OBJ, preoccupied 1948 *ovoidea* Rauzer-Chernoussova)
1962 *paraconvexa* Bogush and Yuferev
1951 *paraparva* Ganelina
1959 *paraprisca* Durkina
1948 *parastruvei* Rauzer-Chernoussova
1954 *perspicabilis* Grozdilova and Lebedeva
1944 *pinguis* Thompson
1951 *postmosquensis* Kireeva *in* Rauzer-Chernoussova and others
1960 *puella* Saurin
1959 *pressa* Durkina
1948 *proikensis* Rauzer-Chernoussova
1936 *pseudostruvei* Rauzer-Chernoussova and Reitlinger *in* Rauzer-Chernoussova, Beljaev, and Reitlinger
1876 *radiata* Brady
1956 *raguchensis* Ganelina
1959 *recta* Durkina
1951 *rhomboides* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others
1951 *rjasanensis* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others
1959 *rotunda* Durkina
1956 *schwetsovi* Ganelina
1948 *singularia* Vissarionova
1951 *sublata* Ganelina
1959 *subtilis* Durkina
1951 *subvasta* Ganelina
1948 *tenebrosa* Vissarionova
1964 *umbonata* Potievskaia
1959 *variabilis* Durkina
1948 *varvariensis* Brazhnikova and Potievskaia
1963 *vasta* Rozovskaia
1958 *versabilis* Orlova

*Stratigraphic range and distribution.*—The first occurrence of Eostaffellidae is characteristic of the Viséan; as early as the basal Middle Viséan, *Eostaffella* is abundant and diversified all over Eurasia; the acme of the taxon is Late Viséan and Namurian where more than 40 valid taxa are known.

*Eostaffella* is much scarcer in North America, although it is ubiquitous in the Chester Group of the midcontinent and its time equivalents in the Cordillera.

*Eostaffella* is present in the Alapah Limestone and in the Wahoo Limestone.

**Eostaffella of the group E. radiata Brady 1876**

Plate 35, figures 5, 7, 10

Group exemplified by:

1876. *Endothyra radiata* Brady. Palaeont. Soc. London Pub., v. 30, p. 97, 98, pl. 5, figs. 10–12 [idealized].
1876. *Endothyra globulus* Brady [not *Endothyra globulus* (d'Eichwald) emend. von Möller]. Palaeont. Soc. London Pub., v. 30, p. 95, 96, pl. 5, fig. 7 a, b [part].
1928. [not] *Orobias radiata* Galloway and Harlton. Jour. Paleontology, v. 2, no. 3, p. 350, pl. 45, fig. 12 a–c.
1944. ?*Millerella*? *advena* Thompson. Kansas Geol. Survey Bull. 52, pt. 7, p. 427–429, pl. 1, figs. 10?, 16?
1948. *Eostaffella mosquensis acuta* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 236, 237, pl. 16, fig. 5.
1948. *Eostaffella mosquensis* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 222, pl. 14, figs. 4–6.
1951. *Eostaffella mosquensis* Ganelina. VNIGRI Trudy 56, p. 188, 189, pl. 2, figs. 1, 2.
1951. *Eostaffella mosquensis acuta* Ganelina. VNIGRI Trudy 56, p. 190, 191, pl. 2, figs. 3, 4.
1951. *Eostaffella mosquensis attenta* Ganelina. VNIGRI Trudy 56, p. 191, 192, pl. 2, figs. 5–7.

1962 *endothyroidea* Chang
1954 *enormis* Grozdilova and Lebedeva
1950 *exilis* Grozdilova and Lebedeva
1956 *galinae* Ganelina
1956 *gruenwaldti* Malakhova
1962 *hohsienica* Chang
1948 *ikensis* Vissarionova
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1956 *oblonga* Ganelina
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1956 *ovoidea* Brazhnikova and Potievskaia *in* Brazhnikova (OBJ, preoccupied 1948 *ovoidea* Rauzer-Chernoussova)
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1928. [not] *Orobias radiata* Galloway and Harlton. Jour. Paleontology, v. 2, no. 3, p. 350, pl. 45, fig. 12 a–c.
1944. ?*Millerella*? *advena* Thompson. Kansas Geol. Survey Bull. 52, pt. 7, p. 427–429, pl. 1, figs. 10?, 16?
1948. *Eostaffella mosquensis acuta* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 236, 237, pl. 16, fig. 5.
1948. *Eostaffella mosquensis* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 222, pl. 14, figs. 4–6.
1951. *Eostaffella mosquensis* Ganelina. VNIGRI Trudy 56, p. 188, 189, pl. 2, figs. 1, 2.
1951. *Eostaffella mosquensis acuta* Ganelina. VNIGRI Trudy 56, p. 190, 191, pl. 2, figs. 3, 4.
1951. *Eostaffella mosquensis attenta* Ganelina. VNIGRI Trudy 56, p. 191, 192, pl. 2, figs. 5–7.

1951. *Eostaffella mosquensis sublata* Ganelina. VNIGRI Trudy 56, p. 192, 193, pl. 2, figs. 8–10.
1959. *Eostaffella mosquensis* Durkina. VNIGRI Trudy 136, p. 196, 197, pl. 20, fig. 10.
1959. *Eostaffella mosquensis attenta* Durkina. VNIGRI Trudy 136, p. 197, pl. 20, figs. 11, 12.
1959. *Eostaffella mosquensis variabilis* Durkina (OBJ, preoccupied). VNIGRI Trudy 136, p. 197, 198, pl. 20, figs. 13, 14.
1962. *Eostaffella mosquensis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 172, pl. 6, fig. 26.
1962. *Eostaffella acuta* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 172, 173, pl. 6, fig. 27.
1963. *Eostaffella mosquensis* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 31, 93, pl. 16, figs. 16, 17, pl. 17, figs. 1–5.
1964. *Eostaffella mosquensis* var. I Conil and Lys (OBJ, infrasubspecific). Louvain Univ. Inst. Géol. Mém., v. 23, p. 235, pl. 40, fig. 822.
1964. *Eostaffella mosquensis* tumida Conil and Lys (OBJ, infrasubspecific). Louvain Univ. Inst. Géol. Mém., v. 23, p. 234, pl. 40, figs. 820, 821.
1965. [not] *Millerella mosquensis acuta* van Ginkel. Leidse Geol. Meded., v. 34, p. 34, pl. 13, figs. 25, 26.
1970. *Eostaffella* of the group *E. radiata* Mamet. Canada Geol. Survey Paper 70–21, p. 11, pl. 5, fig. 2.
1970. [not] *Eostaffella mosquensis* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 900, pl. 8, figs. 9, 10.

*Diagnosis.*—Test free, lenticular, with faint umbilici. Proloculus followed by small glomospirally coiled spire then by three to five regular involute coils. Last whorl embracing, slightly keeled. Keel nonexistent in early spire. Chambers subquadratic, numerous, 15 to 17 in last whorl, 40 to 50 in total for adult specimens. Septa nearly straight, regular, about 80° from spirotheca. Diameter of test 400$\mu$ to 600$\mu$. Width 230$\mu$ to 300$\mu$. Secondary deposits poorly developed as low pseudochomata. Wall dark, microcrystalline, dense. Aperture simple.

*Stratigraphic range and distribution.*—Reported from the Middle Viséan to the Late Namurian of Eurasia and north Africa where it is a common group.

Present in Alaska in the Viséan and Namurian part of the Alapah Limestone.

*Figured specimens.*—USNM 179476; Univ. Montréal 174/8, 206/2.

#### Genus ZELLERINA Mamet in Mamet and Skipp 1970

1915. *Endothyra* Girty. U.S. Geol. Survey Bull. 593, p. 27.
1927. *Endothyra* Harlton. Jour. Paleontology, v. 1, no. 1, p. 19 [part].
1928. *Endothyra* Galloway and Harlton. Jour. Paleontology, v. 2, no. 3, p. 347 [only].
1930. *Endothyra* Warthin. Oklahoma Geol. Survey Bull. 53, p. 20.
1944. *Millerella* Thompson. Kansas Geol. Survey Bull. 52, pt. 7, p. 420–430 [part].
1947. *Millerella* Cooper. Jour. Paleontology, v. 21, no. 1, p. 82–87 [part].
1951. (?)*Eostaffella* (*Millerella*) Kireeva *in* Rauzer-Chernoussova and others. Akad. Nauk SSSR Geol. Inst. Trudy Ministerstvo Neftyanoy Promyshlennosti SSSR, p. 62, 63 [part], pl. 2, fig. 4 [only].
1953. *Millerella* Zeller. Jour. Paleontology, v. 27, no. 2, p. 185, 194.
1954. *Millerella* Sage. Nova Scotia Dept. Mines Mem. 3, p. 114.
1957. *Paramillerella* Zeller. Jour. Paleontology, v. 31, no. 4, p. 703.
1958. ?*Endothyra* Okimura. Hiroshima Univ. Jour. Sci., ser. C, v. 2, no. 3, p. 262 [part].
1967. *Millerella* Ross. Jour. Paleontology, v. 41, no. 3, p. 715 [part].
1967. (?)*Millerella* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, pl. 21, figs. 16, 17 [only].
1969. *Eostaffella* Hewitt and Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 78, pl. 1, figs. 4–6.
1970. *Eostaffella*? Mamet. Canada Geol. Survey Paper 70–21, p. 37.
1970. *Zellerina* Mamet *in* Mamet and Skipp. Liège Univ. Cong. et Coll., v. 55, p. 336.

*Diagnosis.*—Test free, discoidal. Proloculus followed by involute planispirally coiled spirotheca. Last half coil often becomes evolute. Periphery rounded to subrounded. Umbilical depression faint. Septa, endothyroid like, not numerous, 10 to 12 in last volution. Chambers subquadratic. Wall calcareous secreted, a tectum with poorly defined tectoria. Secondary deposits absent or as inconsistent, variable floor thickenings. Aperture slitlike at base of apertural face.

*Remarks.*—Differs from *Millerella* sensu stricto by its aperture, its endothyroid chambers and septation. Differs from *Eostaffella* by its absence of keel and the slight evolution of the last whorl. Differs from *Mediocris* by its lack of umbilical filling. Differs from *Endostaffella* by the regularity of the coil, its tendency to become evolute, and the poorly developed secondary deposits.

*Type of genus.*—1915 *Endothyra discoidea* Girty. U.S. Geol. Survey Bull. 593, p. 27, pl. 10, fig. 11.

Taxa included in the genus *Zellerina:*

1927 *ameradaensis* Harlton
1953 *cooperi* Zeller
1953 *designata* Zeller
1967 *porcupinensis* Ross (part)
1953 *tortula* Zeller
1951 ?*uralica* Kireeva *in* Rauzer-Chernoussova and others
1947 *zelleri* Cooper

1951. *Millerella* Thompson. Cushman Found. Foram. Research Contr., v. 2, pt. 4, p. 118.
1951. [not] *Millerella* Ganelina. VNIGRI Trudy 56, p. 205–207.
1951. *Eostaffella* (*Millerella*) Kireeva *in* Rauzer-Chernoussova and others. Akad. Nauk SSSR Geol. Inst. Trudy Ministerstvo Neftyanoy Promyshlennosti SSSR, p. 62, 63 [part].
1951. *Eostaffella* (*Seminovella*) Rauzer-Chernoussova *in* Rauzer-Chernoussova and others. Akad. Nauk SSSR Geol. Inst. Trudy, p. 32, 62–65 [part].
1952. *Millerella* Kanmera. Kyushu Univ. Fac. Sci. Mem., ser. D, v. 3, no. 4, p. 170–175 [part].
1953. [not] *Millerella* Zeller. Jour. Paleontology, v. 27, no. 2, p. 185, 193.
1953. *Millerella* Lehman. Cushman Found. Foram. Research Contr., v. 4, no. 2, p. 74, 75.
1954. *Millerella* Skinner and Wilde. Jour. Paleontology, v. 28, no. 4, p. 449.
1954. *Eostaffella* (*Millerella*) Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 128, 129 [part].
1954. [not] *Millerella* Sage. Nova Scotia Dept. Mines Mem. 3, p. 114.
1956. *Eostaffella* (*Millerella*) Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 70, 71.
1956. ?*Millerella* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 51.
1957. [not] *Millerella* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 172–174.
1957. [not] *Millerella* Zeller. Jour. Paleontology, v. 31, no. 4, p. 695.
1957. *Millerella* Igo. Tokyo Kyoiku Daigaku, Sci. Rept., sec. C, v. 5, no. 47, p. 172, 177, 179 [part].
1958. *Millerella* Sheng. Paleont. Sinica, no. 143, new ser. 8, pt. 7, p. 69–70.
1959. [not] *Millerella* Durkina. VNIGRI Trudy 136, p. 201–203.
1960. *Millerella* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 114.
1960. [not]*Millerella* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 365, 366.
1961. [not] *Millerella* Cummings. Great Britain Geol. Survey Bull. 18, p. 117, 119.
1961. *Millerella* Rich. Jour. Paleontology, v. 35, no. 6, p. 1159.
1962. *Millerella* (*Millerella*) Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 180–182 [part].
1962. *Millerella* Easton. U.S. Geol. Survey Prof. Paper 348, p. 27.
1963. *Millerella* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 32, 33 [part], 110, 111.
1963. [not] *Millerella*? McKay and Green. Research Council Alberta Bull. 10, no text, pl. 10, fig. 14.
1964. *Millerella* (*Seminovella*) Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 48, p. 46–50 [part].
1964. *Millerella* Moore. Jour. Paleontology, v. 38, no. 2, p. 295–305.
1964. [not] *Millerella* Saurin. Archives Géol. Viêtnam, v. 6, p. 67, 68.
1964. *Millerella* (*Millerella*) Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 48, p. 46, 47.
1964. *Millerella* Thompson *in* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, p. C396.
1964. [not] *Millerella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 240–243.
1965. *Millerella* van Ginkel. Leidse Geol. Meded., v. 34, p. 30–60 [part].
1965. *Millerella* Ross and Sabins. Jour. Paleontology, v. 39, no. 2, p. 183, 184.
1967. *Millerella* (*Millerella*) Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, pl. 21, 23 [part].
1967. *Millerella* (*Millerella*) Vakarchuk *in* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, p. 174, 175, pl. 58, figs. 10–13.
1967. [not] *Millerella* (*Seminovella*) Vakarchuk *in* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, p. 175, 176.
1967. *Millerella* Sada. Palaeont. Soc. Japan Trans. and Proc., new series, no. 67, p. 140–142 [part].
1967. [not] *Millerella* Saurin. Archives Géol. Viêtnam, v. 10, p. 129, 130.
1967. *Millerella* Ross. Jour. Paleontology, v. 41, no. 3, p. 715 [part].
1969. ?*Millerella* Solovieva. NIIGA Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 13 [part].
1969. [not] *Millerella*? Sada. Paleont. Soc. Japan Trans. and Proc., new series, no. 75, p. 120.
1970. [not] *Millerella* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 898–900.

*Diagnosis.*—Test free, lenticular, compressed laterally, regular, symmetrical. Proloculus followed by a planispirally coiled spirotheca, evolute in ultimate or penultimate coil. Periphery blunt. Septa arcuate forward, regular, numerous. Sixteen to twenty chambers in last volution. Wall calcareous secreted, a dense tectum with poorly developed inner? and outer tectoria. Secondary deposits as chomatas. Tunnel single.

*Type of genus.*—1942 *Millerella marblensis* Thompson. Am. Jour. Sci., v. 240, no. 6, p. 404, 405, pl. 1, figs. 1, 3, 5, 7.

*Remarks.*—Some confusion is observed in the literature concerning *Millerella.* This confusion dates back to the time of erection of the genus, when Thompson (1942, 1944, 1945) included *Eostaffella* (that he renamed *Paramillerella*) and *Zellerina* in the taxon. In our sense, *Millerella* is an evolute form (hence not an *Eostaffella*), without a strong keel (hence not a *Seminovella*), with anteriorly curved regular septa delimiting numerous regular chambers (hence not a *Zellerina*), with a tectum (hence not a *Pseudoendothyra*), without umbilical plug (hence not a *Mediocris*), and without early glomospiral coil (hence not an *Endostaffella*). It has a single tunnel and is therefore a fusuline, not an Eostaffellidae.

Taxa included in the genus *Millerella:*

1950 ?*aperta* Grozdilova and Lebedeva
1957 *bigemmicula* Igo
1950 *carbonica* Grozdilova and Lebedeva
1964 *concinna* Potievskaia
1957 ?*discoidea* Igo
1952 *gigantea* Kanmera
1950 *graciosa* Manukalova
1951 *keltmensis* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others
1956 *lyschnjanskensis* Brazhnikova
1942 *marblensis* Thompson
1958 *minima* Sheng
1950 *nautiloides* Manukalova
1944 *pressa* Thompson
1951 ?*pressula* Ganelina
1967 ?*prilukiensis* Vakarchuk *in* Brazhnikova and others
1951 ?*umbilicata* Kireeva *in* Rauzer-Chernoussova and others
1951 *variabilis* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others
1954 *visherensis* Grozdilova *in* Grozdilova and Lebedeva.

The following taxa have been referred to *Millerella* but should be transferred to:

*Endostaffella:*

1959 *pauperis* Durkina
1951 *tantilla* Ganelina

*Mediocris*?:

1957 *komatui* Igo

*Eostaffella:*

1944 *advena* Thompson
1944 *ampla* Thompson
1945 "*circuli*" Thompson [part]
1947 *chesterensis* Cooper
1945 *inflecta* Thompson
1952 ?*japonica* Kanmera
1957 *kanmerai* Igo
1948 *kasakhstanica*? Rauzer-Chernoussova
1944 *pinguis* Thompson
1960 *puella* Saurin
1956 ?*pura* Malakhova
1959 *recta* Durkina

*Seminovella:*

1964 *donetziana* Potievskaia
1951 *elegantula* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others
1967 *fragilis* Vakarchuck *in* Brazhnikova and others
1951 ?*keltmensis* Rauzer-Chernoussova *in* Rauzer-Chernoussova and others

*Zellerina:*

1953 *cooperi* Zeller
1953 *designata* Zeller
1967 *porcupinensis* Ross (type only)
1953 *tortula* Zeller
1947 *zelleri* Cooper

Umbilicated *Millerella* such as *M. rossica* Rozovskaia or *M. excavata* Conil and Lys ought to be transferred to a new genus.

*Stratigraphic range and distribution.*—Eurasia, north Africa, and North America. Common.

Although often reported from the Viséan (Rozovskaia, 1963; Conil and Lys, 1964), *Millerella* sensu stricto does not occur below Zone 20; this is basal Pennsylvanian (middle Carboniferous). *Millerella* reported in earlier zones (Zeller, 1957; Thompson *in* Loeblich and Tappan, 1964) have to be transferred to *Eostaffella* or *Zellerina.*

**Millerella pressa Thompson 1944**

Plate 35, figures 1, 2

1944. *Millerella pressa* Thompson. Kansas Geol. Survey Bull. 52, pt. 7, p. 423–425, pl. 2, figs. 16–19, not 20–23.

*Diagnosis.*—Test free, lenticular, with slight umbilical depressions. Proloculus small, 20μ to 40μ, followed by evolute planispiral rapidly expanding spire. Uncoiling particularly rapid in the last volution. Diameters of adult specimens range from 450μ to 600μ for 4½ to 5 volutions. Septa thin, curved forward, regular, same thickness as spirotheca, 15μ to 22μ in last volution. Wall, a tectum with faint tectoria. Secondary deposits as low continuous chomata. Aperture a single tunnel.

*Stratigraphic range and distribution.*—North America. Apparently no counterparts in Eurasia?

Originally described from the Pennsylvanian Kearny Formation of Kansas (Morrow).

In Alaska and the Yukon Territory, *Millerella pressa* is present in the Wahoo Limestone (Zones 20 and 21).

*Figured specimens.*—Univ. Montréal 220/4, 131/19.

**Millerella aff. M. carbonica Grozdilova and Lebedeva 1950**

Plate 34, figures 14, 17

1950. *Eostaffella* (*Millerella*) *carbonica* Grozdilova and Lebedeva. VNIGRI Trudy 50, p. 19, 20, pl. 1, figs. 10, 11.

1954. [not] *Millerella* aff. *carbonica* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 128, pl. 14, fig. 15.

1964. *Seminovella carbonica* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol., Ser. Strat. Paleont., Trudy 48, p. 48, 49, pl. 3, figs. 13–15.

1965. *Millerella* cf. *carbonica* van Ginkel. Leidse Geol. Meded. v. 34, p. 44, pl. 14, figs. 39, 40.
1967. [not] *Seminovella carbonica* Saurin. Archives. Géol. Viêtnam, v. 10, p. 130, pl. 2, figs. 20 ,21.
1967. *Millerella* (*Seminovella*) *carbonica* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy [no text], pl. 23, figs. 7, 8.

*Diagnosis.*—Test free, small, lenticular, discoidal, with faint umbilical depressions. Proloculus small, spherical, around 30$\mu$ to 50$\mu$, followed by involute, planispiral whorls, which become evolute in ultimate volution. Diameter 300$\mu$ to 340$\mu$ for 3½ to 4 whorls. Periphery slightly subangular. Septa arcuate, regular, 16 to 20 in mature forms. Wall calcareous secreted, 6$\mu$ to 8$\mu$, a tectum with probable tectoria? Chomata present but very small. Tunnel single.

*Remarks.*—By its slightly subangular periphery, this evolved *Millerella* is very similar to *M. carbonica* described from the Donbass and in particular with the taxa reported by Brezhnikova and others (1967) from the $C_2^b$ b+c (Zone 22). It differs from the Ukrainian forms by a somewhat thinner wall and a slightly less pronounced angularity.

*Stratigraphic range and distribution.*—Similar forms are reported from Zones 20 to 23 in the U.S.S.R.

In Alaska, exclusively present in Zone 21, in the Wahoo Limestone.

*Figured specimens.*—Univ. Montréal 219/32, 200/1.

### Millerella? sp.

Plate 34, figures 15, 16, 18

*Diagnosis.*—Test free, small, laterally compressed, lenticular. Proloculus small, followed by involute planispiral spirotheca. Last whorl becomes slightly evolute. Periphery subrounded with tendency to keel in last whorl. Diameter 270$\mu$ to 340$\mu$ for three whorls. Wall calcareous secreted, dark thin, 6$\mu$ to 8$\mu$. Tectoria unknown. Secondary deposits very faint, as indistinct pseudochomata? Aperture unknown.

*Remarks.*—Rare specimens from the upper part of the Wahoo Limestone in the West Sadlerochit Mountains section can be assigned with doubt to *Millerella*? sp. As no good equatorial section is known, this assignment is unsecure, and the forms could well turn out to be *Zellerina*. As no similar forms are known from the literature, the nomenclature remains open.

*Stratigraphic range and distribution.*—Currently only known from Zone 21, in the eastern part of the Arctic North Slope of Alaska.

*Figured specimens.*—Univ. Montréal 219/33, 219/12, 219/11.

## Family FUSULINIDAE von Möller 1878
## Subfamily SCHUBERTELLINAE Skinner 1931
### Genus EOSCHUBERTELLA Thompson 1937

[Revision of the taxonomy pending. Synonymy list incomplete.]

1930. *Schubertella* Lee and Chen *in* Lee, Chen, and Chu. Acad. Sinica, Nat. Res. Inst. Geol., Mem. 9, p. 111.
1937. *Schubertella* (*Eoschubertella*) Thompson. Jour. Paleontology, v. 11, no. 2, p. 123, 124.
1945. ?*Pseudostaffella* Thompson. Kansas Geol. Survey Bull. 60, p. 49, 50 [part].
1947. *Eoschubertella* Thompson. Jour. Paleontology, v. 21, no. 2, p. 161, 162.
1948. *Eoschubertella* Thompson. Kansas Univ. Paleont. Contr., Protozoa, art. 1, p. 79.
1957. *Eoschubertella* St.-Jean. Indiana Geol. Survey Bull. 10, p. 45.
1965. *Schubertella* van Ginkel. Leidse Geol. Meded., v. 34, p. 86–100 [part].
1967. *Pseudostaffella* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, pl. 21, 23 [part].
1967. ?*Pseudostaffella* Ross. Jour. Paleontology, v. 41, no. 3, p. 718, 719 [part].

*Diagnosis.*—Test free, inflated to slightly fusiform. Proloculus followed by erratically coiled initial spire, then by outer spires coiled at right angle. Septa not numerous, 9 to 11 in last volution, oblique, and irregular. Chomata low. Wall trilayered, a tectum with outer and inner tectoria. Aperture a high tunnel.

*Remarks.*—Russian authors practically ignore the genus. Cursory examination of the numerous Namurian and Bashkirian *Pseudostaffella* taxa of the Russian literature discloses that their concept of *Pseudodostaffella* includes forms with quadratic axial outline, quadratic chambers in equatorial section, and regular coil as well as forms with inflated-fusiform shape, irregular chambers, and erratic inner coils.

Recently, Reitlinger (1971) has proposed the subgenus *Semistaffella* for askew-coiled *Pseudostaffella*. However, her illustrations do not permit a decision on whether her *Semistaffella* is an Eostaffellidae or a Fusulinidae. Taxonomic revision is pending.

*Typc of genus.*—1930 *Schubertella lata* Lee and Chen *in* Lee, Chen, and Chu. Acad. Sinica, Nat. Res. Inst. Geol., Mem. 9, p. 111, pl. 6, fig. 6.

*Stratigraphic range and distribution.*—Eurasia, North America, and South America.

First occurrence in the Bashkirian of the Russian authors (upper part of the Namurian Series, sensu stricto) and in the Atoka Group and its time equivalents of North America.

### Eoschubertella? yukonensis (Ross 1967)

Plate 35, figure 3

1967. *Pseudostaffella yukonensis* Ross. Jour. Paleontology, v. 41, no. 3, p. 718, 719, pl. 79, figs. 12, 14–16, 13?

*Diagnosis.*—Test free, inflated, spherical to slightly fusiform. Proloculus very large (70μ to 110μ) followed by erratically coiled spire, then at right angle by succession of regular symmetrical involute spire. Diameter 550μ to 850μ for 4 to 4½ whorls. Septa not numerous, oblique, 9 to 10 in last coil. Chambers crescentiform in regular part. Chomata poor, low, rounded. Wall a tectum with an outer and inner tectoria. Aperture a high tunnel.

*Remarks.*—The small number of crescentiform chambers indicates much more an *Eoschubertella* than a *Pseudostaffella* that has numerous subquadratic chambers (compare for instance in Ross, 1967, pl. 79, figs. 15, 16 and pl. 81, figs. 1–11).

*Stratigraphic range and distribution.*—Originally recorded from an uncertain stratigraphic level, Keele Range, south of Old Crow, Yukon Territory.

Very abundant in the upper part of the Wahoo Limestone (Zone 21).

*Figured specimen.*—USNM 179474.

#### Family PALAEOTEXTULARIIDAE Galloway 1933

#### Genus CRIBROSTOMUM von Möller 1879, emend. Eickhoff 1968

1860. ?*Textularia* d'Eichwald. Lethaea Rossica, v. 1, p. 355.
1879. *Cribrostomum* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 39–67 [part].
1880. *Cribrostomum* von Möller. Mat. Geol. Russ., v. 9, p. 79–81.
1927. ?*Cribrostomum* Harlton. Jour. Paleontology, v. 1, no. 1, p. 22 [part].
1928. *Climacammina* Harlton. Jour. Paleontology, v. 1, no. 4, p. 308 [part].
1928. *Cribrostomum* Harlton. Jour. Paleontology, v. 1, no. 4, p. 308 [part].
1928. *Cribostomum* Cushman. Cushman Lab. Foram. Research Spec. Pub. 1, p. 111.
1930. ?*Cribrostomum* Lee and Chen *in* Lee, Chen, and Chu. Acad. Sinica, Nat. Res. Inst. Geol., Mem. 9, p. 96–102 [part?].
1932. *Textularia* Liebus. Preuss. Geol. Landesanst. Abh., new series, no. 141, p. 156 [part].
1932. [not] *Cribrostomum* Liebus. Preuss. Geol. Landesanst. Abh., new series, no. 141, p. 156.
1939. *Cribrostomum* Mikhailov. Leningrad Geol. Trust Symp. no. 3, no text, pl. 4, fig. 16.
1945. *Cribrostomum* Plummer. Texas Univ. Bull. 4401, p. 245 [part].
1948. *Cribrostomum* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 203–207 [part].
1950. *Cribrostomum* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 56, 57 [part].
1956. *Cribrostomum* Cummings. Micropaleontology, v. 2, no. 3, p. 219–224 [part].
1956. *Cribrostomum* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, no text, pl. 8, fig. 7.
1959. *Cribrostomum* Durkina. VNIGRI Trudy 136, p. 218, 219 [part].
1960. *Cribrostomum* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 355, 356 [part].
1960. *Cribrostomum* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 83.
1961. ?*Cribrostomum* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 218, 219 [part].
1962. ?*Cribrostomum* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 188.
1964. [not] *Cribrostomum* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, p. 190.
1964. *Cribrostomum* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 81, 82 [part].
1964. *Climacammina* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, p. C333 [part].
1967. *Cribrostomum* Okimura. Hiroshima Univ. Geol. Repts., ser. C, v. 5, no. 3, p. 260, 261.
1968. *Cribrostomum* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 540.
1968. *Cribrostomum* Conil, Paproth, and Lys. Decheniana, v. 119, no. 1–2, p. 72–76 [part].
1968. *Cribrostomum* Eickhoff. Paläont. Zeitschr., v. 42, no. 3/4, p. 171–176.
1969. *Cribrostomum* Vdovenko. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 11, p. 35–40 [part].
1969. [not] *Cribrostomum* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 38, 39.
1970. *Cribrostomum* Hallet. 6ème Cong. Avanc. Strat. Carb. Compte-Rendu, p. 890.

*Diagnosis.*—Test free. Proloculus followed by tapering biserial part. Adult part septate throughout. Wall calcareous secreted, composed of two layers; an inner pseudofibrous layer and an outer dark micritic tectum with some additional agglutinated material. Aperture a low slit at base of apertural chamber. In addition, ultimate and penultimate septa are cribrate.

*Remarks.*—As demonstrated by Cummings (1956), identification of Palaeotextulariidae in random thin section is difficult. An oblique section of a biserial-uniserial *Climacammina* appears to belong to a biserial *Cribrostomum;* an oblique section of a cribrate *Cribrostomum* appears to be that of a *Palaeotextularia* (compare for instance the fossils in figs. 14 and 15, pl. 35, which belong to the same species, although they appear to be characteristic of two different genera). These difficulties have induced some authors (Loeblich and Tappan, 1964, for example), to consider *Cribrostomum* and *Deckerella* as synonyms of *Climacammina.* In this report, the authors follows Eickhoff's emendation (1968b) and recognize *Cribrostomum* (not *Climacammina,* not *Koskinobigenerina*) as a valid taxon.

As for the Tetrataxidae, the value of most Palaeotextulariid species of the literature is difficult to assess. Tentatively, the following taxa are reported to the genus:

1928 *?attenuata* Harlton
1879 *bradyi* von Möller
1960 *breve* Saurin OBJ (not *breve* Reitlinger 1950)
1879 *?commune* von Möller
1968 *curvatum* Eickhoff
1948 *eximiniformis* Lipina
1956 *inflatum* Cummings
1964 *lecomptei* Conil and Lys ( = 1879 *"eximium"* von Möller auct. OBJ = 1964 *mölleri* Conil and Pirlet, sic, OBJ)
1961 *liebusi* Saurin
1961 *?lipinae* Saurin
1956 *oveyi* Cummings
1948 *paraeximia* Lipina
1960 *?parva* Saurin
1956 *ponielum* Cummings
1948 *?recurrens* Lipina
1948 *?regularis* Lipina
1956 *scoticum* Cummings
1948 *stalinogorski* Lipina
1879 *textulariforme* von Möller
1956 *wilkiestoni* Cummings

The following taxa have been reported to *Cribrostomum* but should probably be transferred to:

*Climacammina:*

1950 *breve* Reitlinger
1928 *cushmani* Harlton
1959 *fortis* Durkina
1930 *infudibulum* Lee and Chen *in* Lee, Chen, and Chu
1959 *juditchevi* Durkina
1930 *laxum* Lee and Chen *in* Lee, Chen, and Chu
1930 *longissimoides* Lee and Chen *in* Lee, Chen, and Chu
1927 *lucillae* Harlton
1945 *marblense* Plummer
1930 *nelumboforme* Lee and Chen *in* Lee, Chen, and Chu
1950 *posteximium* Reitlinger
1930 *spathulatum* Lee and Chen *in* Lee, Chen, and Chu
1930 *stiloforme* Lee and Chen *in* Lee, Chen, and Chu

*Koskinotextularia:*

1964 *obliquum* Conil and Lys
1964 *strictum* Conil and Lys

Nearly a quarter of the published *Cribrostomum* taxa are unidentifiable on the generic level (for example, 1961 *larvum* Saurin, 1961 *macellum* Saurin, and 1930 *maximum* Lee and Chen in Lee, Chen, and Chu).

*Stratigraphic range and distribution.*—Abundant in the Tethys (Eurasia, north Africa, and Australia). Scarce in North America.

Although reported from the Late Tournaisian (Cummings, 1956; Loeblich and Tappan, 1964), the first appearance of the genus is in the Late Viséan. Earlier occurrences have to be transferred to *Koskinotextularia* or *Eotextularia*. *Cribrostomum* is characteristically abundant in the Late Viséan of the Tethys. It is very scarce above the base of the Namurian, and most reported occurrences in the middle Carboniferous are to be transferred to *Climacammina.*

**Cribrostomum bradyi von Möller 1879**

Plate 35, figures 14, 15

1879. *Cribrostomum bradyi* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 53–55, pl. 3, fig. 1, pl. 6, fig. 1.

1880. *Cribrostomum bradyi* von Möller. Mat. Geol. Russ., v. 9, p. 79–81, pl. 3, fig. 1 a–3, pl. 6, fig. 1 a–e [not text figs. 18, 19].

1948. *?Cribrostomum bradyi* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 206, pl. 9, figs. 4?, 6? [not 7].

1956. *Cribrostomum bradyi* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, no text, pl. 8, fig. 7.

1960. *?Cribrostomum bradyi parva* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 355, pl. 2, fig 23.

1962. *?Cribrostomum bradyi* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 188, pl. 7, fig. 19.

*Diagnosis.*—Test free. Proloculus followed by slowly tapering, cylindrical, biserial part. Width 700$\mu$ to 800$\mu$ for eight chambers. Septa long, largely overlapping. Tip of septa slightly enlarged. Sutures well marked. Wall calcareous secreted, two layered; a thick (30$\mu$ and more) dark micritic tectum with rare additional material and a faint thin uneven pseudofibrous layer. Aperture a low slit at base of apertural face, cribrate in last two chambers.

*Stratigraphic range and distribution.*—Mostly Tethyan, but also present in the Taimyr-Alaska realm.

Present in the Chester time equivalents of Alaska (Alapah Limestone and Kogruk? Formation).

*Figured specimens.*—USNM 177479; Univ. Montréal 174/7.

### Family Undetermined

#### Genus VOLVOTEXTULARIA Termier and Termier 1950

1947. *Trepeilopsis* Cooper. Jour. Paleontology, v. 21, no. 1, p. 87.
1950. *Volvotextularia* Termier and Termier. Paléont. marocaine Invertébrés Ere Primaire, Pt. 1, p. 33.
1956. *Trepeilopsis* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 26, 27.
1958. *Trepeilopsis* Dain. VNIGRI Trudy 115, p. 11.
1964. *Volvotextularia* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, p. C786 (as "unrecognizable generic name").
1965. *Trepeilopsis* Solovieva *in* Solovieva and Krasheninikov. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 9, p. 19, 20.
1966. *Trepeilopsis* Sossipatrova. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 11, no text, pl. 3, fig. 9.
1966. *Trepeilopsis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 101–106 [part].
1967. *Trepeilopsis* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, no text, pl. 18, fig. 11.
1969. *Trepeilopsis* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12.
1969. *Trepeilopsis* Hewitt and Conil. Soc. Belge Géologie Paléontologie Hydrologie Bull., v. 78, pl. 1, figs. 7–9?

*Diagnosis.*—Test attached. Proloculus followed by cylindrical chamber, spirally close coiled along a support (usually a brachiopod spine or an alga). Last part of cylindrical chamber expands rapidly, bends back, and surrounds first spiral coils. Wall calcareous secreted, dark, fine grained, a tectum. Aperture simple, at open end of tube.

*Type of genus.*—1950 *Volvotextularia polymorpha* Termier and Termier. Paléont. Maroc., Invertébrés Ere Primaire, Pt. 1, p. 33, 39, pl. 1, figs. 11, 12, not 13.

*Remarks.*—Termier and Termier (1950) originally thought that *Volvotextularia* was biserial, a misinterpretation of the regularly coiled spiral tube around an axis; hence the assignment to the Textulariidae is unwarranted. Examination of the type material, kindly lent by Professor H. Termier, shows that the test is calcareous secreted, fine grained, and partly chertified (accompanying foraminifers such as *Hemigordius* are also partly epigenized). Cummings (1961) attributed *Volvotextularia* to the Tetrataxinae, and Loeblich and Tappan thought it was an "unrecognizable generic name."

As the type of *Trepeilopsis* (*Turritella grandis* Cushman and Waters) is an agglutinated Ammodiscidae (Loeblich and Tappan, 1964), all calcareous secreted "*Trepeilopsis*-looking" forms are here placed among *Volvotextularia.*

Taxa included in the genus *Volvotextularia:*

1956 *extensus* Brazhnikova
1956 *granularis* Brazhnikova
1958 *minima* Dain
1947 *mississippiana* Cooper
1965 *mollis* Solovieva *in* Solovieva and Krasheninikov
1950 *polymorpha* Termier and Termier

*Stratigraphic range and distribution.*—Eurasia, north Africa, and North America.

Occurs for the first time in the Viséan. Observed in middle and upper Carboniferous. Rather common in the Pennsylvanian of the midcontinent. Last occurrence unknown.

#### Volvotextularia mississippiana (Cooper 1947))

Plate 35, figure 19

1947. *Trepeilopsis mississippiana* Cooper. Jour. Paleontology, v. 21, no. 1, p. 87, pl. 20, figs. 34–41.

*Diagnosis.*—Test attached. Proloculus followed by cylindrical chamber, spirally close coiled along tubular support. Maximum width 250$\mu$ to 280$\mu$, and maximal length 450$\mu$ to 550$\mu$ for eight coils. Wall calcareous secreted, fine grained, 12$\mu$ to 18$\mu$. Aperture at open end of tube.

*Remarks.*—Bogush and Yuferev (1966) have recently equated *Volvotextularia mississippiana* (Cooper) with agglutinated Ammodiscidae such as *Turritellella grandis* Cushman and Waters, *Turritellella spirans* Cushman and Waters (now *Trepeilopsis*), *Trepeilopsis spiralis* Gutschick and Treckman, and *Trepeilopsis recurvidens* Gutschick and Treckman. This emendation is not substantiated by a study of wall structures in thin sections; hence it remains debatable and unconvincing.

*Stratigraphic range and distribution.*—North America.

Late Viséan, Namurian, and Moscovian. Also late Carboniferous?

In Alaska, it is observed in the Alapah and Wahoo Limestones.

*Figured specimen.*—Univ. Montréal 222/1.

### Family TETRATAXIDAE Galloway 1933

#### Genus TETRATAXIS Ehrenberg 1854 emend. von Möller 1879

1854. *Tetrataxis* Ehrenberg. Mikrogeologie, p. 106.
1876. *Valvulina* Brady. Palaeont. Soc. London Pub., v. 30, p. 87–88 [only].
1879. *Tetrataxis von* Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 71–73 [part].
1898. *Tetrataxis* Schellwien. Paleontographica, v. 44, pt. 5–6, p. 274, 275.
1901. *Tetrataxis* Spandel. Abhand. der Natur-Hist. Gesellsch., Nürnberg, Festschrift Saec., p. 186.
1921. *Ruditaxis* Schubert. Paläont. Zeitschr., v. 3, pt. 2, p. 180.

1925. *Tetrataxis*? Ozawa. Tokyo Imp. Univ. Jour., Coll. Sci., v. 45, art. 6, p. 9.
1927. *Tetrataxis* Harlton. Jour. Paleontology, v. 1, no. 1, p. 22, 23.
1927. [not] *Tetrataxis* Cushman and Waters. Cushman Lab. Foram. Research Contr., v. 3, pt. 3, p. 153.
1928. *Tetrataxis* Cushman and Waters. Cushman Lab. Foram, Research Contr., v. 4, no. 3, p. 65–67 [part].
1928. *Tetrataxis* Cushman and Waters. Jour. Paleontology, v. 2, no. 3, p. 371.
1930. *Tetrataxis* Lee and Chen *in* Lee, Chen, and Chu. Acad. Sinica, Nat. Res., Inst. Geol., Mem. 9, p. 92–94.
1930. [not] *Tetrataxis* Roth and Skinner. Jour. Paleontology, v. 4, no. 4, p. 337.
1930. *Tetrataxis* Cushman and Waters. Texas Univ. Bull. 3019, p. 75.
1930. *Tetrataxis* Galloway and Ryniker. Oklahoma Geol. Survey Circ. 21, p. 17, 18.
1930. *Tetrataxis* Warthin. Oklahoma Geol. Survey Bull. 53, p. 25–26.
1932. *Tetrataxis* Liebus. Preuss. Geol. Landesanstalt Abh., new series, no. 141, p. 163 [part].
1933. *Tetrataxis* Galloway and Spock. Am. Mus. Novitates, no. 658, p. 5.
1937. ?*Tetrataxis* Lee. Geol. Soc. China Bull., v. 16, p. 68, 69.
1939. *Tetrataxis* Mikhailov. Leningrad Geol. Trust Symp. no. 3, p. 54.
1940. *Tetrataxis* Chernysheva. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, ser. geol. 18, no. 5–6, p. 132.
1948. [not] *Tetrataxis* Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 12, 13.
1948. *Tetrataxis* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 191–195 [part].
1949. *Tetrataxis* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol. no. 6, p. 164 [part].
1949. *Tetrataxis* Morozova. Akad. Nauk SSSR Geol. Trudy 105, no. 35, p. 255–263.
1949. *Tetrataxis* Suleimanov. Akad. Nauk SSSR Geol. Inst. Trudy 105, no. 35, p. 242, 243.
1950. *Tetrataxis* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 71–75 [part].
1950. *Tetrataxis* Termier and Termier. Paléont. Marocaine, Invertébrés Ere Primaire, Pt. 1, p. 36 [part].
1951. *Tetrataxis* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 5, p. 83–86 [part].
1953. *Tetrataxis* Lehmann. Cushman Found. Foram. Research Contr., v. 4, no. 2, p. 71–73.
1954. *Tetrataxis* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 65–68.
1954. [not] *Tetrataxis* Sage. Nova Scotia Dept. Mines Mem. 3, p. 112.
1955. *Tetrataxis* Marple. Ohio Jour. Sci., v. 55, no. 2, p. 87.
1956. *Tetrataxis* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 44, 45 [part], 117–120 [part].
1956. *Tetrataxis* Putria. VNIGRI Trudy 98, p. 375–377.
1956. *Tetrataxis* Ganelina. VNIGRI Trudy 98, pl. 5, fig. 1.
1956. *Tetrataxis* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 51–54.
1957. *Tetrataxis* St.-Jean. Indiana Geol. Survey Bull. 10, p. 37–39.
1957. *Tetrataxis* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 133–141.
1958. *Tetrataxis* Liszka. Polskie. Towarz. Geol. Rocznik, v. 28, no. 2, p. 159, 160.
1958. *Tetrataxis* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Geol. Strat., no. 31, pl. 2, figs. 4, 7.
1959. *Tetrataxis* Durkina. VNIGRI Trudy 136, p. 221, 222.
1959. *Tetrataxis* Deleau and Marie. Serv. Carte Géol. Algérie, n.s., Bull. 25, p. 90, 91.
1959. *Falsotetrataxis* Deleau and Marie. Serv. Carte Géol. Algérie, n.s., Bull. 25, p. 94–96.
1959. *Pseudotetrataxis* Deleau and Marie. Serv. Carte Gêol. Algérie, n.s., Bull. 25, p. 91–94.
1960. *Tetrataxis* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 357 [part].
1960. *Tetrataxis* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 85–88.
1961. *Tetrataxis* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 219 [part].
1962. *Tetrataxis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 192–195 [part].
1962. *Tetrataxis* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21 p. 114.
1962. [not] *Tetrataxis* Vdovenko. Paleont. Zhur., no. 1, p. 45.
1962. *Tetrataxis* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 44, p. 63–64.
1963. *Tetrataxis* Bogush. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 60.
1963. *Tetrataxis* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 148–150.
1964. *Tetrataxis* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, pl. 1, figs. 7–9 [no text].
1964. *Tetrataxis* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, p. C337.
1964. *Tetrataxis* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 86–96 [part].
1964. [not] *Tetrataxis* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, no text, pl. 1, fig. 6.
1964. [not] *Tetrataxis* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 48, p. 39, 40.
1965. *Tetrataxis* Omara and Conil. Soc. Géol. Belgique Annales, v. 88, no. 5, p. 226.
1965. *Tetrataxis* Conil and Lys. Soc. Géol. Belgique Annales, v. 88, no. 3, p. 29.
1966. *Tetrataxis* Sossipatrova. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 11, no text, pl. 3, figs. 11, 13–15 [part].
1966. *Tetrataxis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 173–177 [part].
1966. [not] *Tetrataxis* Ganelina. VNIGRI Trudy 250, no text, pl. 12, fig. 15.
1967. *Tetrataxis* Chanton. Soc. Géol. France Bull., sér. 7, v. 8, p. 39.
1967. *Tetrataxis* Potievskaia *in* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, p. 156.
1967. [not] *Tetrataxis* Brazhnikova and others. Akad. Nauk

Ukrain. SSR Inst. Geol. Trudy, pl. 18, fig. 15, pl. 20, fig. 3.
1967. *Tetrataxis* Pelhate. Soc. Géol. France Bull., sér. 7, v. 9, no. 6, p. 897.
1968. *Tetrataxis* Mamet. Rev. Micropaléontologie, v. 11, no. 3, p. 134.
1969. *Tetrataxis* Vdovenko. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 11, p. 35–40.
1969. *Tetrataxis* Pelhate. Soc. Géol. Minéral. Bretagne Bull., p. 40, 41.
1969. *Tetrataxis* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12.
1970. *Tetrataxis* Mamet. Canada Geol. Survey Paper 70–21, p. 14, 44 [part].
1970. *Tetrataxis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 105 [part].
1970. *Tetrataxis* Hallet. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 892 [part].
1970. *Tetrataxis* Gorecka and Mamet. Rev. Micropaléontologie, v. 13, no. 3, p. 162.

*Diagnosis.*—Test free, conical. Coiling trochospiral, four chambers per whorl. Flanks smooth. Chambers not divided by secondary partitions. Wall calcareous secreted; an inner fine-grained microcrystalline tectum and an outer pseudofibrous hyaline layer. Aperture crosslike, slightly anteriomarginal, umbilical.

*Type of genus.*—1854 *Tetrataxis conica* Ehrenberg. Mikrogeologie, p. 106, pl. 37, figs. 12, 13, emend. 1879 von Möller, St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 9, p. 73, pl. 2, fig. 3; pl. 7, fig. 3.

Taxa included in the genus *Tetrataxis*:

1958 *acutiformis* Potievskaia
1959 *acutus* Durkina (sic)
1948 *angusta* Vissarionova
1964 aperta Conil and Lys (OBJ, infrasubspecific)
1960 *barkatovae* Grozdilova and Lebedeva
1949 *bashkirica* Morozova
1967 *beshevensis* Potievskaia *in* Brazhnikova and others
1957 *biconvexa* St. Jean
1964 *compactus* Conil and Lys (sic)
1876 *compressa* Brady
1930 *concava* Galloway and Ryniker
1956 *conciliatus* Ganelina (sic)
1964 condrusiana Conil and Lys (OBJ, infrasubspecific)
1967 *conili* Pelhate
1928 ?*corona* Cushman and Waters
1937 *cumulosa* Lee
1949 *curviseptata* Morozova
1876 *decurrens* Brady
1956 *dievi* Malakhova
1898 *depressa* Schellwien
1964 depressus Conil and Lys (OBJ, infrasubspecific)
1956 *donetzica* Putria
1949 *elata* Reitlinger
1949 *elegans* Suleimanov
1964 *elegans* Conil and Lys (OBJ, preoccupied)
1949 *elongata* Morozova
1965 *emaciatus* Conil and Lys (sic)
1956 *eomaxima* Putria
1964 *exornatus* Conil and Lys (sic)
1964 *fluxus* Conil and Lys (sic)
1964 gigantea Conil and Lys (OBJ, infrasubspecific)
1956 *gigas* Brazhnikova
1964 *gradi* Conil and Lys
1949 *hemiovoides* Morozova
1949 *hemisphaerica* Morozova
1954 *immaturata* Grozdilova and Lebedeva
1949 *irregularis* Morozova
1959 *izhimica* Durkina
1957 *labiata* St.-Jean
1901 *lata* Spandel
1957 *lata* Golubsov (OBJ, preoccupied, by 1901 *lata* Spandel)
1962 *lata* Bogush and Yuferev (OBJ, preoccupied, 1901 *lata* Spandel)
1930 *latispiralis* Lee and Chen *in* Lee, Chen, and Chu
1925 ?*linea* Ozawa
1948 *magna* Vissarionova
1898 *maxima* Schellwien
1948 *media* Vissarionova
1949 *meridionalis* Morozova
1928 *millsapiensis* Cushman and Waters
1930 *minima* Lee and Chen *in* Lee, Chen, and Chu
1949 *minuta* Morozova
1951 *minuta* Brazhnikova (OBJ, preoccupied, 1949 *minuta* Morozova)
1964 *mirus* Conil and Lys (sic)
1949 *moderata* Morozova
1950 *mosquensis* Reitlinger
1949 *nana* Morozova
1950 *numerabilis* Reitlinger
1964 *obliquus* Conil and Lys (sic)
1956 *obtusus* Malakhova (sic)
1937 *pagodoformis* Lee
1964 *pallae* Conil and Lys
1950 *paraconica* Reitlinger
1948 *paraminima* Vissarionova
1930 *parviconica* Lee and Chen *in* Lee, Chen, and Chu

1956 *perfidus* Malakhova (sic)
1964 *petasi* Conil and Lys
1964 pigra Conil and Lys (OBJ, infrasubspecific)
1949 *plana* Morozova
1957 *plana* Golubsov (OBJ, preoccupied, 1949 *plana* Morozova)
1950 *planispiralis* Reitlinger
1930 *planolocula* Lee and Chen *in* Lee, Chen, and Chu
1949 *planoseptata* Morozova
1949 *planulata* Morozova
1876 *plicata* Brady
1930 *pauperata* Warthin
1962 *postminima* Potievskaia
1956 *pressulus* Malakhova (sic)
1957 *pusillus* Golubsov (sic)
1964 *pusillus* Conil and Lys (sic) (OBJ, preoccupied, 1957 *pusillus* Golubsov)
1956 *quasiconica* Brazhnikova
1956 *regularis* Brazhnikova
1964 *rugosus* Conil and Lys (sic)
1950 *serpukhovensis* Reitlinger
1949 *shikkanensis* Morozova
1949 *subconica* Morozova
1964 *subcylindricus* Conil and Lys (sic)
1956 *submedia* Brazhnikova
1960 *volongaensis* Grozdilova and Lebedeva
1956 *vulgaris* Malakhova

This faunal list is indicative of duplication. Indeed, *Tetrataxis* is difficult to speciate in random cuts as the section, to be significant, should be axial through the proloculus. Most (80 percent) of the valid taxa cited above have been erected on oblique sections which are nondiagnostic (for example, *beshevensis* Potievskaia in Brazhnikova and others, *compactus* Conil and Lys, *perfidus* Malakhova, and so on). Such sections do not even permit estimation of the apical angle and give a distorted view of the chambers' outline; they do not even allow placing the taxon in a given group; a fortiori, their specific value is nil.

In the list, all *Tetrataxis* have a characteristic double-layered wall structure. However, primitive Late Tournaisian forms and some Viséan and Namurian forms do not possess a pseudofibrous layer. Such difference of wall composition is here considered to have a generic value and has led to the erection of *Pseudotaxis* (Mamet, 1974).

*Stratigraphic range and distribution.*—Cosmopolitan: Eurasia, north Africa, Australia, and North America.

Occurs for the first time in the Late Tournaisian. Very long ranging, up to the Permian. Could range in the Triassic, but the question is debatable.

#### Tetrataxis of the group T. angusta Vissarionova 1948

Plate 35, figure 9

Group exemplified by:

1948. *Tetrataxis angusta* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 193, pl. 8, figs. 6, 7.
1957. *Tetrataxis angusta* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 134, pl. 5, figs. 9, 10.
1962. *Tetrataxis angusta* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 175, 176, pl. 12, fig. 9.

Common taxa referable to the group are *Tetrataxis acuta* Durkina 1959, *Tetrataxis submedia* Brazhnikova 1956, and *Tetrataxis gigas* Brazhnikova 1956.

*Diagnosis.*—Test free, conical. *Tetrataxis* with an apical angle of 45°–60°. Wall distinctively two layered.

*Stratigraphic range and distribution.*—Cosmopolitan: Eurasia, north Africa, Australia, and North America.

Occurs for the first time in the latest Tournaisian. Abundant in the Viséan and Namurian. Scarce in the late Carboniferous. Last occurrence undetermined, probably Permian. Present but rather scarce in Alaska where it is represented by the following taxon.

#### Tetrataxis sp.

Plate 35, figure 9

*Diagnosis.*—Test free, conical. Apical angle small, 45°–60°. Coiling trochospiral. Maximum diameter for eight spires 1,200$\mu$; maximum height for same number of coils 1,300$\mu$. Wall calcareous secreted, two layered with very slow thickness increase; 40$\mu$ to 60$\mu$ in last chamber. Pseudofibrous layer conspicuous but not thick. Aperature umbilical.

*Stratigraphic range and distribution.*—Observed in the Alapah Limestone of the arctic North Slope, where it ranges from Viséan to Namurian.

*Figured specimen.*—Univ. Montréal 222/5.

#### Tetrataxis of the group T. conica Ehrenberg emend. von Möller 1879

Plate 35, figures 11–13

Group exemplified by:

1854. *Tetrataxis conica* Ehrenberg. Mikrogeologie, p. 106, pl. 37, figs. 12, 13.
1879. *Tetrataxis conica* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 71–73, pl. 2, fig. 3; pl. 7, figs. 1, 2; and text fig. 30.

1879. [not] *Tetrataxis conica gibba* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 73, pl. 2, fig. 4; pl. 7, fig. 3.
1927. [not] *Tetrataxis conica* Harlton. Jour. Paleontology, v. 1, no. 1, p. 22, pl. 4, figs. 5 a–d.
1930. [not] *Tetrataxis conica* Cushman and Waters. Texas Univ. Bull. 3019, p. 75, pl. 7, figs. 2 a, b, 4, 5 a, b.
1932. [not] *Tetrataxis conica* Liebus. Preuss. Geol. Landesanstalt Abh., new series, no. 141, p. 163, pl. 9, figs. 29–32.
1933. [not] *Tetrataxis conica* Galloway and Spock. Am. Mus. Novitates, no. 658, p. 5, fig. 6.
1939. *Tetrataxis conica* Mikhailov. Leningrad Geol. Trust Symp. no. 3, pl. 4, fig. 7.
1950. [not] *Tetrataxis conica* Termier and Termier. Paléont. Marocaine, Invertébrés Ere Primaire, Pt. 1, p. 36, pl. 1, figs. 27, 28.
1953. ?*Tetrataxis conica* Lehmann. Cushman Found. Foram. Research Contr., v. 4, no. 2, p. 72, pl. 12, figs. 1–3.
1956. ?*Tetrataxis conica* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 44, pl. 5, fig. 4.
1957. ?*Tetrataxis corona* St. Jean. Indiana Geol. Survey Bull. 10, p. 39, pl. 1, fig. 13 [part].
1958. *Tetrataxis conica* Liszka. Polskie. Towarz. Geol. Rocznik, v. 28, no. 2, p. 159, 160, pl. 18, fig. 11, pl. 19, fig. 6.
1962. *Tetrataxis conica* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleinye Inst. Geologii i Geofiziki Trudy, p. 193, pl. 8, fig. 7.
1962. *Tetrataxis conica* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 114.
1963. *Tetrataxis conica* Pronina. Akad. Nauk SSSR Ural Fil., Geol. Inst. Trudy 65, p. 150, pl. 7, fig. 9.
1964. *Tetrataxis exornatus* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 89, 90, pl. 12, fig. 226.
1966. [not] *Tetrataxis conica* Sossipatrova. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 11, no text, pl. 3, fig. 11.
1970. *Tetrataxis* of the group *T. conica* Mamet. Canada Geol. Survey Paper 70–21, p. 14, 44, pl. 4, fig. 9.
1970. *Tetrataxis* ex. gr. *conica* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 105, pl. 9, fig. 10.

Other common taxa belonging to the group are: *Tetrataxis paraminima* Vissarionova 1948, *T. quasiconica* Brazhnikova 1956, and *T. media* Vissarionova 1948.

*Diagnosis.*—Test free, conical. Apical angle ranges from 80° to 100°. Coiling trochospiral. Wall calcareous secreted, two layered, with strong development of pseudofibrous layer.

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America. Common.

Occurs for the first time in the latest Tournaisian. Abundant in the Tethyan Viséan. Present in late Carboniferous. Level of extinction undermined, probably Permian.

**Tetrataxis quasiconica Brazhnikova 1956**

Plate 35, figures 11, 13

1956. *Tetrataxis quasiconica* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 51, pl. 10, figs. 3, 4.
1956. *Tetrataxis regularis* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 53, pl. 10, fig. 7.
1970. *Tetrataxis quasiconica* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 105, pl. 9, fig. 11.

*Diagnosis.*—Test free, conical. Apical angle around 90°. Coiling trochospiral. Maximum diameter, $600\mu$ to $900\mu$ for seven to nine coils. Height, for same number of volutions, $450\mu$ to $650\mu$. Wall bilayered, regular, with well-developed inner dark layer. Fibrous layer present; total thickness $40\mu$ to $70\mu$. Aperture crosslike, umbilical.

*Remarks.*—Alaskan species are slightly bigger than the forms originally described from the Donbass.

*Tetrataxis regularis* was based on a slightly oblique cut of *T. quasiconica*, hence the apparently thicker walls.

*Stratigraphic range and distribution.*—Known from the Middle and Late Viséan of the Donbass, the Late Viséan of Siberia, and the Late Viséan and Early Namurian of Alaska (Alapah Limestone) .

*Figured specimens.*—Univ. Montréal 221/34, 131/26.

**Tetrataxis media Vissarionova 1948**

Plate 35, figure 12

1948. *Tetrataxis media* Vissarionova. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 191, pl. 8, fig. 1 [not 2].
1954. ?*Tetrataxis digna* Grozdilova and Lebedeva. VNIGRI Trudy 81, p. 67, pl. 8, fig. 3.
1957. *Tetrataxis media* Golubsov. Akad. Nauk Beloruss. SSR Inst. Geol. Nauk Trudy, sbornik 2, p. 135, pl. 5, fig. 16.
1960. *Tetrataxis digna* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 87, pl. 9, fig. 9.
1963. *Tetrataxis media* Pronina. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, p. 149, pl. 7, fig. 5.
1963. *Tetrataxis digna* Pronina. Akad. Nauk SSSR Ural Fil., Geol. Inst. Trudy 65, p. 149, pl. 7, fig. 6.
1966. *Tetrataxis media* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 174, pl. 12, figs. 1 ,3.
1970. *Tetrataxis media* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 105, pl. 9, figs. 5–6.

*Diagnosis.*—Test free, conical. Apical angle around 80°. Coiling trochospiral. Maximal diameter $400\mu$ to $500\mu$. Height $300\mu$ to $400\mu$ for six spiral whorls. Wall bilayered, $25\mu$ to $30\mu$; dark inner layer well developed; fibrous layer thin. Aperture umbilical.

*Remarks.*—In her original description, Vissarionova (1948) included in the taxon a thin-walled form (holotype, her fig. 1) and a thick-walled form with a heavy pseudofibrous layer (her fig. 2). In the author's view, this later taxon ought to be assigned to the *Tetrataxis paraminima* group, of which it represents a very oblique cut.

*Stratigraphic range and distribution.*—Scarce Reported from the latest Tournaisian(?) and the Viséan of the Russian Platform, the Urals, and arctic Siberia.

Rarely observed in Alaska in the Viséan Kogruk Formation and in the Viséan and Namurian Alapah Formation.

*Figured specimen.*—USNM 179478.

#### Genus Monotaxinoides Brazhnikova and Yartseva 1956

1949. *Ammodiscus* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 155, 156.
1952. *Ammodiscus* Dain *in* Potievskaia. Akad. Nauk Ukrain. SSR, Inst. Geol., p. 234, 235.
1956. *Eolasiodiscus* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 1, p. 75–77.
1956. *Ammodiscus* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, no text, pl. 1, figs. 25, 26.
1956. *Monotaxinoides* Brazhnikova and Yartseva. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 1, p. 62–65.
1956. *Ammodiscus* Putria. VNIGRI Trudy 98, p. 368.
1956. *Ammodiscus* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 38.
1958. *Endothyra* Okimura. Hiroshima Univ. Jour. Sci., ser. C, v. 2, no. 3, p. 260 [only].
1958. *Ammodiscus* Dain. VNIGRI Trudy 115, p. 8.
1962. *Monotaxinoides* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 212.
1964. *Monotaxinoides* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, p. C358 [part].
1964. *Eolasiodiscus* Pogrebniak. Paleont. Zhur., no. 1, p. 6–9.
1967. *Eolasiodiscus* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, no text, pl. 19, fig. 4, pl. 20, fig. 7 [only].
1968. cf. *Monotaxinoides* Mamet. Rev. Micropaléontologie, v. 11, no. 3, p. 134.
1969. *Monotaxinoides* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12.

*Diagnosis.*—Test free, discoidal. Proloculus followed by cylindrical second chamber, planispirally coiled and evolute throughout. Axial section asymmetrical. Umbilic developed on one side only, filled by pseudofibrous material, opposite side straight. Slight deviation of coil is often observed in penultimate and ultimate coil. Wall calcareous secreted, two layered; an inner dark tectum and an outer pseudofibrous layer. Aperture at open end of tube.

*Type of genus.*—1956 *Monotaxinoides transitorius* Brazhnikova and Yartseva. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 1, p. 65, pl. 1, figs. 2, 3, 5, 8.

*Remarks.*—Considerable confusion is observed in the literature between *Monotaxinoides* and *Eolasiodiscus*. *Montotaxinoides*, however, does not possess secondary chamberlets in the inner whorls (see *Monotaxinoides transitorius* Brazhnikova 1956) or any umbilical fissures. *Eolasiodiscus* is more advanced as it has subquadratic chamberlets and umbilical fissures; it is therefore the root of the Eolasiodiscidae (see *Eolasiodiscus donbassicus* in Brazhnikova and others, 1967). That such characters can only be observed in equatorial section and not in axial section does not alter the validity of the two taxa.

Confusion is also possible with *Turrispira* Reitlinger 1950 OBJ renamed *Turrispiroides* Reitlinger 1959. It is probable that this genus does not possess a fibrous layer and that it would be derived from *Vissariotaxis* Hallett 1970. However, the case is unclear because some of the "*Turrispira*" originally published by Reitlinger seem to have some pseudofibrous umbilical filling (for example, Reitlinger, 1950, pl. 2, fig. 8).

*Monotaxinoides* is derived from *Howchinia* by progressive opening of the spire which tends to become discoidal. The process is progressive through the Late Viséan; hence the distinction between the two genera is purely arbitrary. By convention, "*Monotaxis*" *subconica* Brazhnikova 1956 and "*Monotaxis*" *subplana* Brazhnikova 1956 are here considered as *Howchinia*.

Taxa included in the genus *Monotaxinoides*:

1958 *discoideus* Okimura
1952 *gracilis* Dain *in* Potievskaia
1949 *multivolutus* Reitlinger
1956 *priscus* Brazhnikova and Yartseva
1956 *transitorius* Brazhnikova and Yartseva.

*Stratigraphic range and distribution.*—Eurasia and North America.

Abundant from the Late Viséan to the Moscovian.

#### Monotaxinoides multivolutus (Reitlinger 1949)

Plate 35, figures 16–18

1949. *Ammodiscus multivolutus* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 155, 156, fig. 2 a–c.
1956. *Ammodiscus multivolutus* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, no text, pl. 1, figs. 25, 26.
1956. *Ammodiscus multivolutus* Putria. VNIGRI Trudy 98, p. 368, pl. 1, figs. 2–3.
1969. *Monotaxinoides multivolutus* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 12, pl. 2, fig. 5.

*Diagnosis.*—Test free, discoidal, small. Proloculus small, followed by evolute, planispiral tube, with very slow rate of expansion. Diameter 220μ to 300μ, for eight to nine coils. Width 40μ to 60μ. Axial section asymmetrical; pseudofibrous umbilical cover on one side only. Wall a thin tectum, 6μ to 10μ. Aperature simple at open end of tube.

*Stratigraphic range and distribution.*—Eurasia and North America.

Recorded in the U.S.S.R. from the Bashkirian and the lower part of the Moscovian. Present in the upper part of the Alapah Limestone (from the latest Viséan and upwards) and in the Wahoo Limestone. Abundant in the Bashkirian of the Yukon Territory.

*Figured specimens.*—Univ. Montréal 220/3, 221/37.

### Family BISERIAMMINIDAE

#### Genus BISERIELLA Mamet 1974

1948. *Globivalvulina* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 249.
1949. *Globivalvulina* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 158, 159.
1950. *Globivalvulina* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 76, 78 [only].
1962. *Spiroplectammina* Vdovenko. Paleont. Zhur., no. 1, p. 41, 42 [part].
1962. *Globivalvulina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 196, 197.
1967. *Globivalvulina* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, no text, pl. 18, fig. 12; pl. 22, fig. 4 [only]; pl. 25, fig. 5.
1969. *Globivalvulina* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 13–15 [part].
1970. *Globivalvulina*? Mamet. Canada Geol. Survey Paper 70–21, p. 9.
1974. *Biseriella* Mamet *in* Armstrong and Mamet, Am. Assoc. Petroleum Geologists Bull., v. 58, no. 4, p. 660.

*Diagnosis.*—Test free, subglobular. Proloculum followed by biserial succession of very rapidly enlarging chambers, with initial biseriamminid coil followed by open helicoid coil. Valvular projections poorly developed. Wall calcareous secreted, as a dense tectum. Aperture simple, lobate, at base of apertural face.

*Remarks.*—The genus is readily distinguishable from *Globivalvulina* by its wall structure, a tectum instead of a diaphanotheca. Phylogenetically, the genus links *Globivalvulina* and *Biseriammina.*

*Type of genus.*—1948 *Globivalvulina parva* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 249, pl. 18, figs. 1–4.

Taxa included in the genus *Biseriella*:

1950 *kamensis* Reitlinger
1950 *minima* Reitlinger
1962 *minima* Vdovenko (OBJ, preoccupied by 1950 *minima* Reitlinger)
1949 *moderata* Reitlinger
1950 ?*pulchra* Reitlinger
1949 *scaphoidea* Reitlinger

*Stratigraphic range and distribution.*—Eurasia, north Africa, and North America. Common.

First occurrence at the base of Zone 18, which it characterizes. Abundant from Zones 18 to 21, where it is progressively replaced by *Globivalvulina* sensu stricto. Known up to the middle Moscovian.

#### Biseriella of the group B. parva (Chernysheva 1948)

Plate 35, figures 4, 8

Group exemplified by:

1948. *Globivalvulina parva* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 249, pl. 18, figs. 1–4.
1949. *Globivalvulina moderata* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 158, pl. 1, fig. 4 a–b.
1960. [not] *Globivalvulina parva* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 357, pl. 1, fig. 36, 37, pl. 3, fig. 6.
1962. *Globivalvulina parva* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 196, pl. 8, fig. 12.
1962. *Spiroplectammina minima*? Vdovenko. Paleont. Zhur., no. 1, p. 41, 42, pl. 3, figs. 4–6.
1967. *Globivalvulina moderata* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, no text, pl. 17, fig. 12, pl. 22, fig. 4.
1969. *Globivalvulina* ex. gr. *moderata* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 14, pl. 3, fig. 35, pl. 4, fig. 62.

*Diagnosis.*—Test free, subglobular. Proloculus small, followed by biserial succession of rapidly expanding chambers. Initial biseriamminid coil well developed (see pl. 35, fig. 8) followed by open helicoidal coil. Diameter 200μ to 320μ. Height 240μ to 330μ. Valvular projection poorly developed. Wall calcareous secreted, dark, fine grained, 10μ to 12μ. Aperture simple, anteriomarginal.

*Remarks.*—Although in her original description, Chernysheva indicates a diameter of 170μ to 240μ, her figured specimens are bigger (for example, her pl. 18, fig. 2), a fact confirmed by cursory examination of the types by the author. Moreover, in *Biseriella* and in *Globivalvulina,* the spire expands extremely rapidly, and the addition of one single chamber can increase the diameter of the test by 40 to 50 percent. Hence *Biseriella parva* and *B. moderata,* which are present at the same stratigraphic level, are regarded here as one single entity.

*Stratigraphic range and distribution.*—Eurasia, north Africa, and North America.

Common in Zones 18 to 21. Scarce higher up in the middle Carboniferous.

In Alaska, and in the Yukon Territory, present in abundance in the uppermost part of the Alapah Limestone and in the Wahoo Limestone.

*Figured specimens.*—Univ. Montréal 131/2; USNM 179475.

### Genus GLOBIVALVULINA Schubert 1921

1876. *Valvulina* Brady. Palaeont. Soc. London Pub., v. 30, p. 89.
1921. *Globivalvulina* Schubert. Palaeont. Zeitschrift, v. 3, pt. 2, p. 153.
1927. *Globivalvulina* Harlton. Jour. Paleontology, v. 1, no. 1, p. 23.
1928. *Globivalvulina* Harlton. Jour. Paleontology, v. 1, no. 4, p. 308, 309.
1928. *Globivalvulina* Cushman and Waters. Cushman Lab. Foram. Research Contr., v. 4, pt. 3, p. 64, 65.
1930. *Globivalvulina* Galloway and Ryniker. Oklahoma Geol. Survey Circ. 21, p. 16.
1930. *Globivalvulina* Cushman and Waters. Texas Univ. Bull. 3019, p. 70, 71.
1930. *Globivalvulina* Warthin. Oklahoma Geol. Survey Bull. 53, p. 23, 24.
1932. [not] *Globivalvulina* Liebus. Preuss. Geol. Landesanstalt Abh., new series, no. 141, p. 164, 165.
1933. *Globivalvulina* Galloway and Spock. Am. Mus. Novitates 658, p. 5.
1945. *Globivalvulina* Reichel. Eclogae Geol. Helvetiae, v. 38, no. 2, p. 550–556, not 553.
1948. [not]*Globivalvulina* Chernysheva. Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 249.
1948. *Globivalvulina* Plummer. Am. Midland Naturalist, v. 39, no. 1, p. 169, 170.
1949. [not] *Globivalvulina* Reitlinger. Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 158, 159.
1949. *Globivalvulina* Morozova. Akad. Nauk SSSR Geol. Inst. Trudy 105, no. 35, p. 253–255.
1950. [not] *Globivalvulina* Termier and Termier. Paléont. Marocaine, Invertébrés Ere Primaire, Pt. 1, p. 35.
1950. *Globivalvulina* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 76–81 [part].
1953. *Globivalvulina* Lehmann. Cushman Found. Foram. Research Contr., v. 4, pt. 2, p. 73, 74.
1956. [not] *Globivalvulina* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 44.
1957. *Globivalvulina* St.-Jean. Indiana Geol. Survey Bull. 10, p. 36.
1959. [not] *Globivalvulina* Deleau and Marie. Serv. Carte Géol. Algérie, n.s., Bull. 25, p. 112, 113.
1960. [not] *Globivalvulina* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 357.
1962. *Spiroplectammina* Vdovenko. Paleont. Zhur., no. 1, p. 42 [part].
1962. *Globivalvulina* Konovalova. Paleont. Zhur., no. 3, p. 22, 23.
1962. *Globivalvulina* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 44, p. 65.
1962. [not] *Globivalvulina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 196, 197.
1964. *Globivalvulina* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, p. C338.
1967. *Globivalvulina* Brazhnikova and others. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk Trudy, no text, pl. 39, fig. 4 [only].
1969. *Globivalvulina* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 13–15 [part].
1970. [not] *Globivalvulina*? Mamet. Canada Geol. Survey Paper 70–21, p. 9.

*Diagnosis.*—Test free, subglobular. Proloculum followed by biserial succession of very rapidly enlarging chambers with relict of initial biseriamminid coil, followed by open helicoidal coil. Valvular projection overlaps that of preceding chamber. Wall calcareous secreted, a clearly defined diaphanotheca. Aperture simple, lobate, at base of apertural face, deep in a vestibule (interiomarginal).

*Remarks.*—Although Schubert (1921) claimed that *Globivalvulina* was agglutinated ("sandig agglutinierde") and although Cushman (1928) had some doubts concerning the wall constitution ("arenaceous or calcareous"), the type in the British Museum of Natural History undoubtedly shows a well-defined clear calcareous-secreted diaphanotheca. Hence Plummer's (1948) and St.-Jean's (1957) descriptions are here fully confirmed.

*Type of genus.*—1876 *Valvulina bulloides* Brady. Palaeont. Soc. London Pub., v. 30, p. 89, pl. 2, figs. 12–15.

Taxa included in the genus *Globivalvulina*:

1962 *arguta* Konovalova
1928 *biserialis* Cushman and Waters
1928 *cora* Harlton
1950 *complicata* Reitlinger
1950 *compressa* Reitlinger
1945 *cyprica* Reichel
1962 *donbassica* Potievskaia
1949 *eogranulosa* Reitlinger
1962 *exotica* Vdovenko
1928 *gaptakensis* Harlton
1945 *graeca* Reichel
1950 *granulosa* Reitlinger
1945 *hantkarensis* Reichel
1950 *mosquensis* Reitlinger
1950 *multiseptata* Reitlinger
1928 *ovata* Cushman and Waters
1962 *paula* Konovalova
1962 *pergrata* Konovalova
1950 *rauserae* Reitlinger
1949 *shikhanensis* Morozova
1949 *spiralis* Morozova
1950 *syzranica* Reitlinger
1945 *vonderschmitti* Reichel
1949 *vulgaris* Morozova

*Stratigraphic range and distribution.*—Eurasia, north Africa, and North America.

Occurs for the first time in Zone 20 (basal Pennsylvanian) and develops rapidly from Zone 21 upwards into the Moscovian. Last occurrence in Late Permian.

**Globivalvulina of the group G. bulloides Brady 1876**

Plate 35, figure 6

Group exemplified by:

1876. *Valvulina bulloides* Brady. Palaeont. Soc. London Pub., v. 30, p. 89, pl. 4, figs. 12–15.
1927. *Globivalvulina bulloides* Harlton. Jour. Paleontology, v. 1, no. 1, p. 23, pl. 5, fig. 2 a–c.
1928. *Globivalvulina cora* Harlton. Jour. Paleontology, v. 1, no. 4, p. 309, pl. 53, fig. 4 a, b.
1928. *Globivalvulina ovata* Cushman and Waters. Cushman Lab. Foram. Research Contr., v. 4, no. 3, p. 65, pl. 8, fig. 8.
1930. *Globivalvulina ovata* Cushman and Waters. Texas Univ. Bull. 3019, p. 71, pl. 8, fig. 8.
1930. *Globivalvulina bulloides* Cushman and Waters. Texas Univ. Bull. 3019, p. 71, pl. 8, figs. 12, 13.
1930. *Globivalvulina bulloides* Warthin. Oklahoma Geol. Survey Bull. 53, p. 23, pl. 1, fig. 16.
1930. *Globivalvulina bulloides* Galloway and Ryniker. Oklahoma Geol. Survey Circ. 21, p. 16, pl. 3, fig. 1.
1932. [not] *Globivalvulina bulloides* Liebus. Preuss. Geol. Landesanstalt Abh., new series, no. 141, p. 165, pl. 10, figs. 1, 2.
1933. *Globivalvulina* cf. *bulloides* Galloway and Spock. Am. Mus. Novitates 658, p. 5, fig. 2.
1949. (?) *Globivalvulina bulloides* Morozova. Akad. Nauk SSSR Geol. Inst. Trudy 105, no. 35, p. 254, 255, pl. 2, figs. 10–14.
1950. [not] *Globivalvulina bulloides* Termier and Termier. Paléont. Marocaine, Invertébrés Ere Primaire, Pt. 1, p. 35, pl. 1, figs. 23–25.
1960. [not] *Globivalvulina bulloides* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 357, pl. 3, fig. 5.
1962. [not] *Globivalvulina bulloides* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 44, p. 65, pl. 4, figs. 7, 8, 10, 11.

*Diagnosis.*—Test free, subglobular. Proloculus followed by biserial succession of very rapidly enlarging chambers; poorly developed initial biseriamminid coil, followed by open helicoidal coil. Diameter 350$\mu$ to 500$\mu$. Valvular projections heavy, strongly overlapping. Wall calcareous secreted with clearly defined diaphanotheca; thickness 22$\mu$ to 30$\mu$, of which more than half is composed of clear layer. Aperture simple, lobate, interiomarginal.

*Stratigraphic range and distribution.*—Eurasia, north Africa and North America.

Occurs for the first time in Zone 20, where it is scarce. Abundant in Zones 20 to 25.

In Alaska, it is known from the Wahoo Limestone, where it is quite abundant in the oolitic facies.

*Figured specimen.*—USNM 179477.

**Phylum CHLOROPHYCOPHYTA Papenfuss 1946**
**Family DASYCLADACEAE Kützing 1843 orth. mut. Stizenberger 1860**

**Genus KONINCKOPORA Lee 1912, emend. Wood 1942**

1842. *Calamopora* de Koninck. Description animaux fossiles terrains carbonifères Belgique, v. 3, p. 10.
1849. *Favosites* McCoy. Ann. Mag. Nat. History, ser. 2, v. 3, p. 134 [part].
1852. *Chaetetes* Milne-Edwards and Haime. London Palaeont. Soc., v. 6, p. 159, 160.
1855. *Stenopora* McCoy. Systematic description British Paleozoic fossils, p. 82.
1872. *Monticuliopora*? de Koninck. Acad. Royale Sci. Belgique Mém., v. 39, no. 4, p. 146.
1912. *Koninckopora* Lee. Great Britain Geol. Survey Mem., v. 1, pt. 3, p. 182–184.
1931. *Coelocæratioides* Derville. Marbres Calcaire Carbonifère Bas-Boulonnais, pl. 18, fig. 71, pl. 20, figs. 93, 94.
1935. *Uragiella* Maslov. All-Union Inst. Trans., Econ. Mineralogy, v. 72, p. 21.
1935. *Koninckopora* Maslov. All-Union Inst. Trans., Econ. Mineralogy, v. 72, p. 21.
1942. *Koninckopora* Wood. Geol. Soc. London Quart. Jour., v. 98, no. 3–4, p. 212–219.
1956. *Koninckopora* Maslov. Akad. Nauk SSSR Geol. Inst. Trudy 160, p. 126 [part].
1956. *Koninckopora* Johnson and Konishi. Colorado School Mines Quart., v. 51, no. 4, p. 46.
1956. *Koninckopora* Konishi *in* Johnson and Konishi. Colorado School Mines Quart., v. 51, no. 4, p. 122.
1964. *Koninckopora* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, no. 2, pl. 1, fig. 1, no text.
1964. *Koninckopora* Chanton. Soc. Géol. France Bull. ser. 7, no. 6, p. 565.
1964. *Koninckopora* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 27.
1964. *Koninckopora* Chanton. Soc. Géol. France Bull., ser. 7, v. 6, p. 263, 264.
1965. [not] *Koninckopora* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 77.
1966. *Koninckopora* Güvenç. Rev. Micropaléontologie, v. 9, no. 2, p. 102, 103.
1967. *Koninckopora* Weyant. Soc. Linnéenne Normandie Bull., v. 8, no. 1, p. 63–66.
1968. *Koninckopora* Mamet. Rev. Micropaléontologie, v. 11, no. 3, p. 126–130.
1968. *Koninckopora* Weyer. Geologie, v. 17, no. 2, p. 180–181.
1970. *Koninckopora* Mamet. Canada Geol. Survey Paper 70–21, p. 12.
1970. *Koninckopora* Hallet. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 888.
1972. *Koninckopora* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 780–782.
1972. *Koninckopora* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 81, 82.

*Diagnosis.*—Thallus cylindrical, unsegmented, stout, with cylindrical medulla. Attachment "pores" polygonal, forming continuous cell layer. Wall bilayered; an inner dark micritic layer coated by pseudofibrous yellowish calcite. Sporangia? spherical.

Occurs for the first time in Zone 20 (basal Pennsylvanian) and develops rapidly from Zone 21 upwards into the Moscovian. Last occurrence in Late Permian.

**Globivalvulina of the group G. bulloides Brady 1876**

Plate 35, figure 6

Group exemplified by:

1876. *Valvulina bulloides* Brady. Palaeont. Soc. London Pub., v. 30, p. 89, pl. 4, figs. 12–15.
1927. *Globivalvulina bulloides* Harlton. Jour. Paleontology, v. 1, no. 1, p. 23, pl. 5, fig. 2 a–c.
1928. *Globivalvulina cora* Harlton. Jour. Paleontology, v. 1, no. 4, p. 309, pl. 53, fig. 4 a, b.
1928. *Globivalvulina ovata* Cushman and Waters. Cushman Lab. Foram. Research Contr., v. 4, no. 3, p. 65, pl. 8, fig. 8.
1930. *Globivalvulina ovata* Cushman and Waters. Texas Univ. Bull. 3019, p. 71, pl. 8, fig. 8.
1930. *Globivalvulina bulloides* Cushman and Waters. Texas Univ. Bull. 3019, p. 71, pl. 8, figs. 12, 13.
1930. *Globivalvulina bulloides* Warthin. Oklahoma Geol. Survey Bull. 53, p. 23, pl. 1, fig. 16.
1930. *Globivalvulina bulloides* Galloway and Ryniker. Oklahoma Geol. Survey Circ. 21, p. 16, pl. 3, fig. 1.
1932. [not] *Globivalvulina bulloides* Liebus. Preuss. Geol. Landesanstalt Abh., new series, no. 141, p. 165, pl. 10, figs. 1, 2.
1933. *Globivalvulina* cf. *bulloides* Galloway and Spock. Am. Mus. Novitates 658, p. 5, fig. 2.
1949. (?) *Globivalvulina bulloides* Morozova. Akad. Nauk SSSR Geol. Inst. Trudy 105, no. 35, p. 254, 255, pl. 2, figs. 10–14.
1950. [not] *Globivalvulina bulloides* Termier and Termier. Paléont. Marocaine, Invertébrés Ere Primaire, Pt. 1, p. 35, pl. 1, figs. 23–25.
1960. [not] *Globivalvulina bulloides* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 357, pl. 3, fig. 5.
1962. [not] *Globivalvulina bulloides* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 44, p. 65, pl. 4, figs. 7, 8, 10, 11.

*Diagnosis.*—Test free, subglobular. Proloculus followed by biserial succession of very rapidly enlarging chambers; poorly developed initial biseriamminid coil, followed by open helicoidal coil. Diameter 350$\mu$ to 500$\mu$. Valvular projections heavy, strongly overlapping. Wall calcareous secreted with clearly defined diaphanotheca; thickness 22$\mu$ to 30$\mu$, of which more than half is composed of clear layer. Aperture simple, lobate, interiomarginal.

*Stratigraphic range and distribution.*—Eurasia, north Africa and North America.

Occurs for the first time in Zone 20, where it is scarce. Abundant in Zones 20 to 25.

In Alaska, it is known from the Wahoo Limestone, where it is quite abundant in the oolitic facies.

*Figured specimen.*—USNM 179477.

**Phylum CHLOROPHYCOPHYTA Papenfuss 1946**

**Family DASYCLADACEAE Kützing 1843 orth. mut. Stizenberger 1860**

**Genus KONINCKOPORA Lee 1912, emend. Wood 1942**

1842. *Calamopora* de Koninck. Description animaux fossiles terrains carbonifères Belgique, v. 3, p. 10.
1849. *Favosites* McCoy. Ann. Mag. Nat. History, ser. 2, v. 3, p. 134 [part].
1852. *Chaetetes* Milne-Edwards and Haime. London Palaeont. Soc., v. 6, p. 159, 160.
1855. *Stenopora* McCoy. Systematic description British Paleozoic fossils, p. 82.
1872. *Monticuliopora*? de Koninck. Acad. Royale Sci. Belgique Mém., v. 39, no. 4, p. 146.
1912. *Koninckopora* Lee. Great Britain Geol. Survey Mem., v. 1, pt. 3, p. 182–184.
1931. *Coelocératioides* Derville. Marbres Calcaire Carbonifère Bas-Boulonnais, pl. 18, fig. 71, pl. 20, figs. 93, 94.
1935. *Uragiella* Maslov. All-Union Inst. Trans., Econ. Mineralogy, v. 72, p. 21.
1935. *Koninckopora* Maslov. All-Union Inst. Trans., Econ. Mineralogy, v. 72, p. 21.
1942. *Koninckopora* Wood. Geol. Soc. London Quart. Jour., v. 98, no. 3–4, p. 212–219.
1956. *Koninckopora* Maslov. Akad. Nauk SSSR Geol. Inst. Trudy 160, p. 126 [part].
1956. *Koninckopora* Johnson and Konishi. Colorado School Mines Quart., v. 51, no. 4, p. 46.
1956. *Koninckopora* Konishi *in* Johnson and Konishi. Colorado School Mines Quart., v. 51, no. 4, p. 122.
1964. *Koninckopora* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, no. 2, pl. 1, fig. 1, no text.
1964. *Koninckopora* Chanton. Soc. Géol. France Bull. ser. 7, no. 6, p. 565.
1964. *Koninckopora* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 27.
1964. *Koninckopora* Chanton. Soc. Géol. France Bull., ser. 7, v. 6, p. 263, 264.
1965. [not] *Koninckopora* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 77.
1966. *Koninckopora* Güvenç. Rev. Micropaléontologie, v. 9, no. 2, p. 102, 103.
1967. *Koninckopora* Weyant. Soc. Linnéenne Normandie Bull., v. 8, no. 1, p. 63–66.
1968. *Koninckopora* Mamet. Rev. Micropaléontologie, v. 11, no. 3, p. 126–130.
1968. *Koninckopora* Weyer. Geologie, v. 17, no. 2, p. 180–181.
1970. *Koninckopora* Mamet. Canada Geol. Survey Paper 70–21, p. 12.
1970. *Koninckopora* Hallet. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 888.
1972. *Koninckopora* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 780–782.
1972. *Koninckopora* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 81, 82.

*Diagnosis.*—Thallus cylindrical, unsegmented, stout, with cylindrical medulla. Attachment "pores" polygonal, forming continuous cell layer. Wall bilayered; an inner dark micritic layer coated by pseudofibrous yellowish calcite. Sporangia? spherical.

(endosporanges), in a double row. Wall calcareous secreted, microcrystalline.

*Type of species.*—1972 *Sphinctoporella lisburnensis* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 84, pl. 4, figs. 1–6.

*Stratigraphic range and distribution.*—Unknown outside North America (in addition to the type species, one single unnamed *Sphinctoporella* is known from the Windsor Group of Nova Scotia).

Originally described from Zone 13, where it is quite abundant in the eastern part of the Brooks Range and in the Yukon Territory. Ranges up to Zone 17, in the Windsor Group.

#### *Sphinctoporella lisburnensis* Mamet and Rudloff 1972

Plate 36, figures 6–9

1972. *Sphinctoporella lisburnensis* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 84, pl. 4, figs. 1–6.

*Diagnosis.*—Thallus elongate, axially pentagonal, segmented; maximal diameter of thallus around 700μ to 900μ. Diameter of medulla reaching 400μ to 500μ. Maximal thickness of endospores(?) rows 150μ. Spherules micrite filled, 50μ to 60μ.

*Stratigraphic range and distribution.*—At the present time only known from Alaska and the Yukon Territory, where it ranges from Zone 13 to 15 (Middle and Late Viséan)

*Figured specimens.*—USNM 179484–179487.

### Family DASYCLADACEAE? Kutzing 1843 or CODIACEAE? (Trevisan) Zanardini 1843

### Genus ORTHRIOSIPHONOIDES Petryk in Petryk and Mamet 1972

1972. *Orthriosiphonoides* Petryk *in* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 776.

*Diagnosis.*—Thallus club shaped, segmented, bulbous, with important medulla. Segments rounded externally; sutures depressed. Amount of tissue in cortex greater than volume of apparent tubes. Tubes straight, dichotomous, of even diameter.

*Type of species.*—1972 *Orthriosiphonoides salterensis* Petryk in Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 776, pl. 2, figs. 10–14; pl. 3, figs. 4, 5.

*Stratigraphic range and distribution.*—Viséan of Alberta, the Yukon Territory, and Alaska.

#### *Orthriosiphonoides salterensis* Petryk in Petryk and Mamet 1972

Plate 38, figures 11, 12

1972. *Orthriosiphonoides salterensis* Petryk *in* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 776, pl. 2, figs. 10–14; pl. 3, figs. 4, 5.

*Diagnosis.*—Thallus club shaped, segmented; diameter of largest segment 1,000μ to 2,000μ and maximum diameter of the medulla 500μ to 1,000μ. Vertical height of each ring 400μ to 600μ. Outer surface rounded. Tubes straight to slightly curved, 30μ to 50μ in diameter, dichotomous. Conceptacles present.

*Stratigraphic range and distribution.*—*Orthriosiphonoides* has the same distribution in Alberta, British Columbia, the Yukon Territory, and Alaska. It is present in Middle and early Late Viséan carbonates. The basal part of the Alapah Limestone yields few of this important taxon.

*Figured specimens.*—USNM 179509, 179937.

### Family undetermined

### Genus YUKONELLA Mamet and Rudloff 1972

1972. *Yukonella* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 87.

*Diagnosis.*—Thallus cylindrical, with faint constrictions. Cortex microcrystalline, perforated by thick slightly irregular nondichotomous pores. Nature of the reproduction organs unknown.

*Type of species.*—1972 *Yukonella bamberi* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 87, pl. 5, figs. 24–29.

*Stratigraphic range and distribution.*—At the present time, only known from Alaska and the Yukon Territory.

The type is from the Kayak(?) Shale, Zone 14? Total range from Zone 13 to 15 (Middle and Late Viséan).

#### *Yukonella bamberi* Mamet and Rudloff 1972

Plate 36, figures 10–13

1972. *Yukonella bamberi* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 87, pl. 5, figs. 24–29.

*Diagnosis.*—Thallus cylindrical, with faint outer and inner constrictions. Diameter of cortex around 300μ to 550μ. Medulla diameter, two or three times cortex thickness (which ranges from 50μ to 75μ). Pore diameter around 18μ.

*Stratigraphic range and distribution.*—Rather common in the Yukon Territory in the uppermost part of the Kayak(?) Shale, when the shaly facies extends into the Late Viséan. Also present in the lower part of the Alapah Limestone (Zone 13).

*Figured specimens.*—Univ. Montréal 204/13, 203/13, 204/16, 204/17.

### Phylum RHODOPHYCOPHYTA Papenfuss 1946
### Family UNGDARELLACEAE Maslov 1956
### Subfamily STACHEIINAE Loeblich and Tappan 1961

### Genus STACHEIA Brady 1876

1876. *Stacheia* Brady. Palaeont. Soc. London Pub. v. 30, p. 107 [not 114, 118].

*Type of species.*—1842 *Calamopora inflata* de Koninck. Description animaux fossiles terrains carbonifères Belgique, v. 3, p. 10, pl. A, fig. 8 a, b.

Taxa included in the genus *Koninckopora*:

1931 *fragilis* Derville
1968 *minuta* Weyer
1966 *pruvosti* Güvenç
1964 *sahariensis* Chanton
1942 *tenuiramosa* Wood

*Koninckopora micropora* and *K. macropora* Maslov (1956) are both considered to belong to *Epimastopora* as suggested by Weyer (1968).

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America. Abundant in the Tethyan realm.

Exclusively restricted to the Viséan; other reported occurrences are to be disregarded. Very common in the southern part of the North American Cordillera. Present, but scarce, in the Yukon Territory, northern British Columbia, and Alaska.

#### Koninckopora inflata (de Koninck 1842)

Plate 36, figures 1–4

1842. *Calamopora inflata* de Koninck. Description animaux fossiles terrains carbonifères Belgique, v. 3, p. 10, pl. A, fig. 8 a, b.
1852. *Chaetetes tumidus* Milne-Edwards and Haime. London Palaeont. Soc., v. 6, p. 159, 160, pl. 45, fig. 3a, b [part].
1872. *Monticuliopora? inflata de* Koninck. Acad. Royale Sci. Belgique Mém., v. 39, no. 4, p. 146, pl. 14, fig. 4.
1912. *Koninckopora inflata* Lee. Great Britain Geol. Survey Mem., v. 1, pt. 3, p.. 182, 183, pl. 14, figs. 17, 18; pl. 16, figs. 21–23.
1931. *Coeloceratioides fragilis* Derville. Marbres Calc. Carbonifére Bas-Boulonnais, pl. 18, fig. 71, pl. 20, figs. 93, 94.
1942. *Koninckopora inflata* Wood. Geol. Soc. London Quart. Jour., v. 98, no. 3–4, p. 212–219, pl. 8, figs. 1–6; pl. 9, fig. 1?, not 2, 3; pl. 10, figs. 4–6, not 1–3.
1964. [not] *Koninckopora inflata* Pelhate. C. R. som. Soc. Géol. France, sér. 7, v. 6, p. 263, 264.
1964. *Koninckopora inflata* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, no. 2, p. 1, pl. 1, fig. 1.
1964. *Koninckopora inflata* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 27, pl. 3, figs. 9, 10.
1967. [not] *Koninckopora inflata* Weyant. Soc. Linnéenne Normandie Bull., v. 8, no. 1, p. 63–66, pl. 1, figs. 1–4.
1968. *Koninckopora inflata* Weyer. Geologie, v. 17, no. 2, p. 180, 181, pl. 1, figs. 1–8.
1970. [not] *Koninckopora inflata* Hallet. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 888, pl. 2, fig. 5.
1972. *Koninckopora inflata* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 781, 782, pl. 4, figs. 7, 8.
1972. *Koninckopora inflata* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 82, pl. 2, figs. 14–18; pl. 3, figs. 1, 2, 6.
1973. *Koninckopora inflata* Kulik. Uralshoe Geologich. Upravlenie, Lvov, p. 43, pl. 1, figs. 1, 2.

*Diagnosis.*—Thallus cylindrical, unsegmented, stout, reaching 5 mm in height. Cell layer polygonal; average diameter of alveoli 180$\mu$ to 250$\mu$. Wall bilayered; an inner, thin, 2$\mu$- to 6$\mu$-micritic layer coated by heavy, continuous pseudofibrous yellowish layer.

*Stratigraphic range and distribution.*—A "cosmopolitan" dasyclad alga known in Eurasia, Africa, Australia, and America. Its total range is from Zone 11 to Zone 16. In North America this range is reduced to Zones 12 to 15.

In Alaska, it is present in the basal part of the Alapah Limestone (Zone 13) and in the Kogruk Formation. It is never present in the "*Brunsia*-facies"; thus the presence of *Koninckopora inflata* in Zones 14 and 15 is scanty in Alaska and the Yukon Territory.

*Figured specimens.*—Univ. Montréal 204/8; USNM 179480–179482.

#### Koninckopora tenuiramosa Wood 1942

Plate 36, figure 5

1942. *Koninckopora tenuiramosa* Wood. Geol. Soc. London Quart. Jour., v. 98, no. 3–4, p. 219, pl. 10, figs. 2–3.
1956. *Koninckopora* cf. *inflata* Konishi. Colorado School of Mines Quart., v. 51, no. 4, p. 122, pl. 2, figs. 6–8.
1964. *Koninckopora inflata* Pelhate. Soc. Géol. France Bull., 7ème série, v. 6, p. 263–264, 2 figs.
1967. *Koninckopora inflata* Weyant. Soc. Linnéenne Normandie Bull., v. 8, no. 1, p. 63–66, pl. 1, fig. 3 [part] [not 1, 2, 4].
1968. *Koninckopora sahariensis* Weyer. Geologie, v. 17, no. 2, p. 182–183, pl. 2, figs. 1, 8, 9, pl. 3, figs. 3–7.
1972. *Koninckopora tenuiramosa* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 781, pl. 4, figs. 1–6.
1972. *Koninckopora tenuiramosa* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, pl. 2, figs. 1–7, 9–12.

*Diagnosis.*—Small *Koninckopora;* average diameter of alveoli 130$\mu$ to 180$\mu$; thickness of the wall 300$\mu$ to 380$\mu$.

*Stratigraphic range and distribution.*—Cosmopolitan as *Koninckopora inflata.* Total range from uppermost Zone 11 to Zone 16. Scarce in the Alapah Limestone.

*Figured specimen.*—USNM 179483.

#### Genus SPHINCTOPORELLA Mamet and Rudloff 1972

1972. *Sphinctoporella* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 84.

*Diagnosis.*—Thallus elongate, axially polyedric (roughly pentagonal), segmented. Outer constrictions correspond to an inner thinning of the medulla. Thallus perforated by a series of regular spheres

1972. ?*Stacheoides* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 90.

*Diagnosis.*—Thallus encrusting, irregular, composed of irregular cells clustering around tubes and apophyses; superficial protuberances present. Cell walls irregular; vertical and horizontal elements morphologically identical but horizontal elements usually thicker than the vertical ones. Cells may be meandriform. Wall calcareous secreted, hyaline, of faint yellowish color.

*Type of species.*—1876 *Stacheia polytrematoides* Brady. Palaeont. Soc. London Pub., v. 30, p. 118, pl. 9, figs. 9–13.

Taxa included in the genus *Stacheoides*:

1972?*meandriformis* Mamet and Rudloff
1955 *papillata* Cummings
1972 ?*spissa* Petryk and Mamet
1972 *tenuis* Petryk and Mamet

*Stratigraphic range and distribution.*—Eurasia, north Africa, Australia, and North America.

Appears in early Viséan and is quite abundant in the Middle and Late Viséan of the Tethyan realm. Scarce in Namurian. Present in Alaska and the Yukon Territory.

#### Stacheoides? meandriformis Mamet and Rudloff 1972

Plate 38, figures 3, 4

1972. *Stacheoides*? *meandriformis* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 90, pl. 7, figs. 9–15.

*Diagnosis.*—Thallus irregular, with irregular framework of meandriform cells. Canals 75μ in diameter, present. Wall calcareous secreted clear, thick, heavily calcified, 20μ and more.

*Stratigraphic range and distribution.*—Rather abundant in the Viséan of the northern part of the American Cordillera (British Columbia, the Yukon Territory, and Alaska). Also known from the Pennsylvanian of Idaho and from the Baschkirian of the Richardson Mountains in the Yukon Territory. Observed in Alaska in the Alapah and Wahoo Limestones.

*Figured specimens.*—USNM 179502, 179503.

#### Stacheoides tenuis Petryk and Mamet 1972

Plate 38, figures 8, 9, 10

1972. *Stacheoides tenuis* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 787, pl. 6, figs. 1–6, pl. 7, figs. 1–4, 5?, 6.

1972. *Stacheoides tenuis* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 90, pl. 7, figs. 4–8.

*Diagnosis.*—Thallus encrusting, subreticulate, important, 1,000μ to 2,000μ. Laminar cell thickness 25μ to 40μ. Vertical elements thin, irregular (5μ to 10μ), horizontal elements thin, continuous (5μ to 15μ). Calcification poor. Protuberances present. Tubes of variable diameter (50μ to 250μ). Wall of clear yellowish calcite.

*Stratigraphic range and distribution.*—First appearance in Viséan time. Fairly abundant in the Middle and Late Viséan. Present, but scarce, in the Namurian. Observed in the Alapah and Wahoo Limestones of Alaska.

*Figured specimens.*—USNM 179506–179508.

#### Undetermined STACHEIINAE

Plate 38, figures 5–7

*Diagnosis.*—"Asterocycline-like" Stacheiinae are known from Middle Viséan of American Cordillera. Thallus is star shaped, and cells are arranged along radiating canals.

*Remarks.*—As the material is poorly preserved and very scarce, no new taxon will be erected. The shape of the cells is similar to that of *Epistacheoides connorensis*. However the general arrangement of the thallus is different.

*Stratigraphic range and distribution.*—Alberta, British Columbia, and Alaska. Scarce.

Middle Viséan.

*Figured specimens.*—USNM 179504, 179505; Univ. Montréal 203/32.

### Family SOLENOPORACEAE Pia 1927

#### Genus SOLENOPORA Dybowski 1878

1878. *Solenopora* Dybowski. Die Chaetetiden der Ostbaltischen Silur Formation, p. 124.

Because of the proliferation of Paleozoic *Solenopora*, only Carboniferous references are cited here:

1912. [not] *Solenopora* Hinde *in* Garwood. Geol. Soc. London Quart. Jour., v. 68, p. 459.

1913. [not] *Solenopora* Hinde. Geol. Mag., new series, Dec. 5, v. 10, p. 290–292.

1914. ?*Solenopora* Gürich. Deutsch. Geol. Zeitschr., v. 66, p. 383.

1916. [not] *Solenopora* Garwood. Geol. Assoc. London Proc., v. 27, pt. 1, pl. 18, figs. 1, 2.

1930. [not] *Solenopora* Jodot. Soc. Géol. France Bull., sér. 4, v. 30, p. 523–525.

1930. ?*Solenopora* Ronchesnes. Soc. Géol. Belgique Annales, v. 54, p. B84.

1932. [not] ?*Solenopora* Delépine. Soc. Géol. Nord Annales, v. 57, p. 237–239.

1937. [not] *Solenopora* Paul. Preuss. Geol. Landesanstalt Jahrb., v. 58, p. 279.

1937. *Solenopora* Pia. 2ème Cong. Avanc. Strat. Carb. Compte Rendu, v. 2, p. 795–798.

1939. *Solenopora* Pia. Neues Jahrb. Geol., v. 3, p. 742.

1940. ?*Solenopora* Paul. Zentralblatt Mineralogie, Abt. B, no. 1, p. 17–20.

1945. [not] *Solenopora* Johnson. Geol. Soc. America Bull., v. 56, no. 9, p. 837, 838.

1956. [not] *Solenopora* Johnson and Konishi. Colorado School Mines Quart., v. 51, no. 4, p. 22.

1965. [not] *Solenopora* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 79.
1966. *Solenopora* Conil and Lys. Soc. Géol. Belgique Annales, v. 89, Bull. 6, p. 207.
1972. ?*Solenopora* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 92, pl. 10, figs. 6, 7.

*Diagnosis.*—Solenoporaceae composed of straight or slightly sinuous filaments, subparallel, of even diameter. Horizontal partitions across rows are scarce to absent. Wall calcareous secreted, microcrystalline.

*Type of genus.*—1878 *Solenopora spongioides* Dybowski. Die Chaetetiden der Ostbaltischen Silur Formation, p. 124, pl. 2, figs. 11 a, b.

Carboniferous *Solenopora* are:

1937 *dionantina* Pia
1940 *hillae* Paul
1937 *similis* Paul

*Stratigraphic range and distribution.*—Apparently ranges from Ordovician (?) to Permian.

Rather abundant in the lower Carboniferous Tethys; scarce in North America.

Very scarce in Alaska where it is known from the Wachsmuth and the Alapah Limestones. Also found in the Peratrovich Formation, Prince of Wales Island, southeastern Alaska.

#### Solenopora dionantina Pia 1937

Plate 39, figure 3

1937. *Solenopora dionantina* Pia. 2ème Cong. Avanc. Strat. Carb. Compte Rendu, v. 2, p. 798, pl. 8, figs. 1, 2.
1966. *Solenopora dionantina* Conil and Lys. Soc. Géol. Belgique Annales, v. 89, Bull. 6, p. 207, pl. 1, fig. 1.

*Diagnosis.*—Thallus composed of straight, subparallel filaments, of even diameter ($30\mu$ to $40\mu$). Horizontal partitions poorly developed; when present, discontinuous from one cell to another. Wall microcrystalline, secreted, $7\mu$ to $10\mu$.

*Stratigraphic range and distribution.*—Originally described from the Late Viséan of Belgium where it is rather scarce. Very scarce in Alaska; a few scattered occurrences are known from the Wachsmuth and Alapah Limestones.

*Figured specimen.*—Univ. Montréal 204/31.

### Phylum SCHIZOPHYTA (Falkenberg) Engler 1892 or CHLOROPHYCOPHYTA Papenfuss 1946? "Section" POROSTROMATA Pia 1927

#### Genus GIRVANELLA Nicholson and Etheridge 1878

As the genus is very long ranging, only Late Devonian and Carboniferous *Girvanella* will be referred to herein.

1878. *Girvanella* Nicholson and Etheridge. Monograph Silurian fossils, Girvan district, p. 23.
1890. *Girvanella* Wethered. Geol. Soc. London Quart. Jour., v. 46, p. 280.
1908. *Girvanella* Chapman. Australasian Assoc. Adv. Science Rept., p. 383.
1913. *Girvanella* Garwood. Geol. Mag., Dec. 5, v. 10, p. 498.
1916. ?*Girvanella* Garwood. Geol. Assoc. London Proc., v. 27, pt. 1, pl. 18, fig. 6.
1924. *Girvanella* Garwood and Goodyear. Geol. Soc. London Quart. Jour., v. 80, p. 200.
1930. *Girvanella* Jodot. Soc. Géol. France Bull., sér. 4, v. 30, p. 545.
1931. *Girvanella* Garwood. Geol. Soc. London Quart. Jour., v. 87, p. 140.
1931. *Girvanella* Derville. Marbres Calcaire Carbonifère Bas-Boulonnais, p. 220–228.
1932. *Girvanella* Pia. Acad. Sci. URSS Bull., p. 1354–1357.
1935. *Girvanella* Maslov. All-Union Inst. Sci. Res., Economic Mineral., Trans., v. 72, p. 25.
1937. *Girvanella* Pia. 2ème Cong. Avanc. Strat. Carb. Compte Rendu, v. 2, p. 783–785.
1937. *Girvanella* Paul. Jahrb. Preuss. Geol. Landes. v. 58, p. 277, 278.
1938. *Girvanella* Paul. Paläont. Zeitschr., v. 20, no. 3–4, p. 317, 318 [part].
1941. *Girvanella* Wood. Geologists' Assoc. London Proc., v. 52, pt 3, p. 219–221 [part].
1943. *Girvanella* Wood. Geol. Soc. London Quart. Jour., v. 98, p. 205–221.
1945. *Girvanella*? Johnson. Geol. Soc. America Bull., v. 56, no. 9, p. 829–847 [part].
1946. *Girvanella* Johnson. Jour. Paleontology, v. 20, no. 2, p. 169.
1946. *Girvanella* Johnson. Geol. Soc. America Bull., v. 57, no. 12, p. 1100, 1101.
1948. *Girvanella* Dangeard. Belgique Mus. Royal Hist. Nat. Bull., v. 24, no. 2, p. 1–3.
1955. *Girvanella* Antropov. Ucheniye Zapiski Kazan. Gos. Univ., Trudy ova estest, v. 115, no. 8, p. 48, 49.
1956. *Girvanella* Johnson and Konishi. Colorado School Mines Quart. v. 51, no. 4, p. 55 [part].
1956. *Girvanella* Konishi *in* Johnson and Konishi. Colorado School Mines Quart. v. 51, no. 4, p. 125 [part].
1956. *Girvanella* Maslov. Akad. Nauk SSSR Geol. Inst. Trudy 160, p. 45–47.
1957. *Girvanella* Wood. Palaeontology, v. 1, pt. 1, p. 22–28.
1963. *Girvanella* Brown. Canadian Assoc. Petroleum Geologists Bull., v. 11, no. 2, p. 181.
1963. *Girvanella* Wood. Palaeontology, v. 6, pt. 2, p. 269–272.
1964. *Girvanella* Johnson. Jour. Paleontology, v. 38, no. 1, p. 104.
1964. *Girvanella* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 25, 26.
1964. *Girvanella* Conil. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pl. 1, fig. 7, not 8 [no text].
1965. *Girvanella* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 73, 74.
1967. *Girvanella* Wray. Colorado School Mines Prof. Contr. 3, p. 34.
1970. *Girvanella* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 886.
1972. *Girvanella* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 79, 80.

1972. *Girvanella* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 771–773.

*Diagnosis*.—Thallus composed of sinuous, nonbranching, cylindrical thin tubes. Diameter of the cylinder constant. Wall calcareous, microcrystalline, dark, single layered.

*Type of genus*.—1878 *Girvanella problematica* Nicholson and Etheridge. Monograph Silurian fossils, Girvan district, p. 23.

Carboniferous taxa included in the genus *Girvanella:*

1890 *ducii* Wethered
1890 *incrustans* Wethered
1937 *liebusi* Paul
1946 *maplewoodensis* Johnson
1937 *ottonosia* Pia
1931 *staminea* Garwood
1908 *wetheredii* Chapman

*Stratigraphic range and distribution*.—Widespread in the Paleozoic of Eurasia (about 200 references). Probably extends into the middle part of the Mesozoic.

Very abundant in the lower Carboniferous Tethys. Much scarcer in the midcontinent and the American Cordillera. Uncommon in Alaska and the Yukon Territory.

No known stratigraphic value [although Conil and Lys (1964) have reported numerous *Girvanella* "zones" in France and Belgium].

#### Girvanella problematica Nicholson and Etheridge 1878 (=Girvanella ducii Wethered 1890)

Plate 39, figure 2

1878. *Girvanella problematica* Nicholson and Etheridge. Monograph Silurian fossils, Girvan district, p. 23, fig. "Portion of a slice of limestone showing the tubes of *G.problematica, Tramitchell.*"
1890. *Girvanella ducii* Wethered. Geol. Soc. London Quart. Jour., v. 46, p. 280, pl. 11, fig. 2 a–c.
1930. *Sphaerocodium* sp. Le Maitre. Soc. Géol. Nord Annales, v. 55, p. 43, pl. 3, figs. 14, 15.
1932. *Girvanella ducii* Pia. Acad. Sci. URSS Bull., p. 1354–1357, pl. 1, fig. 3.
1935. *Girvanella ducii* Maslov. All-Union Inst. Sci. Res., Econ. Min., Trans., v. 72, pl. 1, figs. 1, 2; pl. 2, fig. 1.
1937. *Girvanella ducii* Pia. 2ème Cong. Avanc. Strat. Carb. Compte Rendu, v. 2, p. 783, 784, pl. 4, fig. 1.
1937. (?)*Girvanella ducii* Paul. Preuss. Geol. Landesanstalt Jahrb., v. 58, pt. A, p. 277.
1937. *Girvanella liebusi* Paul. Preuss. Geol. Landesanstalt Jahrb., v. 58, pt. A, p. 278, pl. 21, fig. 1?
1946. *Girvanella moorei* Johnson. Geol. Soc. America Bull., v. 57, no. 12, p. 1100, 1101, pl. 3, fig. 6.
1946. *Girvanella* aff. *G. ducii* Johnson. Geol. Soc. America Bull., v. 57, no. 12, p. 1100, 1101, pl. 4, fig. 2.
1948. *Girvanella ducii* Dangeard. Belgique Mus. Royal Hist. Nat. Bull., v. 24, no. 2, p. 1, 2, pl. 1, figs. 2–4; pl. 2, fig. 1.
1955. *Girvanella ducii* Antropov Uchemiye Zapiski Kazan. Gos. Univ., Trudy ova estest., v. 115, no. 8, p. 49, 50, pl. 2, fig. 6.
1956. *Girvanella ducii* Konishi *in* Johnson and Konishi. Colorado School Mines Quart., v. 51, no. 4, p. 125, pl. 3, fig. 1.
1956. *Girvanella ducii* Maslov. Akad. Nauk SSSR Geol. Inst. Trudy 160, p. 45–47, pl. 5, fig. 1, pl. 79, figs. 4, 5.
1959. *Girvanella ducii* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 38, p. 97, pl. 7, fig. 5, pl. 8, fig. 2.
1963. *Girvanella* sp. Brown. Canadian Assoc. Petroleum Geologists Bull., v. 11, no. 2, p. 181, pl. 1, figs. 5, 6.
1963. *Girvanella ducii* Wood. Palaeontology, v. 6, pt. 2, p. 269–272, pl. 40, figs. 1, 2.
1964. *Girvanella densa* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 25, 26, pl. 3, figs. 3–4.
1965. *Girvanella ducii* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 73, pl. 17, fig. 2?
1966. *Girvanella* sp. Racz. Leidse Geol. Meded., v. 31, p. 259, pl. 8, fig. 40.
1970. *Girvanella* sp. Toomey, Mountjoy, and Mackenzie. Canadian Jour. Earth Sci., v. 7, no. 3, p. 964, pl. 2, figs. 14–15, not 13.
1970. *Girvanella ducii* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 886, pl. 1, fig. 1.
1972. *Girvanella ducii* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 771–773, pl. 1, figs. 3–5, 7.
1972. *Girvanella ducii* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 79, 80, pl. 1, figs. 1–5.

As the species is very long ranging, only Upper Paleozoic taxa have been referred to herein. A complete revision of the taxonomy is in Mamet and Roux, 1975.

*Diagnosis*.—Thallus composed of sinuous to subparallel, nonbranching, cylindrical tubes. Inside diameter of the tubes, $15\mu$ to $20\mu$, constant throughout the thread. Wall calcareous secreted, microcrystalline, dense, "dark," $3\mu$ to $5\mu$.

*Stratigraphic range and distribution*.—Reported from the Silurian to the upper Carboniferous.

In the Tethys, very abundant from Givetian to Namurian. No known stratigraphic value.

Scarce to very scarce in Alaska; usually observed from very shallow, quiet-water facies of the Alapah Limestone. Also present in the Wahoo Limestone.

*Figured specimen*.—USNM 179942.

#### Genus STYLOCODIUM Derville 1931

1931. *Stylocodium* Derville. Marbres Calcaire Carbonifère Bas-Boulonnais, p. 102–106.
1956. *Polymorphocodium* Johnson and Konishi. Colorado School Mines Quart., v. 51, no. 4, p. 36 [part].

*Diagnosis*.—Thallus irregular, crustose, composed of irregular layers of cystose cells. Wall calcareous secreted. Reproduction organs unknown.

*Type of species.*—1931 *Stylocodium rhopaloides* Derville. Marbres Calcaire Carbonifère Bas-Boulonnais, p. 102–106, text fig. 15, pl. 14, figs. 14, 15.

*Remarks.*—One may question the value of Derville's genus, but algal specialists have not been able, up to now, to propose a reasonable classification scheme for "algal biscuits." The traditional approach is therefore used here.

*Stratigraphic range and distribution.*—Originally described from the Middle and Late Viséan of northern France. Present in the Viséan and Moscovian of Alaska and the Yukon Territory.

**Stylocodium sp.**

Plate 39, figure 1

*Diagnosis.*—Thallus irregularly concentric, crustose, stout, 700$\mu$ to 1,000$\mu$ in diameter, composed of poorly defined concentric layers. Layers are composed of cystose cells that range from 150$\mu$ to 250$\mu$ in diameter. Shape of the cells variable, some resembling Tuberitinids, other *Sphaeroporella*. Wall calcareous secreted. Abundant micritic material between the layers makes their boundaries indistinct.

*Stratigraphic range and distribution.*—Scarce in the Alapah and Wahoo Limestones of Alaska and the Yukon Territory.

*Figured specimen.*—USNM 179941.

**Undetermined algal phylum**
**Family undetermined**

**Genus ASPHALTINA Mamet in Petryk and Mamet 1972**

1972. *Asphaltina* Mamet *in* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 795–797.
1972. *Asphaltina* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 87–88.

*Diagnosis.*—Thallus? encrusting, composed of intertwined cylindrical cells, undivided and closely packed. Wall calcareous secreted, two layered. Outer dark layer, finely microcrystalline. Inner layer clear, yellowish, pseudofibrous.

*Type of genus.*—1972 *Asphaltina cordillerensis* Mamet *in* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 795–797, pl. 10, figs. 3–6.

*Remarks.*—The systematic position of *Asphaltina* is debatable. By its wall structure and general morphology, it is comparable to *Sphaeroporella* Antropov. If the assignment of this latter genus to a Siphonales is correct, then *Asphaltina* could also be assigned to the algae.

*Stratigraphic range and distribution.*—Although never described in the literature before 1972, *Asphaltina* is a very common taxon in the midcontinent Chester Group and in the Namurian of Europe and north Africa. In the Cordillera, it occurs for the first time in the Viséan and becomes very abundant in the Namurian. This appears to be a general distribution from Alberta to Alaska where the genus is often observed in the upper part of the Alapah Limestone and in the Wahoo Limestone.

**Asphaltina cordillerensis Mamet in Petryk and Mamet 1972**

Plate 39, figures 12–14

1972. *Asphaltina cordillerensis* Mamet *in* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 795–797, pl. 10, figs. 3–5.
1972. *Asphaltina cordillerensis* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 88, pl. 10, figs. 8–10.

*Diagnosis.*—Thallus encrusting, large, averaging 500$\mu$ to 1,500$\mu$ in length and exceptionally as much as 0.5 cm; thallus composed of intertwined cylindrical chambers, closely packed, 150$\mu$ to 300$\mu$ in diameter. Wall calcareous secreted, two layered; outer dark layer thin, 2$\mu$ to 4$\mu$; inner layer clear, pseudofibrous, as much as 50$\mu$.

*Stratigraphic range and distribution.*—Common in the Namurian carbonate rocks in the North American Cordillera. Observed, often in great quantities in the upper part of the Alapah Limestone and in the Wahoo Limestone. Because of its encrusting nature, this alga? certainly played an important role in the stabilization of the carbonate muds.

*Figured specimens.*—USNM 179938–179940.

**Algal spore cases**
**"Calcispheres"**

**Genus CALCISPHAERA Williamson 1881, emend. Andrews 1955**

1881. *Calcisphaera* Williamson. Royal Soc. London Philos. Trans., v. 171, p. 521 [part], not 522, 523.
1928. *Calcisphaera* Milon. Recherches Calcaires Paléozoiques et Briovérien Bretagne, p. 28 [part].
1931. *Granulosphaera* Derville. Marbres Calcaire Carbonifère Bas-Boulonnais, p. 133, 134.
1937. (?) *Granulosphaera* Paul. Jahrb. Preuss. Geol. Landesanstalt, v. 58, pt. A, p. 280.
1942. *Calcisphaera* Derville. Soc. Géol. France Bull., sér. 5, no. 11, p. 364 [part].
1945. *Archaesphaera* Suleimanov. Akad. Nauk SSSR Doklady, v. 48, no. 2, p. 126.
1948. *Pachysphaera* Rauzer-Chernoussova (OBJ, nom. nud.). Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 37, 134.
1950. *Archaesphaera* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 119, no. 43, p. 121 [part].
1953. ?*Kelyphosphaera* Derville. Soc. Géol. France Bull., sér. 6, v. 2, p. 434, pl. 16, fig. 11 (OBJ).
1954. ?*Kelyphosphaera* Derville. Soc. Géol. France Bul., sér. 6, v. 3, p. 982 [part].
1955. *Archaesphaera* Shlykova *in* Pozner and Shlykova. VNIGRI Trudy 87, p. 16 [part].
1955. *Calcisphaera* Andrews. U.S. Geol. Survey Bull. 1013, p. 123.
1959. *Archaesphaera* Konoplina. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 26, p. 18.

1959. *Archaesphaera* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 38, p. 89.
1960. [not] *Calcisphaera* Reitlinger. Akad. Nauk SSSR Geol. Inst. Trudy, ser. 14, p. 145, 146.
1960. *Calcisphaera* Baxter. Jour. Paleontology, v. 34, no. 6, p. 1155 [part].
1962. *Archesphaera* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 73 [part].
1963. *Archaesphaera*? Pronina. Akad. Nauk SSSR Ural. Fil., Inst. Geol. Trudy 65, p. 125, 126.
1963. [not] *Calcisphaera* Pronina. Paleont. Zhur., no. 4, p. 11, 12.
1964. *Pachysphaera* Conil and Pirlet (nom. nud.). Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pl. 1, fig. 1 (no text).
1964. *Pachysphaera* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 42–44 [part] (OBJ, preoccupied).
1966. [not] *Calcisphaera* Aizenberg and Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol., p. 116.
1966. *Archaesphaera* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 71–74 (part).
1968. *Pachysphaerina* Conil and Lys. Soc. Géol. Belgique Annales, v. 91, no. 4, p. 501.
1969. *Pachysphaera* Pelhate. Soc. Géologie Minéral. Bretagne Bull., p. 32, 33.
1970. *Calcisphaera* Mamet. Canada Geol. Survey Paper 70–21, p. 10.
1970. *Pachysphaera* Hallet. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 879, 880 [part].
1971. [not] Calcisphaeren Flügel and Hötzl. Neues Jahrb. Geologie u. Paläontologie Abh., v. 137, no. 3, p. 373–379.

*Remarks.*—*Calcisphaera* is a controversial taxon. These tiny calcite balls were originally thought to be Carboniferous radiolarians (Judd, 1877). Williamson, however, rejected this hypothesis and, without suggesting any formal botanical or zoological nomenclature, coined these enigmatic spheres "Calcispheres." He erected *Calcisphaera laevis* (an algal spore case), *C. spinosa* (a parathuramminid), *C. robusta* (a *Trochiliscus*), *C. cancellata* (a *Palaeocancellus*), and three taxa, *C. sol*, *C. hexagonata*, and *C. fimbriata* (which are *Radiosphaerina*).

Miller (1889) felt that *Calcisphaera robusta* ought to be designated as the type of the genus, but Karpinsky (1906) showed that *C. robusta* was a *Trochiliscus*. Hence Andrews (1955) formally designated *C. laevis* as the type of *Calcisphaera*, a designation confirmed by Horn af Rantzien (1956). Andrews' work was overlooked by Conil and Lys (1964) who renamed the taxon *Pachysphaera* (invalid as preoccupied by *Pachysphaera* Pilsbry) and then *Pachysphaerina* (1968) a junior synonym of *Calcisphaera*.

Because the original description which, as we have suggested, grouped different taxa, numerous hypotheses have been formulated concerning the nature of Calcispheres; umbellinids, parathuramminids, dasycladaceaen, and even air bubbles in the thin sections' Canada balsam.

The type of *Calcisphaera* as designated by Andrews is probably a calcified blue-green algal spore case (Dasycladacean?). This opinion, expressed by Kaisin (1926) and developed by Cayeux (1929), was defended by Derville during most of his life (1942, 1952). Rupp (1966) recently showed that modern Dasycladacean produce calcite kysts morphologically similar to fossil calcispheres. This is further substantiated by the discovery of calcisphere "crowns" with a symmetry eight in the Carboniferous of the Pas-de-Calais (Middle Viséan, northern France) (Mamet, 1973).

*Type of genus.*—1881 *Calcisphaera laevis* Williamson. Royal Soc. London Philos. Trans., v. 171, p. 521, pl. 20, fig. 70.

**Calcisphaera laevis Williamson 1881**

Plate 39, figures 5–7

1881. *Calcisphaera laevis* Williamson. Royal Soc. London Philos. Trans., v. 171, p. 521, pl. 20, fig. 70.
1931. *Granulosphaera laevis* Derville. Marbres Calcaire Carbonifère Bas-Boulonnais, p. 133, 134 [part].
1937. [not]*Granulosphaera laevis* Paul. Jahrb. Preuss. Geol. Landes. v. 58, pt. A, p. 280.
1950. ?*Archaesphaera grandis* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 119, no. 43, p. 121, pl. 1, fig. 18.
1950. *Archaesphaera crassa* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 119, no. 43, p. 121, pl. 1, fig. 17.
1962. *Archaesphaera grandis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 73–74, pl. 1, fig. 5.
1964. *Pachysphaera dervillei* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 43 [part], figs. 60, 65.
1966. *Archaesphaera grandis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 74, pl. 1, fig. 3, pl. 3, fig. 40.

*Diagnosis.*—Microcrystalline calcite spherule. Outside diameter ranges from 110$\mu$ to 180$\mu$; inner cavity spherical. Wall calcareous secreted, one layered, microcrystalline, 15$\mu$ to 30$\mu$. Pores scarcely noticeable, 1$\mu$ to 2$\mu$, straight, about 40 in maximal diameter section.

*Stratigraphic range and distribution.*—Cosmopolitan. Ubiquitous.

A very widespread form in all Lisburne Group carbonate rocks. Very abundant in lagoonal wackestones-packstones but less common in epitaxial crinoidal grainstones.

No known stratigraphic values; abundant in Devonian and Carboniferous sedimentary rocks.

*Figured specimens.*—USNM 179944–179946.

**Calcisphaera pachysphaerica (Pronina 1963)**

Plate 39, figures 8, 9

1931. *Granulosphaera laevis* Derville. Marbres Calcaire Carbonifère Bas-Boulonnais, p. 133, 134 [part], pl. 17, figs. 73, 78 [only].
1963. *Archaesphaera ? pachisphaerica* Pronina [sic]. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy, 65, p. 125, 126, pl. 1, figs. 14, 15?.
1964. *Pachysphaera dervillei* Conil and Pirlet (OBJ, nom. nud.). Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pl. 1, fig. 1 [no text].
1964. *Pachysphaera dervillei* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 43 (part), pl. 6, figs. 59, 64 [only].
1968. *Pachysphaerina pachisphaeroides* Conil and Lys (sic, orth. mut., OBJ). Soc. Géol. Belgique Annales, v. 91, no. 4, p. 501, pl. 3, fig. 40.
1970 *Calcisphaera pachysphaerica* Mamet. Canada Geol. Survey Paper 70–21, pl. 4, fig. 1.
1970. *Calcisphaera pachysphaerica* Mamet. Canada Geol. Sur-Strat. Carb. Compte Rendu,p. 879, pl. 2, fig. 12.

*Diagnosis.*—Microcrystalline calcite spherule. Outside diameter 200μ to 260μ (average 240μ); inner cavity spherical, cement filled. Wall calcareous, fine grained, one layered, 30μ to 50μ thick. Pores 2μ to 4μ thick, straight, about 40 to 60 in maximal diameter section.

*Stratigraphic range and distribution.*—Cosmopolitan and widespread in the Viséan carbonates.

A common taxon in most Lisburne Group carbonates of Alaska and the Yukon Territory. Appears for the first time in the Wachsmuth Limestone and is abundant from Zone 10 and upwards in all shallow-water carbonate rocks. Scarce in the Wahoo Limestone.

*Figured specimens.*—USNM 179947, 179948.

**Incertae sedis**

**Genus EOVOLUTINA Antropov 1950**

1950. *Eovolutina* Antropov. Akad. Nauk SSSR Kazakh. Fil., Geol. Ser., no. 1, p. 29.
1955. *Eovolutina* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 26.
1959. *Eovolutina* Konoplina. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 26, p. 28.
1962. *Eovolutina* Lebedeva *in* Kalfina. SNIIGGIMS Trudy, Bull. 21, p. 101.
1962. *Eovolutina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 92, 93.
1962. [not] *Eovolutina*? Reitlinger. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., no. 5, p. 57.
1964. *Eovolutina* Loeblich and Tappan. Treatise Invert. Paleontology, Protista, p. C323.
1965. *Eovolutina* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 32.
1965. *Cribrosphaeroides* Chuvashov. Akad. Nauk SSSR Ural. Fil., Inst. Geol. Trudy 74, p. 28 [part].
1966. *Eovolutina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 77.
1966. *Eovolutina* Ganelina. VNIGRI Trudy 250, p. 152.
1966. *Eovolutina* Aizenberg and Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol., p. 116.
1969. *Eovolutina* Poyarkov. Akad. Nauk Kirgiz. SSR Inst. Geol., p. 106.
1970. *Eovolutina* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Bull. 60, p. 97.

*Diagnosis.*—Double sphaerical, microcrystalline calcite globule; later "chamber"(?) overlaps the first one. Aperture(?) simple, reported to be at the end of the second globule(?).

*Remarks.*—The systematic position of *Eovolutina* is doubtful. If the presence of an aperture is confirmed, the taxon could be assigned to the foraminifers. Up to now, the author has never been able to observe a good section showing an opening in the outer sphere. As the original photograph of Antropov is heavily retouched, it is impossible to assess whether *Eovolutina* is to be assigned to the calcispheres or the foraminifers. Bogush and Yuferev (1966) have assigned the taxon to the Psammosphaeridae. However, *Psammosphaera*, the type of that family, is siliceous agglutinated, which is not the case of *Eovolutina*. Assignment of the taxon to the Parathuramminidae (Antropov, 1950; Poyarkov, 1969) is plausible but unproven.

*Type of genus.*—1950 *Eovolutina elementata* Antropov. Akad. Nauk SSSR Kazakh. Fil., Geol. Ser., no. 1, p. 29, pl. 3, figs. 6–8.

Taxa included in the genus *Eovolutina:*

1962 *asiatica* Suleimanov
1969 *magna* Poyarkov
1955 *tujmasensis* Lipina

*Stratigraphic range and distribution.*—Eurasia and North America. Uncommon.

Usually reported from the Devonian (Givetian to Famennian). Also present in lower Carboniferous (Bogush and Yuferev, 1962, 1970) where it is scarce in the Tournaisian and the Viséan.

Very scarce in the Kogruk Formation of western arctic Alaska.

**Eovolutina elementata Antropov 1950**

Plate 39, figure 4

1950. *Eovolutina elementata* Antropov. Akad. Nauk SSSR Kazakh. Fil., Geol. Ser., no. 1, p. 29, pl. 3, fig. 6, not 7.
1955. [not] *Eovolutina elementata* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 26, pl. 2, fig. 5.
1959. [not] *Eovolutina elementata* Konoplina. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 26, p. 28, pl. 4, fig. 3.

1962. [not] *Eovolutina elementata* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 92, pl. 1, fig. 29.
1962. *Eovolutina elementata* Lebedeva *in* Kalfina. SNIIG-GIMS Trudy, Bull. 21, p. 101, pl. 1, fig. 5, not 6?.
1965. [not] *Eovolutina elementata* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 32, pl. 4, fig. 8.
1966. [not] *Eovolutina elementata* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 77, pl. 1, fig. 8.

*Diagnosis.*—Test(?) globular, composed of two spherical chambers(?). Later chamber(?) completely overlaps the first one and ranges from 90μ to 120μ in diameter. Wall calcareous secreted, microcrystalline, fine grained, nonporous, about 17μ to 20μ thick. Aperture not observed.

*Stratigraphic range and distribution.*—Illustrated specimens of this species are from the latest Devonian and early Carboniferous. However, it has often been reported from older strata (Durkina, 1959).

Very scarce in the Viséan Kogruk Formation of Alaska.

*Figured specimen.*—USNM 179943.

#### Genus PARACALIGELLOIDES Reitlinger in Tchuvashov 1965

1962. *Ammobaculites* Vdovenko. Paleont. Zhur., no. 1, p. 41–46.
1964. *Caligella* Loeblich and Tappan. Treatise Invert. Paleont., Protista, p. C316.
1965. *Paracaligelloides* Reitlinger *in* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 38.
1966. *Baituganella* Aizenberg and Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol., p. 117, 118 [part].
1969. *Paracaligella*? Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 197.
1970. ?*Paracaligelloides* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 94.
1970. ?*Paracaligelloides* Bogush, Bushmina, and Domnikova. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 71, p. 55 [part].

*Diagnosis.*—Test(?) grossly tubiform, irregular in inner and outer outline, with angular constrictions and pseudosepta(?). Wall calcareous secreted, with minor agglutinated material. Aperture simple, at open end of tube.

*Type of genus.*—1965 *Paracaligelloides abramjanae* Reitlinger *in* Chuvashov. Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 74, p. 38, pl. 5, figs. 14–16.

*Remarks.*—The systematic position of *Paracaligelloides* Reitlinger *in* Chuvashov, *Paracaligella* Lipina, and *Baituganella* Lipina is unclear. That they would be foraminifers remains unproven, although such forms have been reported to the Hyperamminidae (Lipina, 1955), the Caligellidae (Reitlinger, 1959a; Conil and Lys, 1964; Bogush, Bushmina, and Domnikova, 1970), the Lituolidae (Vdovenko, 1962), and the Earlandiidae (Skipp in McKee and Gutschick, 1969).

These taxa are characterized by angular pseudosepta(?) dividing the tube in pseudochambers, but, unlike the Tournayellidae or the Forschiidae, no proloculus has ever been observed. The wall is also puzzling as it is often perforated by thick cylindrical tubes (see *Paracaligelloides muricatiformis* Chuvashov 1965 or the *Paracaligelloides* of this paper) which are unknown among bona fide Paleozoic foraminifers.

As an expediency, the three genera *Paracaligella*, *Paracaligelloides*, and *Baituganella* are recognized and separated according to the traditional usage, although it is uncertain if their morphological differences have generic value.

Loeblich and Tappan (1964) have equated *Caligella* Antropov 1950, *Evlania* Bykova 1952, *Baituganella* Lipina 1955, and *Paracaligella* Lipina 1955. Such treatment is debatable, as it would include in one single genus agglutinated and nonagglutinated taxa. Moreover, Loeblich and Tappan consider *Shuguria* Antropov 1950 related to *Caligella-Evlania-Baituganella-Paracaligella;* to the authors' knowledge, *Shuguria* is closely related to *Renalcis* and *Izhella*, not to the caligellids.

*Stratigraphic range and distribution.*—As the taxonomy of the taxon is unclear, the stratigraphic range and distribution remains vague. *Paracaligelloides* is known from the Middle Devonian to the lower Carboniferous of Eurasia and North America.

#### Paracaligelloides? obicus Bogush in Bogush, Bushmina, and Domnikova 1970

Plate 39, figures 10, 11

1970. *Paracaligelloides*? *obicus* Bogush *in* Bogush, Bushmina, and Domnikova. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 71, p. 55, pl. 1, figs. 11–13.

*Diagnosis.*—Test(?) large, grossly tubular, very irregular in outer outline, with some outside irregular projections and inner pseudosepta(?), marked by constrictions. Length 500μ to 2,000μ. Width 200μ to 320μ. Aperture(s) (?) at open end of projections. No proloculum. Wall calcareous secreted, with agglutinated calcareous debris; thickness variable, usually 15μ to 30μ. Pseudosepta(?) wall perforated by cylindrical pores.

*Remarks.*—By their morphology, Alaskan *Paracaligelloides*? closely resemble some Devonian *Evlania* (see Bykova, 1952), but this latter genus is not agglutinated and does not possess cylindrical perforations.

*Stratigraphic range and distribution.*—Originally reported from the Late Tournaisian of the Obi River (Siberia). Rather abundant in the Lower and Middle Viséan part of the Lisburne carbonates.

*Figured specimens.*—USNM 179949, 179950.

## LOCATIONS OF STRATIGRAPHIC SECTIONS

The material for the Joe Mountain, Canada, section is from a Union Oil Co. of Canada stratigraphic collection. The section is 3 miles east of the Alaskan Border and 3 miles south of Joe Creek at lat 69°00′ N., long 140°45′ W.

The Trout Lake and the West Trout Lake sections were measured by geologists of Chevron Standard Limited, Calgary. Their respective sections are on the Trail River at lat 68°42′ N., long 139°10′ W., and on the Babbage River lat 68°50′ N., long 140°00′ W., in the Yukon Territory of Canada.

The locations of the outcrop sections in Alaska are given from east to west on the index maps shown in figures 8 through 19.

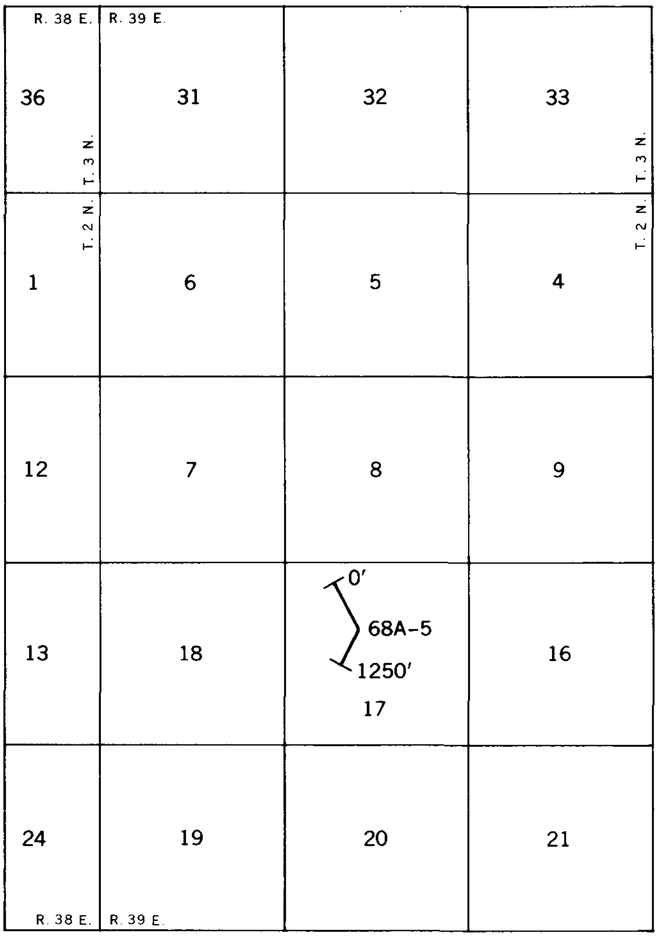


FIGURE 8.—Location map, Egaksrak River section 68A-5, Romanzof Mountains.

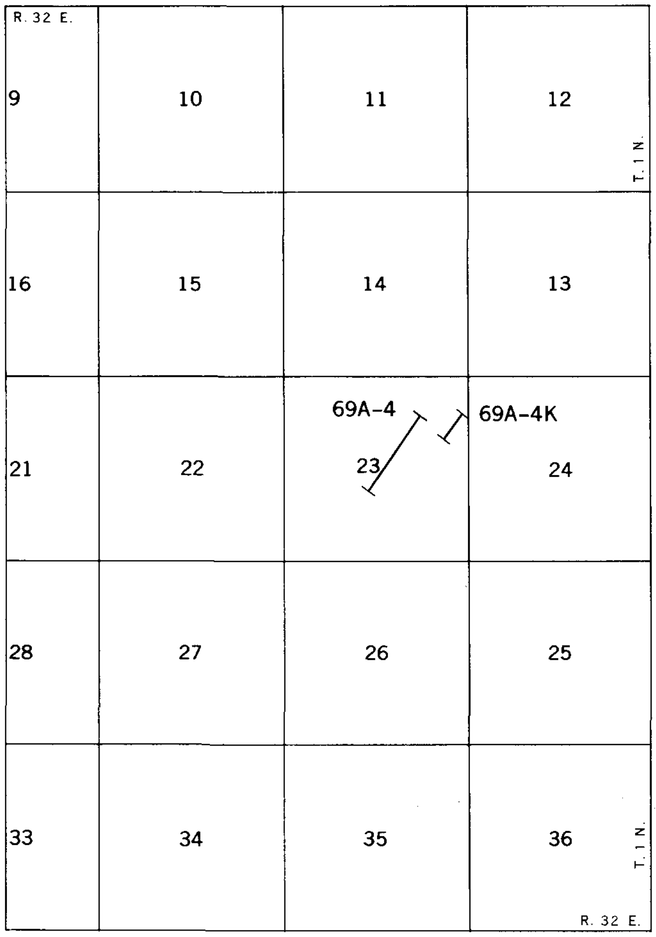


FIGURE 9.—Location of Old Man Creek, sections 69A-4 and 69A-4K, Romanzof Mountains.

*Stratigraphic range and distribution.*—Originally reported from the Late Tournaisian of the Obi River (Siberia). Rather abundant in the Lower and Middle Viséan part of the Lisburne carbonates.

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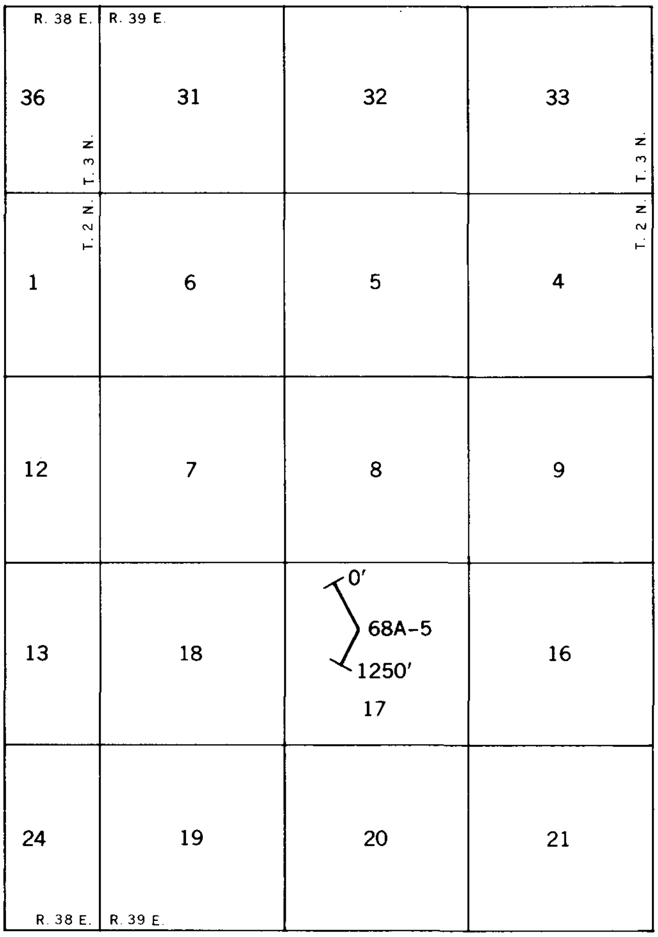


FIGURE 8.—Location map, Egaksrak River section 68A–5, Romanzof Mountains.

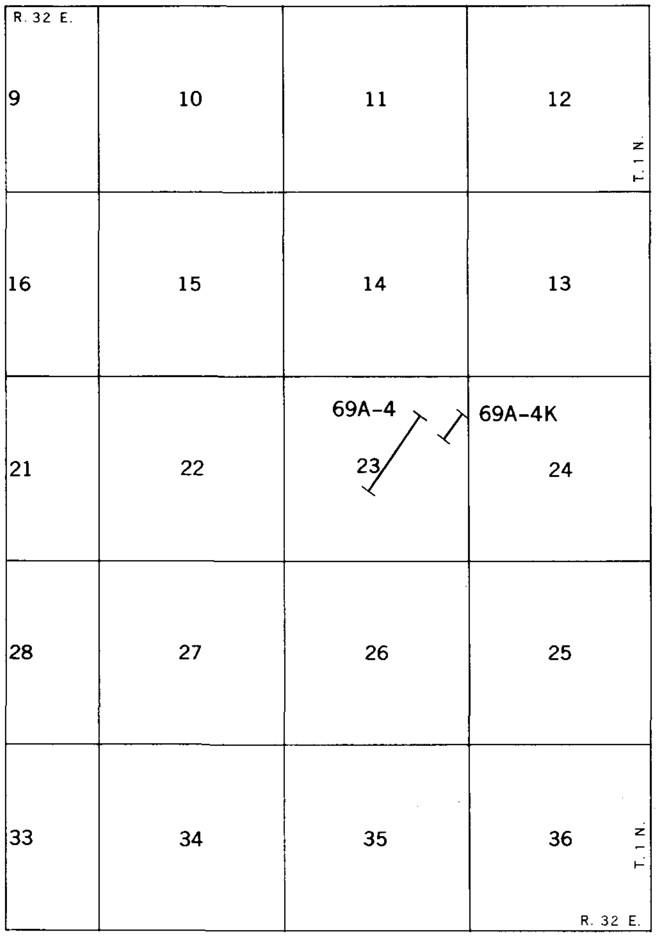


FIGURE 9.—Location of Old Man Creek, sections 69A–4 and 69A–4K, Romanzof Mountains.

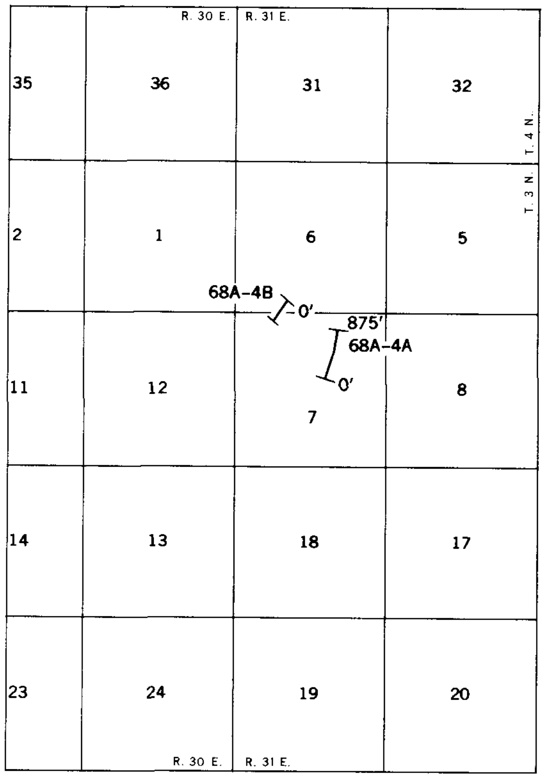


**FIGURE 10.**—Location of sections 68A-4A, 4B, Sunset Pass, Sadlerochit Mountains.

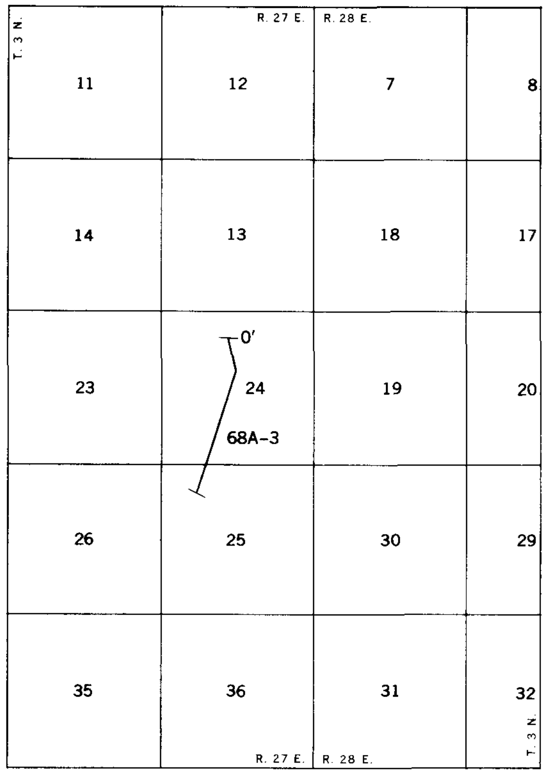


**FIGURE 11.**—Location of Sadlerochit Mountains section 6A-3.

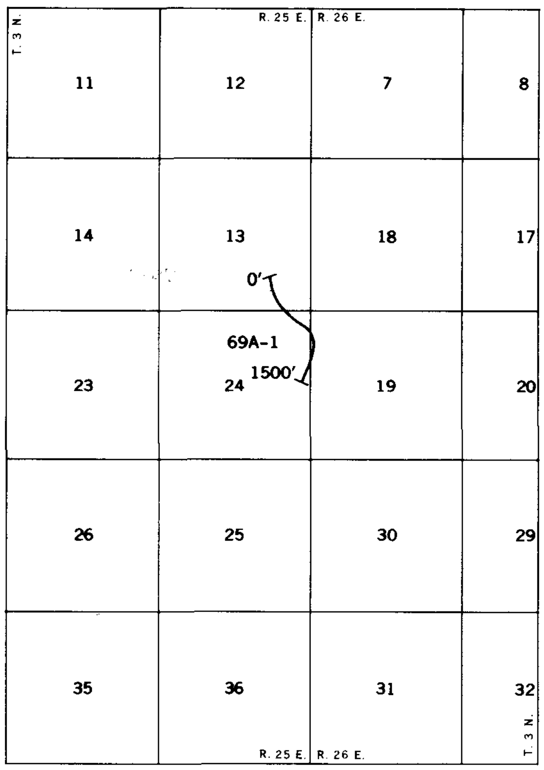


**FIGURE 12.**—Location of West Sadlerochit Mountains section 69A-1.

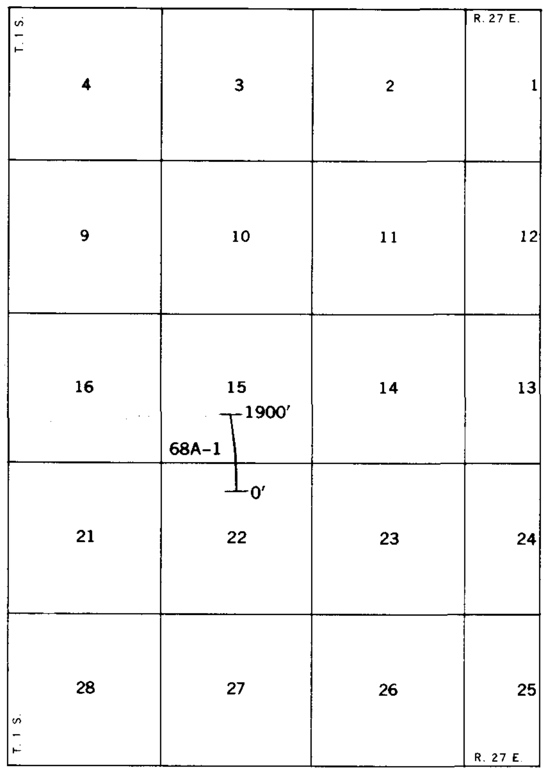


**FIGURE 13.**—Location of Ikiakpuk River section 68A-1, Franklin Mountains.

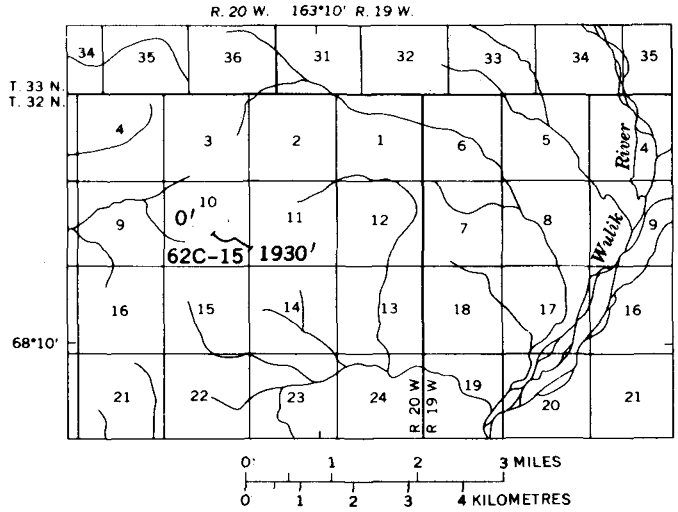


FIGURE 18.—Location of Cirque section 62C–15, De Long Mountains.

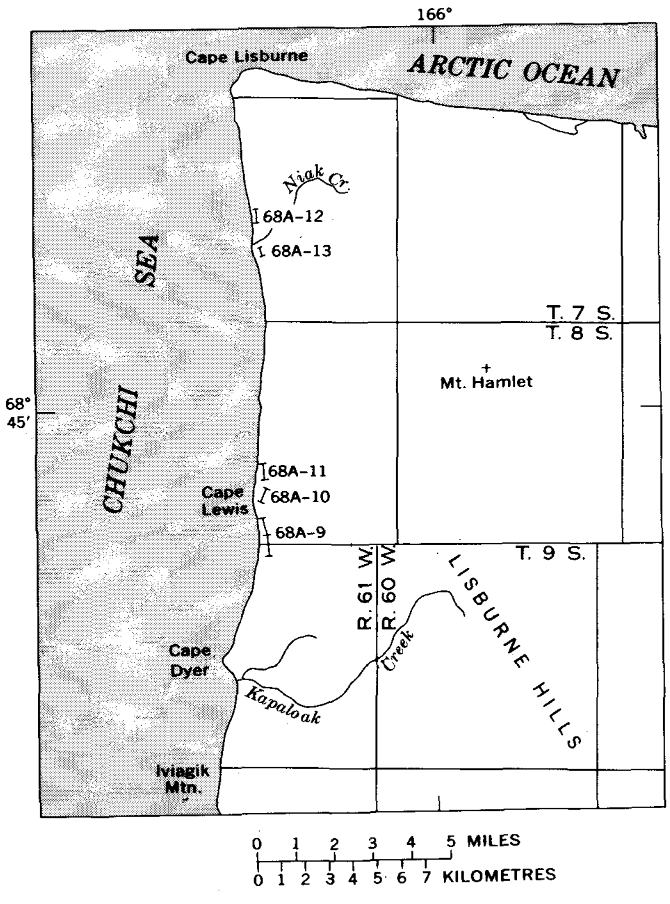


FIGURE 19.—Location of Cape Lewis sections 68A–9 to 11; North Niak Creek section 68A–12; and South Niak Creek section 68A–13, Lisburne Peninsula.

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# INDEX

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# PLATES 1-39

Contact photographs of the plates in this report are available, at cost, from U.S. Geological Survey Library, Federal Center, Denver, Colorado 80225

## PLATE 1

### Joe Mountain section, Canada

FIGURE 1. Univ. Montréal 204/19, 3,900–3,910 ft below top of section (× 25) Alapah Limestone, Zone 12/13 boundary, Middle Viséan, Salem/St. Louis boundary equivalent.

Coarse-grained, relatively well sorted, pelmatozoan grainstone; some epitaxial sparry calcite rim around the crinoidal ossicles. Various degrees of preservation (note the pitting and algal borings) of the pelmatozoan material suggest different sources. Additional debris consists of bryozoan, mud lumps, algal-coated megafaunal fragments and Foraminifera, *Eoendothyranopsis* of the group *E. rara* (Grozdilova in Lebedeva).

2. Univ. Montréal 204/7, 3,750 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Coarse-grained, well-sorted, mud lump-dasyclad-bahamite grainstone. The lumps are believed to be formed by accretion of fine megafaunal debris. Comminuted megafaunal debris are incorporated in the mud matrix. The microflora is composed of *Koninckopora* sp. and *Calcisphaera* sp.

3. Univ. Montréal 204/18, 3,750 ft below top of section (× 30) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Medium-grained, poorly sorted, pelmatozoan-algal-recrystallized packstone. Matrix shows various degrees of recrystallization. Crinoids, bryozoans, and Foraminifera (*Earlandia* sp. and *Eoendothyranopsis* sp.) are present. *Yukonella bamberi* is conspicuous.

4. Univ. Montréal 204/11, 3,750 ft below the top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Medium-grained, poorly sorted, pelmatozoan-foraminiferal packstone. Lime mud matrix shows incipient recrystallization. Microflora is reduced to scattered *Calcisphaera* sp. Foraminifera are *Parathurammina* sp., *Earlandia* sp., and *Endothyra* sp.

5. Univ. Montréal 203/29, 3,750 ft below top of section (25 ×) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Medium-grained, poorly sorted, pelmatozoan-foraminiferal packstone. Foraminifera include *Globoendothyra* sp. and *Eoendothyranopsis* sp. Note the wide range of preservation among the Foraminifera; this is shown by a comparison of the inner whorl of the upper left *Globoendothyra,* whereas the center right specimen is almost completely recrystallized and destroyed.

6. Univ. Montréal 203/31, 3,750 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

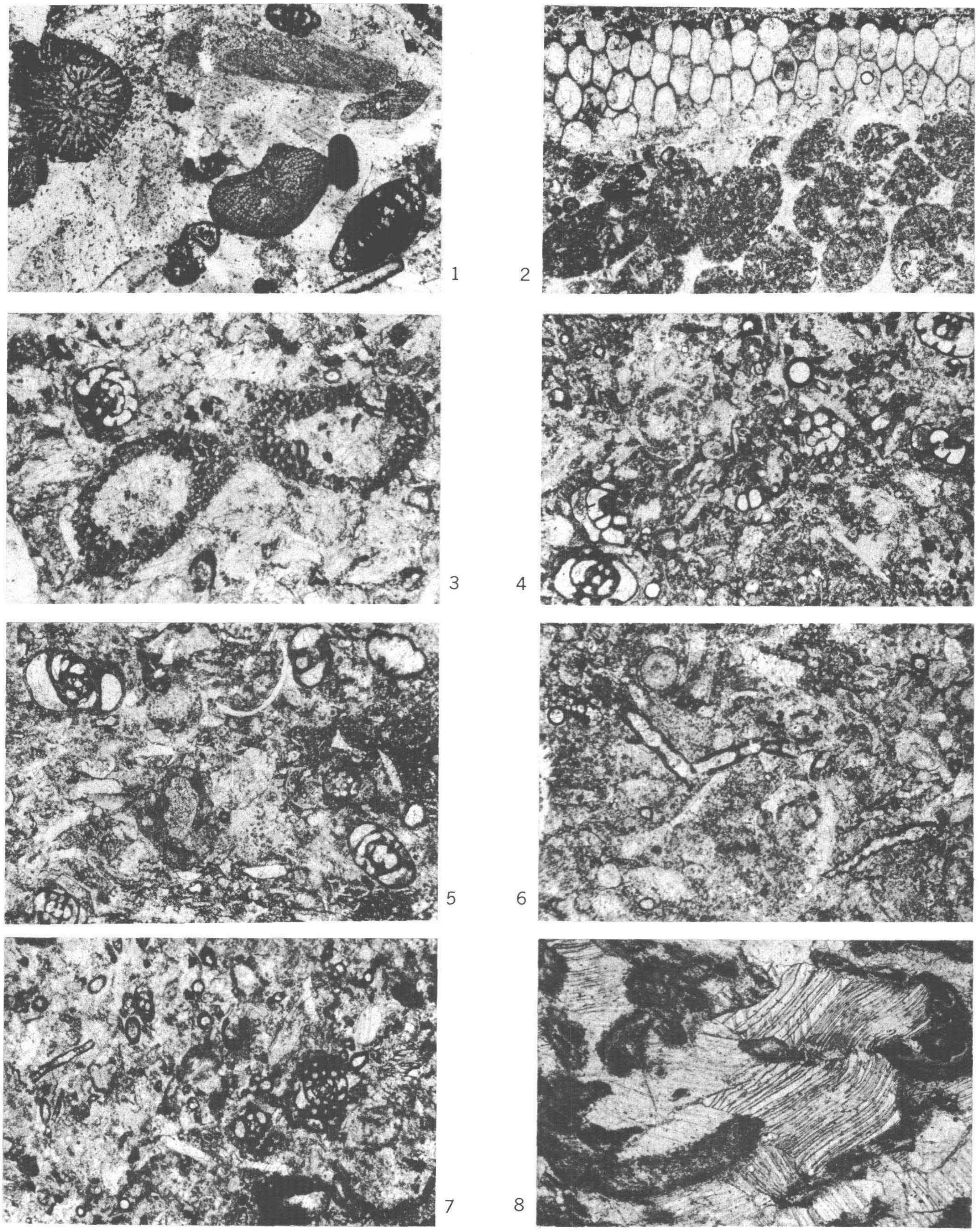
Medium-grained, poorly sorted, pelmatozoan-foraminiferal packstone. Foraminifera include numerous *Earlandinella* sp., *Endothyra* sp., and *Parathurammina* sp. *Calcisphaera pachysphaerica* (Pronina) is also present.

7. Univ. Montréal 204/6, 3,750 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Medium-grained, poorly sorted, pelmatozoan-foraminiferal packstone. Foraminifera include *Eoendothyranopsis* of the group *E. rara* (Grozdilova *in* Lebedeva), *Globoendothyra* sp., *Earlandia* of the group *E. vulgaris* (Rauzer-Chernoussova and Reitlinger), *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova), *Earlandia* sp., and *Parathurammina* sp. Calcisphaerids are also present.

8. Univ. Montréal 203/27, 20–30 ft below top of section (× 25) Alapah Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.

Tectonically stressed limestone. The original rock was probably a bryozoan-pelmatozoan grainstone or packstone. Note the sinuous twin lamellae confined to the ossicles of pelmatozoans.




JOE MOUNTAIN SECTION, CANADA

# PLATE 2

**Egaksra River Section 68A–5, Romanzof Mountains**

FIGURE 1. USNM 179951, 780 ft below top of section (× 25) Wahoo(?) Limestone, Zone 20, Morrow equivalent.
Bryozoan frond (fenestellid) embedded in mudstone. Note the slight dolomitization. This facies is always unfavorable to Foraminifera and algae.

2. USNM 179952, 450 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.
Medium-grained, well-sorted, bryozoan-pelmatozoan-brachiopod grainstone. All debris reworked, rounded, and transformed into ooids or proto-oolites. Foraminifera include *Globivalvulina* sp. sensu stricto and *Glomospiroides* sp.

3. USNM 179953, 400 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.
Medium-grained, very well sorted, oolitic grainstone. Note void-filling sparry calcite cement and the algal borings of the oolites. True oolitic grainstones are always unfavorable to foraminifers.

4. USNM 179954, 250 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.
Medium-grained, well-sorted, pelmatozoan-foraminiferal packstone. Pressure solution is conspicuous and microstylolitic contacts are widespread. Most of the sparry calcite is due to secondary grain growth. Some mud lumps are present. Foraminifers display all stages of preservation; some endothyrids and early fusulinids being so weathered that they can be confused with mud lumps. Also recognized are abundant *Eoschubertella*? sp. and *Pseudostaffella* sp.

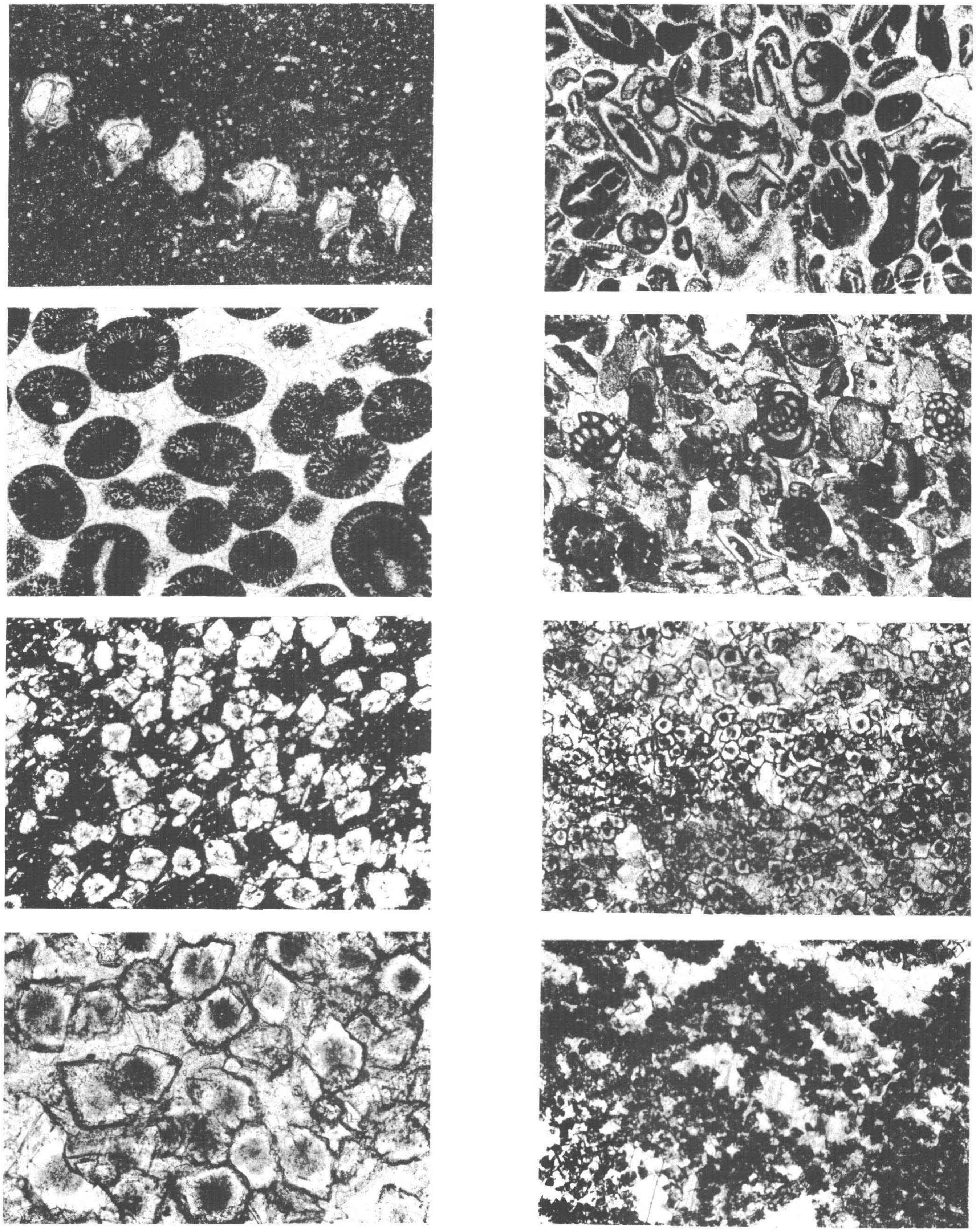
**Old Man Creek section 69A–4**

5. USNM 179955, 835 ft below top of section (× 25) Alapah Limestone, Zones $16_{inf}$ or $16_{sup}$, undetermined latest Viséan zone, lower Chester equivalent.
Dolomitic mudstone. Note clear outer rims of the dolomitic rhombs.

6. USNM 179956, 703 ft below top of section (× 30) Alapah Limestone, Zones $16_{inf}$ or $16_{sup}$, undetermined latest Viséan zone, lower Chester equivalent.
Clear-rimmed dolomite rhombs. The darker dolomite centers are due to the concentration of organic and argillaceous material; iron oxides are also present. The pore spaces between the dolomite rhombs are filled by sparry calcite that has destroyed the porosity.

7. As figure 6 (× 97).

8. USNM 179957, 555 ft below top of section (× 95) Alapah Limestone, Zones 17 or 18, undetermined Early Namurian zone, middle or upper Chester equivalent.
Dolomite. Clear-rimmed dolomite rhombs with sparry calcite-filled vugs.



EGAKSRAK RIVER SECTION 68A-5, ROMANZOF MOUNTAINS

# PLATE 3

**Old Man Creek sections 69A–4, 69A–4K, Romanzof Mountains**

FIGURE 1. USNM 179958, 500 ft below top of section (× 25) Alapah Limestone, Zones 17 or 18, undetermined Early Namurian zone, middle or upper Chester equivalent.
Fine-grained dolomite.

2. USNM 179959, 475 ft below top of section (× 25) Alapah Limestone, Zones 17 or 18, undetermined Early Namurian zone, middle or upper Chester equivalent.
Fine-grained dolomitic sponge spiculite lime mudstone.

3. USNM 179960, 210 ft below top of section (× 25) Alapah Limestone, Zone 18, Early Namurian, upper Chester equivalent.
Dolomite formed by clear-rimmed dolomite rhombs. Voids filled by dark, aphanitic hydrocarbons. Angular quartz sand grains.

4. USNM 179960, 210 ft below top of section (× 25) Alapah Limestone, Zone 18, Early Namurian, upper Chester equivalent.
Medium-grained interlocking dolomite rhombs.

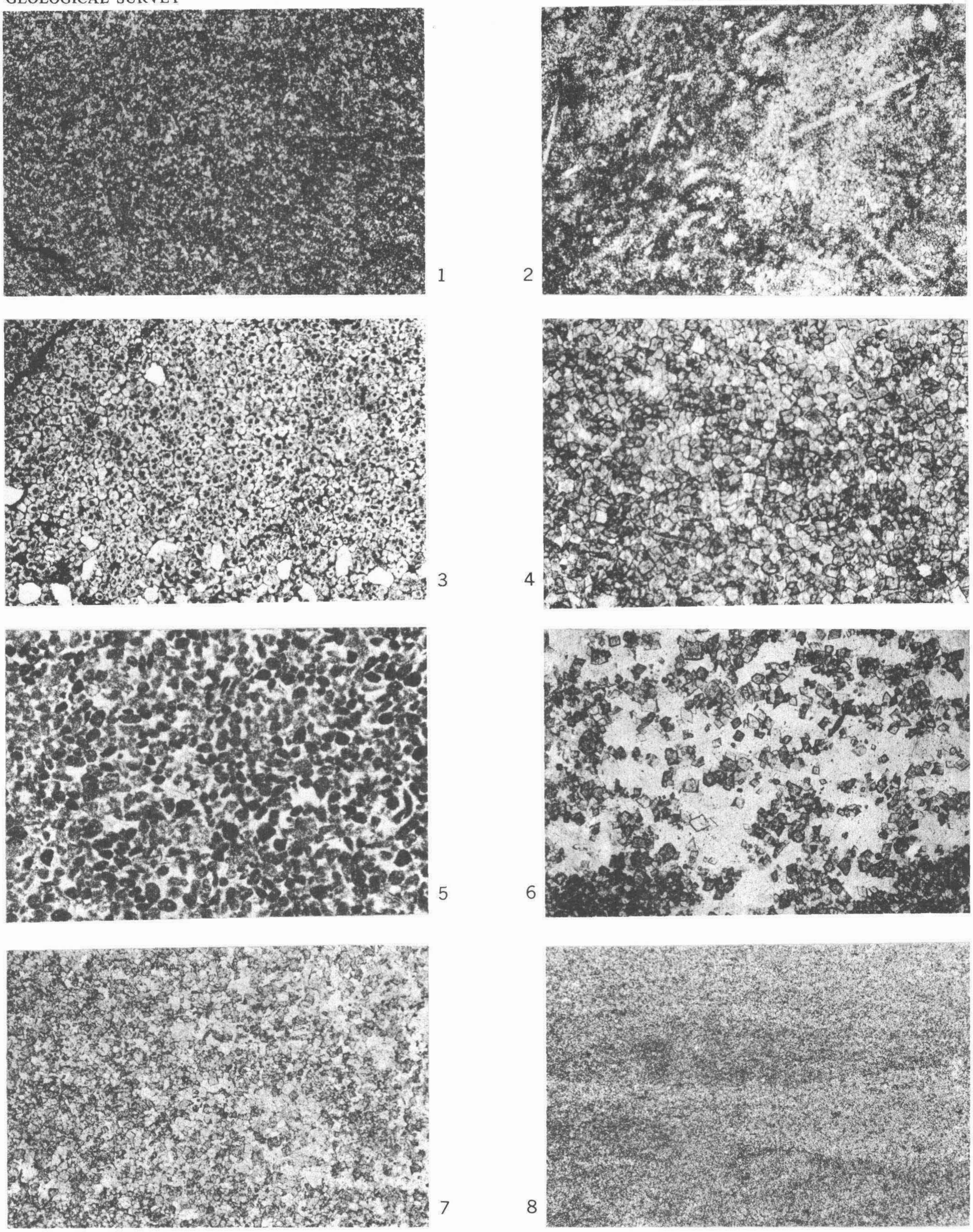
**Sunset Pass section 68A–4A, 4B, Sadlerochit Mountains**

5. USNM 179960, 1,655 ft below top of section (× 25) Alapah Limestone, Zone $16_{sup}$ or 17, Late Viséan or Early Namurian, lower to middle Chester equivalent.
Fine grained, very well sorted pelletoidal grainstone.

6. USNM 179961, 1,320 ft below top of section (× 25) Alapah Limestone, Zone $16_{sup}$ or 17, Late Viséan or Early Namurian, lower to middle Chester equivalent.
Euhedral dolomite rhombs in chert. Chertification and dolomitization were penecontemporaneous.

7. USNM 179962, 1,310 ft below top of section (× 25) Alapah Limestone, Zone $16_{sup}$ or 17, Late Viséan or Early Namurian, lower to middle Chester equivalent.
Medium-grained dolomite. Note the sparry calcite filling of micropores.

8. USNM 179963, 720 ft below top of section (× 25) Alapah Limestone, Zone $16_{sup}$ or 17, Late Viséan or Early Namurian, lower to middle Chester equivalent.
Very fine grained dolomite. Note the preservation in the dolomite of the original microbedding of the pelletoidal lime mudstone. Note also the wavy texture of the original lime mud, frequent as ghost.




OLD MAN CREEK SECTIONS 69A-4 AND 69A-4K, ROMANZOF MOUNTAINS;
SUNSET PASS SECTIONS 68A-4A, 4B, SADLEROCHIT MOUNTAINS

## PLATE 4

**Sunset Pass section 68A–4A, 4B, Sadlerochit Mountains**

FIGURES 1, 2. USNM 179964, 900 ft below top of section (× 25) Alapah Limestone, Zone 17, Early Namurian, middle Chester equivalent.

Calcite pseudomorphs of gypsum in lime mudstone. This facies is encountered with mud cracks, chips, algal mats and is suggestive of supratidal environments.

3, 4. USNM 179965, 500 ft below top of section (× 25) Wahoo Limestone, Zone 20, Morrow equivalent.

Medium-grained, well-sorted oolitic packstone; gastropods, bryozoans, and pelmatozoans display all grades between proto-oolitic and true oolitic coating. This facies is probably indicative of an oolitic bank transgressing over a mud bottom.

5–8. USNM 179966, 240 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.

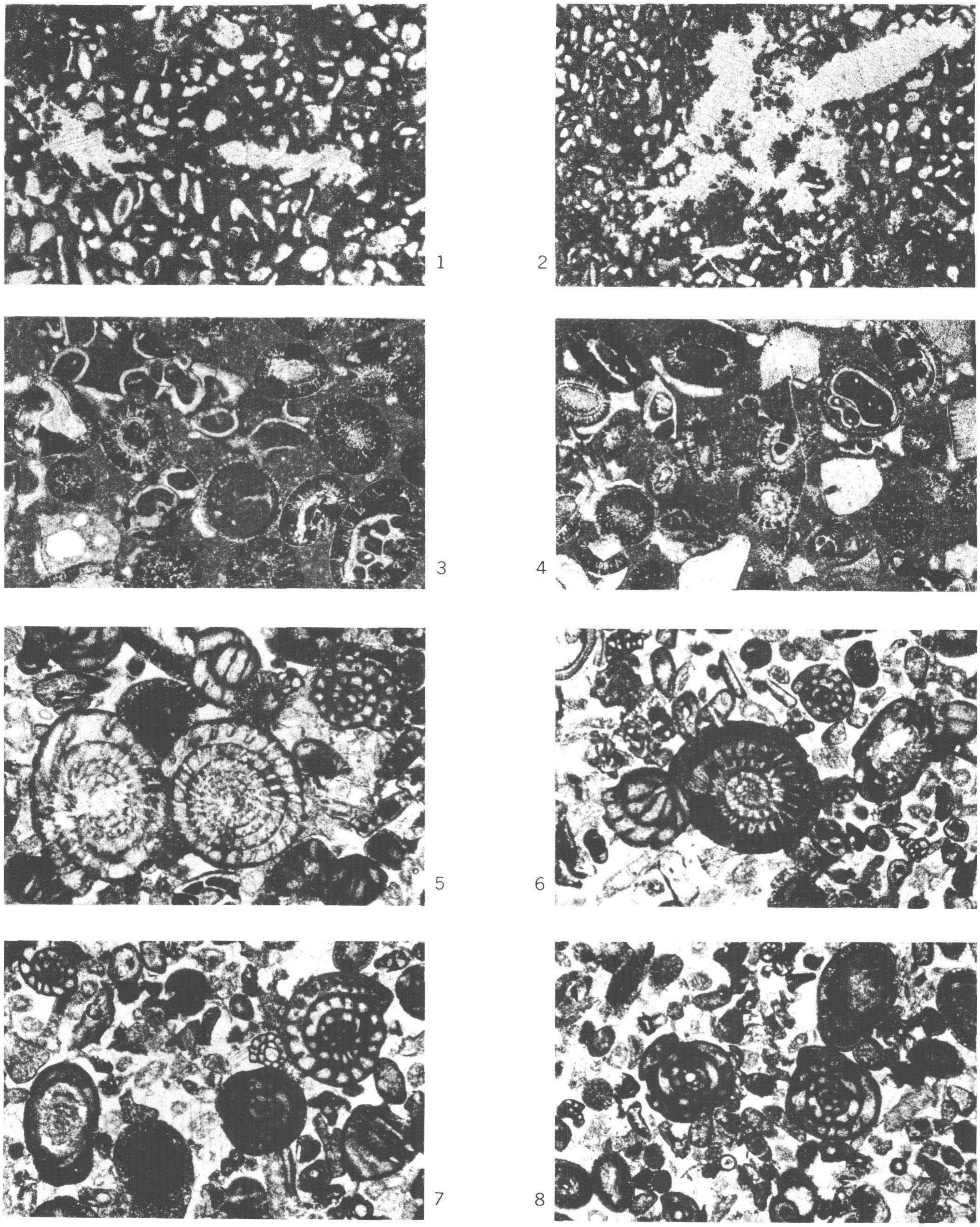
Coarse-grained, poorly sorted foraminiferal-lump grainstone. Oolites and proto-oolites are common. Note the wide variability of the test preservation.

Figure 5 shows two highly recrystallized equatorial sections of *Pseudostaffella* sp. with *Eostaffella* sp., *Asteroarchaediscus* sp., *Eoschubertella*? sp., *Endothyra* sp., and the algae *Kamaena* sp.

Figure 6 has *Pseudostaffella* sp., *Eoschubertella*? sp., *Pseudoendothyra* sp., *Eostaffella* sp., *Glomospiroides* sp., and *Pseudoglomospira* sp.

Figure 7 shows *Pseudostaffella* sp., *Eoschubertella*? sp., *Pseudoendothyra* sp., and endothyrids.

Figure 8 has *Eoschubertella*? sp., *Pseudoendothyra* sp., endothyrids, and calcispherids.




SUNSET PASS SECTIONS 68A–4A, 4B, SADLEROCHIT MOUNTAINS

# PLATE 5

**West Sadlerochit Mountains section 69A–1**

FIGURE 1. USNM 179967, 1,485 ft below top of section (× 25) Alapah Limestone, Zone $16_{\text{inf}}$, Late Viséan, lower Chester equivalent.
Ostracode lime mudstone with birdseye structure.

2. USNM 179968, 1,380 ft below top of section (× 25) Alapah Limestone, Zone $16_{\text{inf}}$, Late Viséan, lower Chester equivalent.
Dolomitized(?), recrystallized mudstone (microspar).

3. USNM 179969, 1,205 ft below top of section (× 25) Alapah Limestone, Zone $16_{\text{inf}}$, Late Viséan, lower Chester equivalent.
Bioturbated wackestone. Note the very wide range of mud lumps.

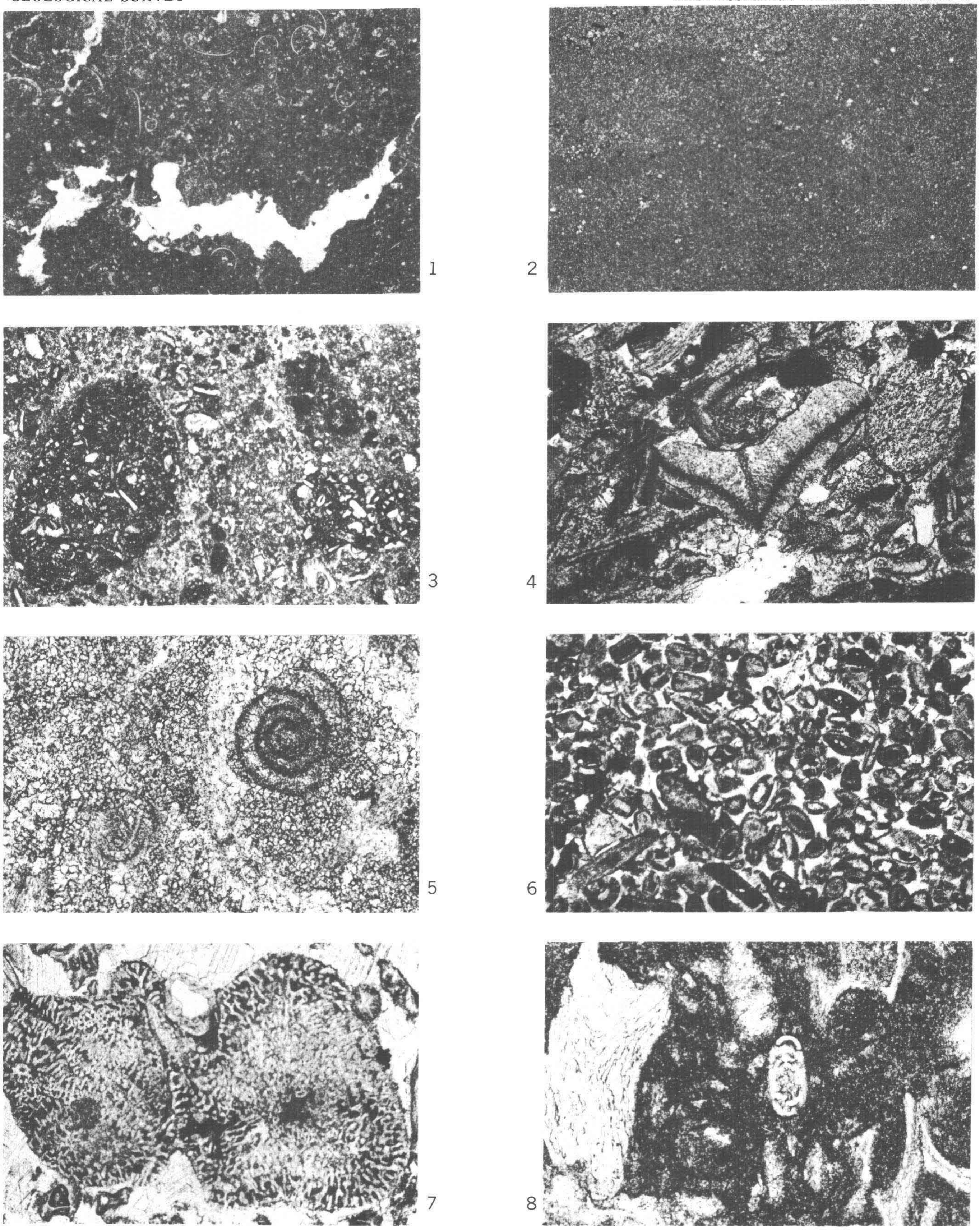
4. USNM 179970, 1,180 ft below top of section (× 25) Alapah Limestone, Zone $16_{\text{inf}}$, Late Viséan, lower Chester equivalent.
A typical example of the ubiquitous bryozoan-pelletoid-pelmatozoan recrystallized packstone in Lisburne Group. Some void filling by sparry calcite is also present. A large coral fragment is in the center of the photograph.

5. USNM 179971, 1,060 ft below top of section (× 97) Alapah Limestone, Zone $16_{\text{sup}}$, Late Viséan, lower Chester equivalent.
Microspar; the original rock was probably a packstone. Note the uniformity of the crystal size. *Pseudoammodiscus* sp. and *Archaediscus* sp. are still visible, their wall structure being recognizable as ghosts. Further recrystallization would lead to complete obliteration of the structure (as exemplified in figure 2).

6. USNM 179972, 1,030 ft below top of section (× 25) Alapah Limestone, Zone $16_{\text{sup}}$, Late Viséan, lower Chester equivalent.
Very well sorted, fine-grained, micro-oolitic grainstone. Echinoid spines, abundant bryozoans, pelmatozoan fragments, algal bored brachiopods, and micropellets are present.

7. USNM 179973, 670 ft below top of section (× 30) Alapah Limestone, Zone $16_{\text{sup}}$, Late Viséan, lower Chester equivalent.
Two *Epistacheoides connorensis* Mamet and Rudloff in a bryozoan grainstone.

8. USNM 179974, 300 ft below top of section (× 97) Wahoo Limestone, Zone 19 or younger, Namurian, upper Chester equivalent.
*Neoarchaediscus* sp. in a brachiopod wackestone.




WEST SADLEROCHIT MOUNTAINS SECTION 69A-1

# PLATE 6

**West Sadlerochit Mountains section 69A–1**

FIGURE 1. USNM 179975, 275 ft below top of section (× 25) Wahoo Limestone, Zone 18 or younger, Namurian, upper Chester equivalent.

*Asphaltina cordillerensis* Mamet and Rudloff in a bryozoan-brachiopod pelmatozoan recrystallized packstone. No sorting; the rock is found by accumulation in situ of the biota.

2. USNM 179976, 176 ft below top of section (× 119) Wahoo Limestone, Zone 18 or younger, Namurian, upper Chester equivalent.

Well-sorted, small-grained, brachiopod-lump grainstone. *Planospirodiscus* sp. is coated by an oolitic coating.

3. USNM 179977, 151 ft below top of section (× 30) Wahoo Limestone, Zone 18 or younger, Namurian, upper Chester equivalent.

Poorly sorted, medium-grained, bryozoan-lump grainstone. All fragments are mud coated. An axial section of *Planospirodiscus* sp. is conspicuous in the center of the photograph. The environment is comparable to that of a modern bahamite.

4. USNM 179978, 130 ft below top of section (× 30) Wahoo Limestone, Zone 20, Morrow equivalent.

Enigmatic macrofaunal fragment in a bryozoan wackestone.

5. USNM 179979, 110 feet below top of section (× 40) Wahoo Limestone, Zone 20, Morrow equivalent.

Unsorted, medium-grained, bryozoan-pelmatozoan-pelletoid, recrystallized packstone; this rock is usually formed by accumulation in situ of the biota. Two axial sections of *Biseriella* sp. of the group *B. parva* (Chernysheva) are present.

6. USNM 179979, 110 ft below top of section (× 40) Wahoo Limestone, Zone 20, Morrow equivalent.

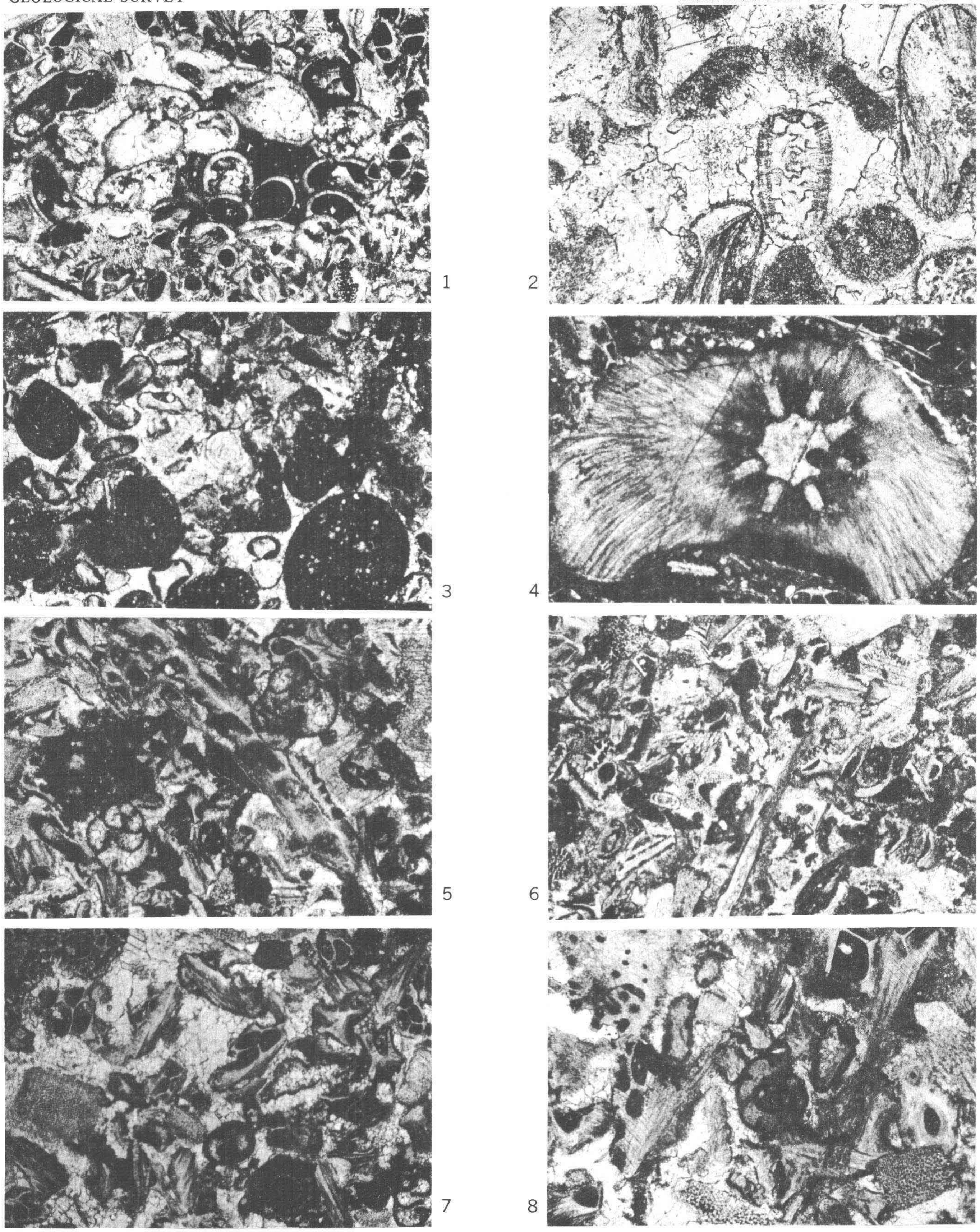
Unsorted, medium-grained, bryozoan-pelmatozoan, pelletoid, recrystallized packstone. Abundant *Planospirodiscus* sp., *Archaediscus* sp., *Neoarchaediscus* sp. are present. A silicified *Eostaffella* sp. is present on the lower left.

7. USNM 179980, 90 ft below top of section (× 25) Wahoo Limestone, Zone 20, Morrow equivalent.

Fairly sorted, medium-grained, bryozoan-pelmatozoan-brachiopod grainstone. The algae *Stacheoides* sp. and foraminifers (*Millerella* sp., *Biseriella* sp.) are present.

8. USNM 179981, 80 ft below top of section (× 40) Wahoo Limestone, Zone 20, Morrow equivalent.

A glauconite-filled *Endothyra* sp. in a poorly sorted, medium-grained, bryozoan-pelmatozoan rich packstone-grainstone.



WEST SADLEROCHIT MOUNTAINS SECTION 69A-1

## PLATE 7

### West Sadlerochit Mountains section 69A–1

FIGURE 1. USNM 179982, 60 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.
Tectonized neomorphic coarse-grained limestone. Note the well-developed stylolitic contact between the grains.

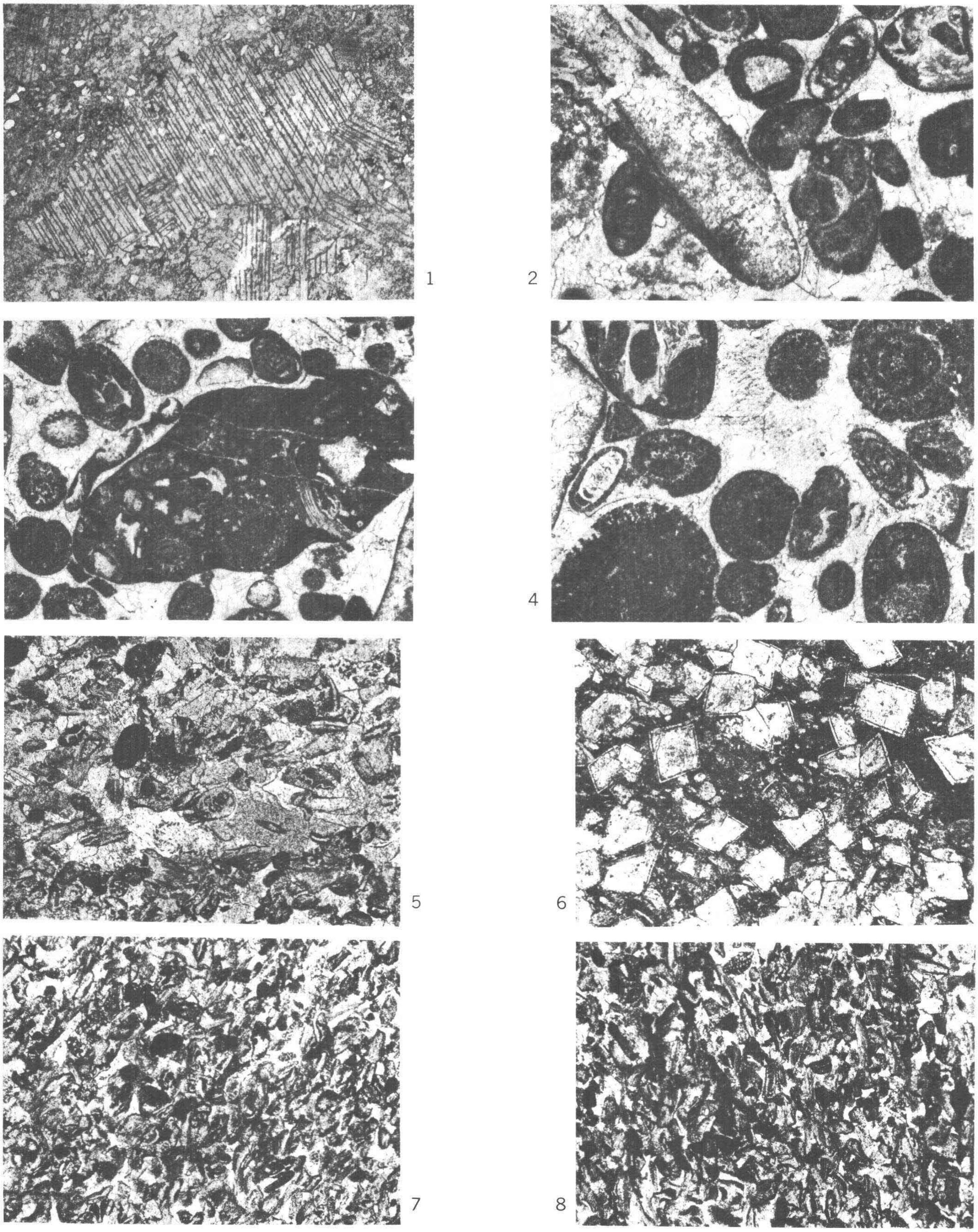
2–4. USNM 179983, 47 ft below top of section (× 30) Wahoo Limestone, Zone 21, Atoka equivalent.
Poorly sorted, unevenly grained, lump-oolitic-foraminiferal grainstone. Grain coating varies from a single thin algal coat to multi-layered oolites. Note the composite lithoclast in figure 3. Foraminifers include *Eostaffella* of the group *E. radiata* Brady, *Pseudoendothyra britishensis* Ross, and *Neoarchaediscus* of the group *N. incertus* (Grozdilova and Lebedeva).

### Sadlerochit Mountains section 68A–3

5. USNM 179984, 1,075 ft below top of section (× 30) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.
Medium-sorted, medium-grained, pelletoidal bryozoan-pelmatozoan recrystallized packstone. *Archaediscus* of the group *A. chernoussovensis* Mamet is present in the center.

6. USNM 179985, 980 ft below top of section (× 30) Alapah Limestone, Zone $16_{sup}$, Late Viséan, lower Chester equivalent.
Large dolomite rhombs in an argillaceous wackestone. Note the double rims indicating two generations of crystal growth.

7, 8. USNM 179986, 850 ft below top of section (× 30) Alapah Limestone, Zone 17, Early Namurian, middle Chester equivalent.
A characteristic and widespread upper Alapah microfacies; well-sorted, fine-grained, rounded, comminuted debris of pelmatozoans and bryozoans, with rare hard pellets. Occasional light algal or proto-oolitic coating. Matrix usually recrystallized, sparry calcite cement present.
Figure 7 shows *Neoarchaediscus* sp. and *Endothyra* sp. Figure 8 shows *Planospirodiscus* sp.




WEST SADLEROCHIT MOUNTAINS SECTION 69A-1 AND SADLEROCHIT MOUNTAINS SECTION 68A-3

## PLATE 8

**Sadlerochit Mountains section 68A–3**

FIGURE 1. USNM 179987, 600 ft below top of section (× 25) Alapah Limestone, Zones 17 or 18, Early Namurian, middle or upper Chester equivalent.

An encrusting *Asphaltina* sp. on a chertified crinoidal ossicle. The host rock is a bryozoan packstone. Incipient dolomitization is conspicuous in the upper left hand quadrant.

2. USNM 179988, 570 ft below top of section (× 25) Alapah Limestone, Zones 17 or 18, Early Namurian, middle or upper Chester equivalent.

Dolomitic lime mudstone. Note the regularity of the rhombs.

3. USNM 179989, 470 ft below top of section (× 97) Wahoo Limestone, Zone 20, Morrow equivalent.

Well-sorted, fine-grained, archaediscid-pelletoidal packstone (*Asteroarchaediscus* sp.). Note the fine-grained microspar recrystallization.

4–6. USNM 179990, 385 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.

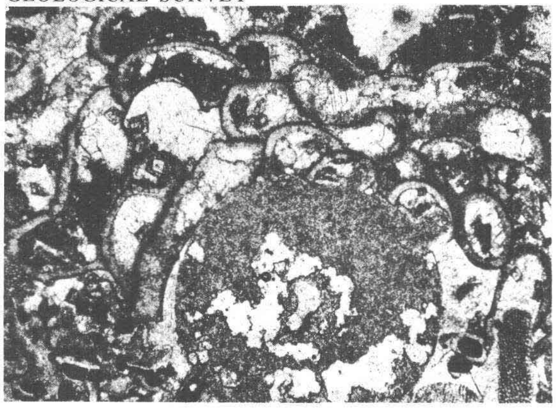
Well-sorted, coarse-grained to very coarse grained coated bryozoan-pelmatozoan-algal-brachiopod grainstone. Gastropods are present. All fragments show signs of reworking and rounding and various degrees of coating. Sparry calcite cement often in continuity with pelmatozoan plates. Foraminifers are restricted to *Globivalvulina* sp. sensu strictu and undeterminable endothyrids. *Stacheia*? *sp.*, *Epistacheoides* sp., and *Asphaltina* sp. are abundant.

7. USNM 179991, 355 ft below top of section (× 30) Wahoo Limestone, Zone 21, Atoka equivalent.

Well-sorted, fine-grained, bryozoan-pelmatozoan-brachiopod-pelletoidal recrystallized packstone. Some cement present. *Neoarchaediscus* sp., *Asteroarchaediscus* sp., *Biseriella* sp., and undeterminable endothyrids are present.

8. Same as figure 7 (× 97).

*Asteroarchaediscus* of the group *A. baschkiricus* (Krestovnikov and Teodorovitch), *Neoarchaediscus* sp., and *Girvanella* sp. are conspicuous.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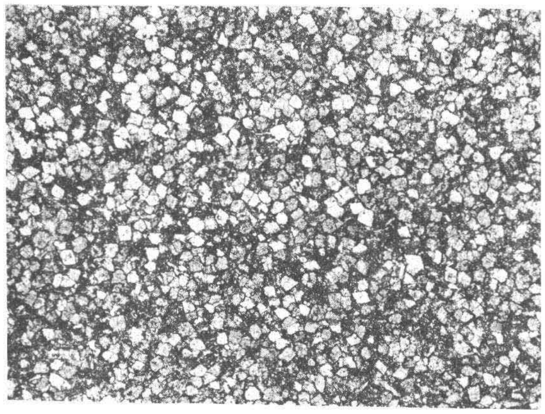
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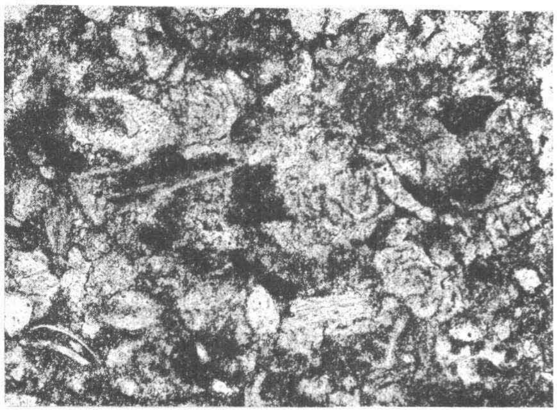
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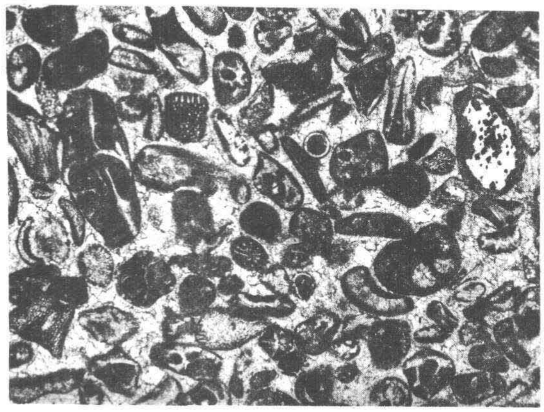
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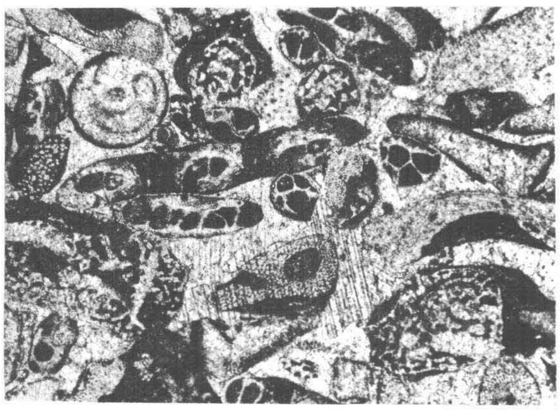
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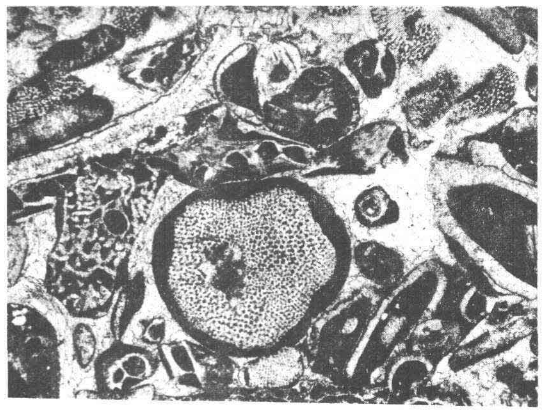
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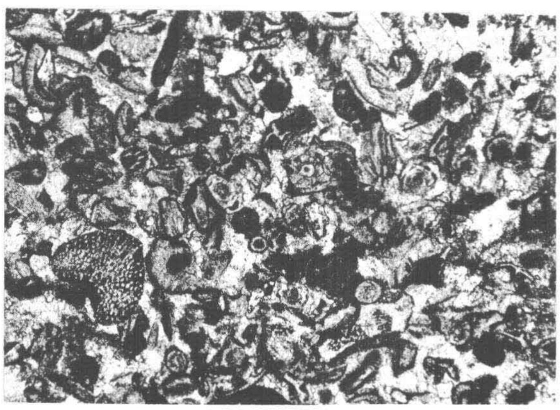
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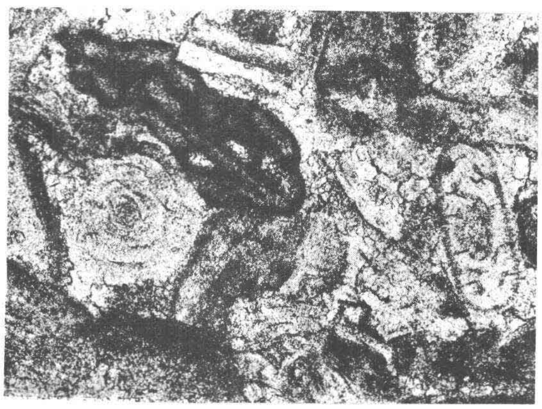
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SADLEROCHIT MOUNTAINS SECTION 68A-3

# PLATE 9

**Ikiakpuk section 68A–1, Franklin Mountains**

FIGURE 1. USNM 179992, 2,000 ft below top of section (× 25) Alapah Limestone, Zone 14, Late Viséan, St. Louis equivalent.

Very poorly sorted, argillaceous, silicified, pelmatozoan-spiculite wackestone. *Globoendothyra* of the group *G. tomiliensis* (Grozdilova in Lebedeva) is in the center.

2. USNM 179993, 1,850 ft below top of section (× 25) Alapah Limestone, zone 15?, Late Viséan, Ste. Genevieve equivalent?

Poorly sorted, medium-grained, dolomitized foraminiferal wackestone. Foraminifers are: *Eoendothyranopsis* sp., *Globoendothyra* sp., and *Parathurammina* sp. Calcispherids are present.

3. USNM 179994, 1,580 ft below top of section (× 25) Alapah Limestone, Zone $16_{int}$, Late Viséan, early Chester equivalent.

Tectonically stressed well-sorted, medium-grained, bryozoan-pelmatozoan grainstone. Note the elongation of the grains, and wavy sparry calcite twin lamellae.

4, 5. USNM 179995, 70 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.

Very well sorted, coarse-grained, lumpy to oolitic grainstones. Figure 4 shows abundant neomorphic sparry calcite and the grains appear to float in a clear cement. Microfauna composed of biseriamminids (*Globivalvulina* sp.), endothyrids, and eostaffelids (*Eostaffella* sp.).

6. USNM 179996, 40 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.

Well-sorted, coarse-grained proto-oolitic to oolitic grainstone. Same environment as figure 5, but having incipient tectonic reorientation. *Pseudostaffella* sp. and endothyrids are conspicuous.

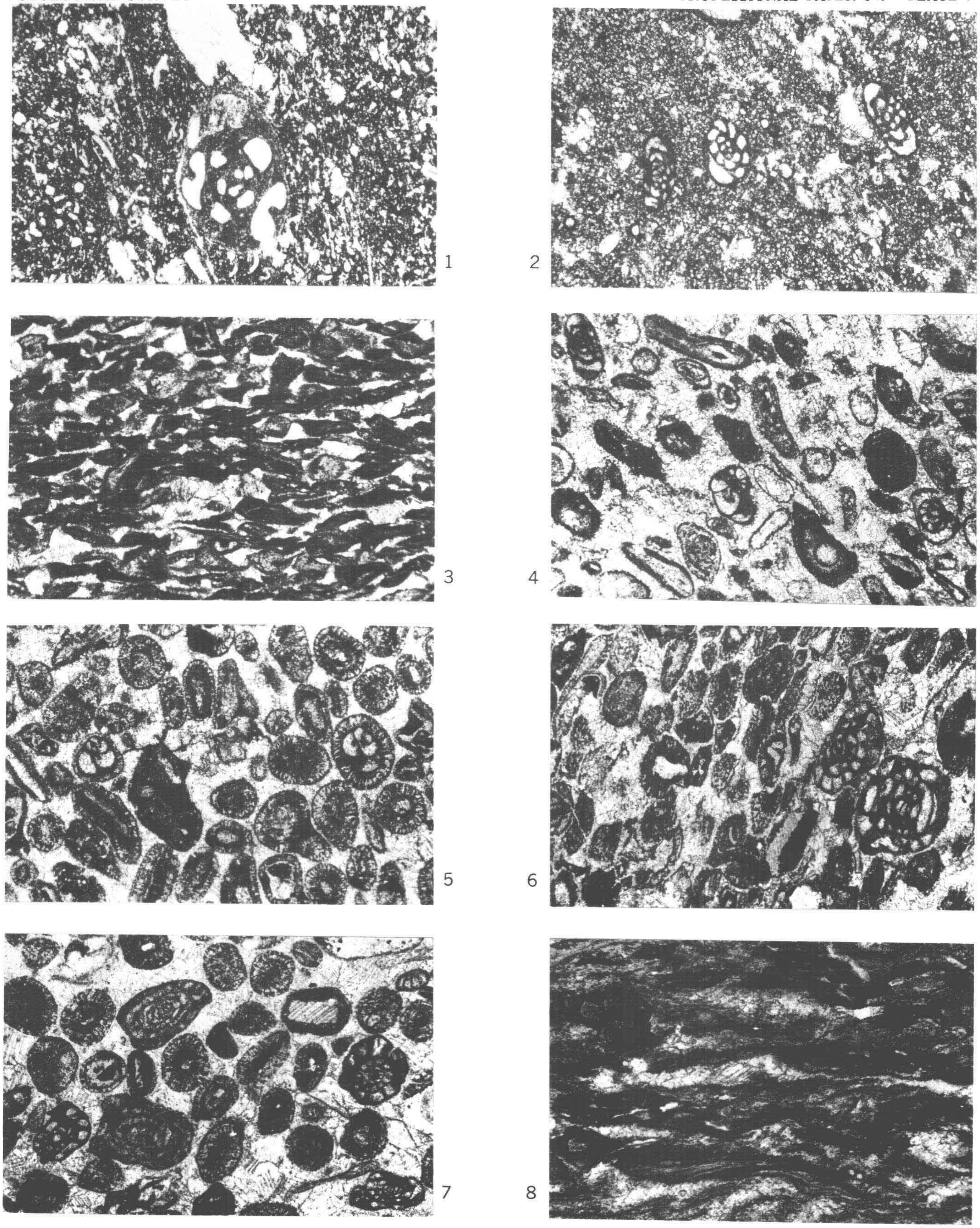
7. USNM 179997, 35 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.

Well-sorted, coarse-grained, proto-oolitic to oolitic grainstone. Mud filled *Eoschubertella* sp., *Pseudostaffella*? sp., *Pseudoendothyra* sp., and *Eostaffella* sp. are present.

**Echooka River section 60E–1 to 72**

8. USNM 179998, uppermost top of outcrop (× 25) Wahoo Limestone, Zone 21?, Atoka equivalent.

Stressed bryozoan packstone or grainstone? Note the fluid appearance of the bryozoan fronds and the wavy twin lamellae of the sparry calcite "cement."



IKIUKPUK SECTION 68A-1, FRANKLIN MOUNTAINS, AND WEST ECHOOKA RIVER SECTION 60E-1 TO 72

# PLATE 10

**Echooka River section 60E–601 to 690, Philip Smith Mountains**

FIGURE 1. USNM 179999, uppermost part of the outcrop (× 25) Wahoo Limestone, Zone 21?, Atoka equivalent. Highly stressed, echinoderm-bryozoan-lump packstone? or grainstone?

2. USNM 180000, about 580 ft below top of outcrop (× 25) Wahoo Limestone, Zone 21?, Atoka equivalent. Highly stressed, echinoderm grainstone.

3. USNM 180001, 870 ft below top of outcrop (× 25) Alapah Limestone, undetermined Namurian zone. Floating euhedral dolomite rhombs, in chert. Dolomite and chert are believed to be penecontemporaneous with the carbonate diagenesis.

4. USNM 180002, 980 ft below top of outcrop (× 25) Alapah Limestone, undetermined Early Namurian zone. Stressed bryozoan-pelmatozoan packstone? Note wavy twin lamellae and epitaxial overgrowth.

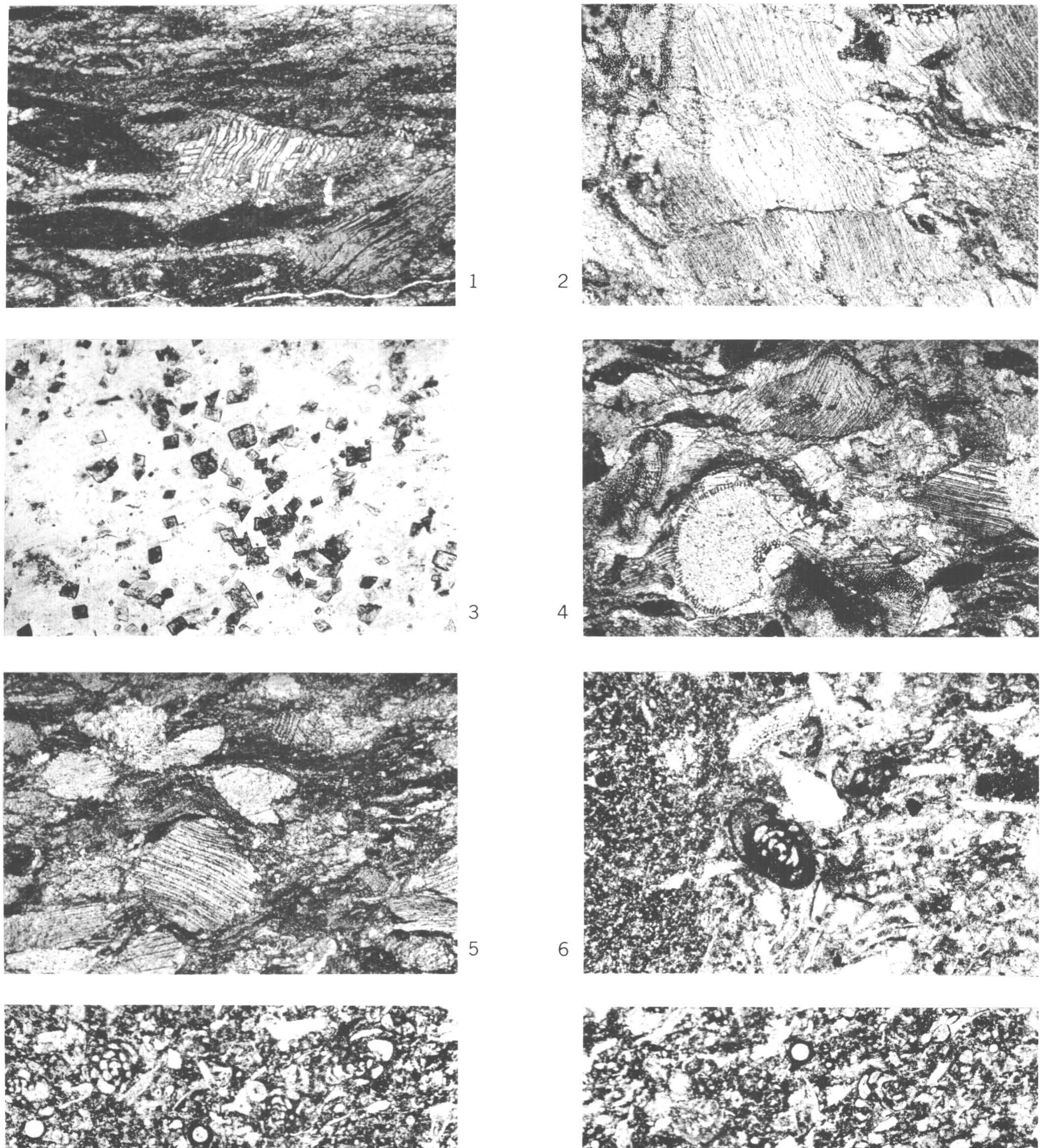
5. USNM 180003, 1,020 ft below top of outcrop (× 25) Alapah Limestone, undetermined Early Namurian zone. Stressed pelmatozoan packstone. Stress deformation appears to be concentrated mainly in the crinoid ossicles and the matrix has a fluid texture.

6. USNM 180004, 2,600 ft below top of outcrop (× 25) Alapah Limestone, Zone 14, Late Viséan, St. Louis equivalent.

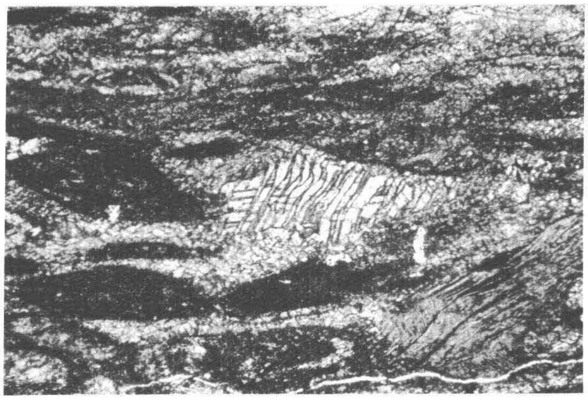
To the left, fine-grained recrystallized lime mudstone. To the right, poorly sorted fossil debris recrystallized packstone. An oblique section of *Eoendothyranopsis* of the group *E. ermakiensis* (Grozdilova in Lebedeva) and *Endothyra* sp. are preesnt.

7, 8. USNM 180005, 2,608 ft below top of section (× 25) Alapah Limestone, Zone 14, Late Viséan, St. Louis equivalent.

A calcisphere-rich, poorly sorted, medium-grained, bioclastic packstone. Pelmatozoans are ubiquitous; ostracods, bryozoans, brachiopods are present. Foraminifera are restricted to *Eoendothyranopsis* sp. and *Globoendothyra* sp. Note the excellent preservation of the *Calcisphaera pachysphaerica* (Pronina) wall where the pores are visible.




ECHOOKA RIVER SECTION 60E-601 TO 690, PHILIP SMITH MOUNTAINS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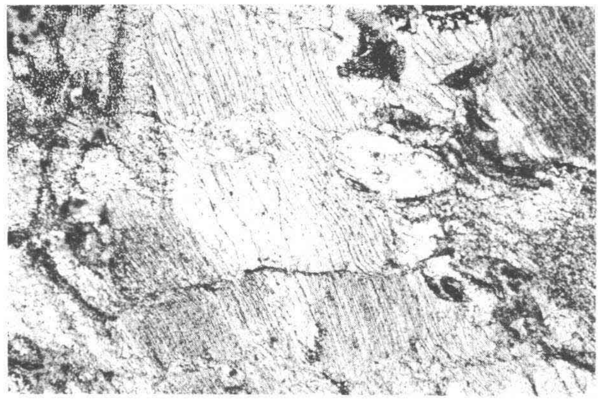
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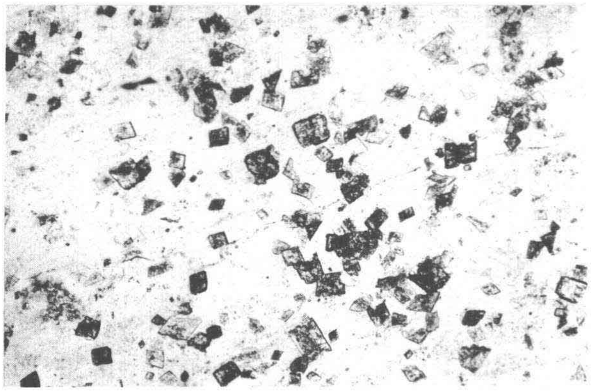
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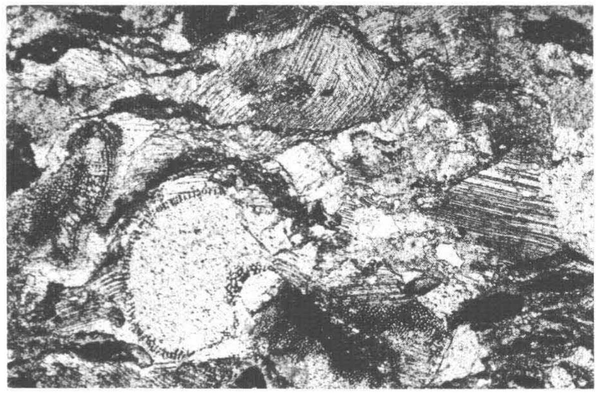
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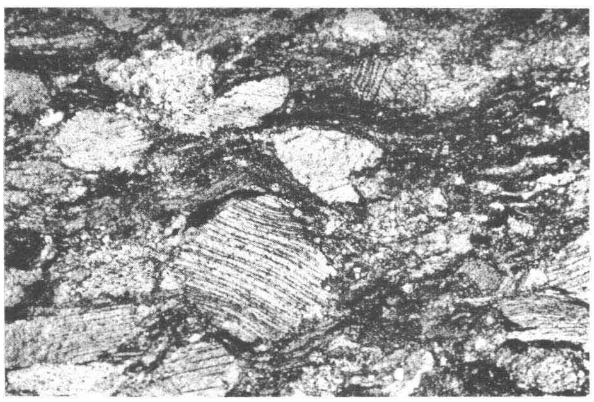
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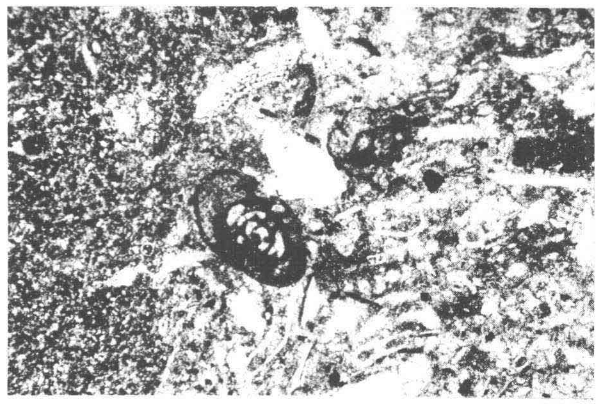
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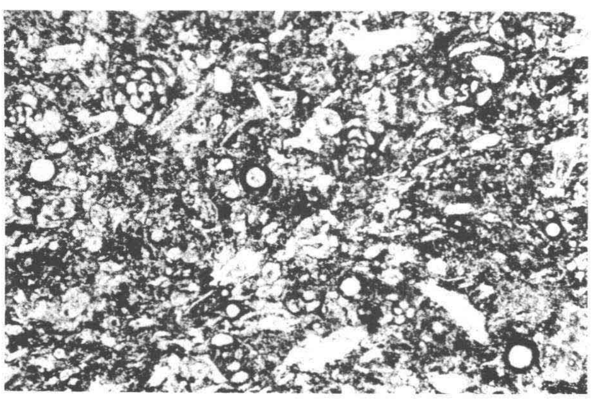
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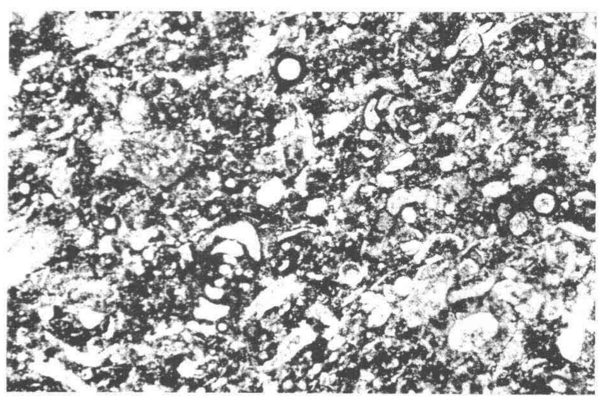
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ECHOOKA RIVER SECTION 60E-601 TO 690, PHILIP SMITH MOUNTAINS

## PLATE 11

**Itkillik Lake section 60C–1 to 72, Endicott Mountains**

FIGURES 1, 2. USNM 180006, 3,257 ft below top of section (× 25) Wachsmuth Limestone, Zone 8?, Late Tournaisian, Osage equivalent.

Poorly sorted, medium-grained, pelmatozoan-bryozoan recrystallized packstone. The former mud matrix is clearly visible in the clouded sparry calcite. Authigenetic quartz is present. Abundant *Septatournayella pseudocamerata* Lipina *in* Lebedeva constitute the bulk of the microfossils. An oblique section of *Earlandia* sp. is also visible.

3–6. USNM 180007, about 3,100 ft below top of section (× 25) Wachsmuth Limestone, Zone 9, latest Tournaisian, Osage equivalent.

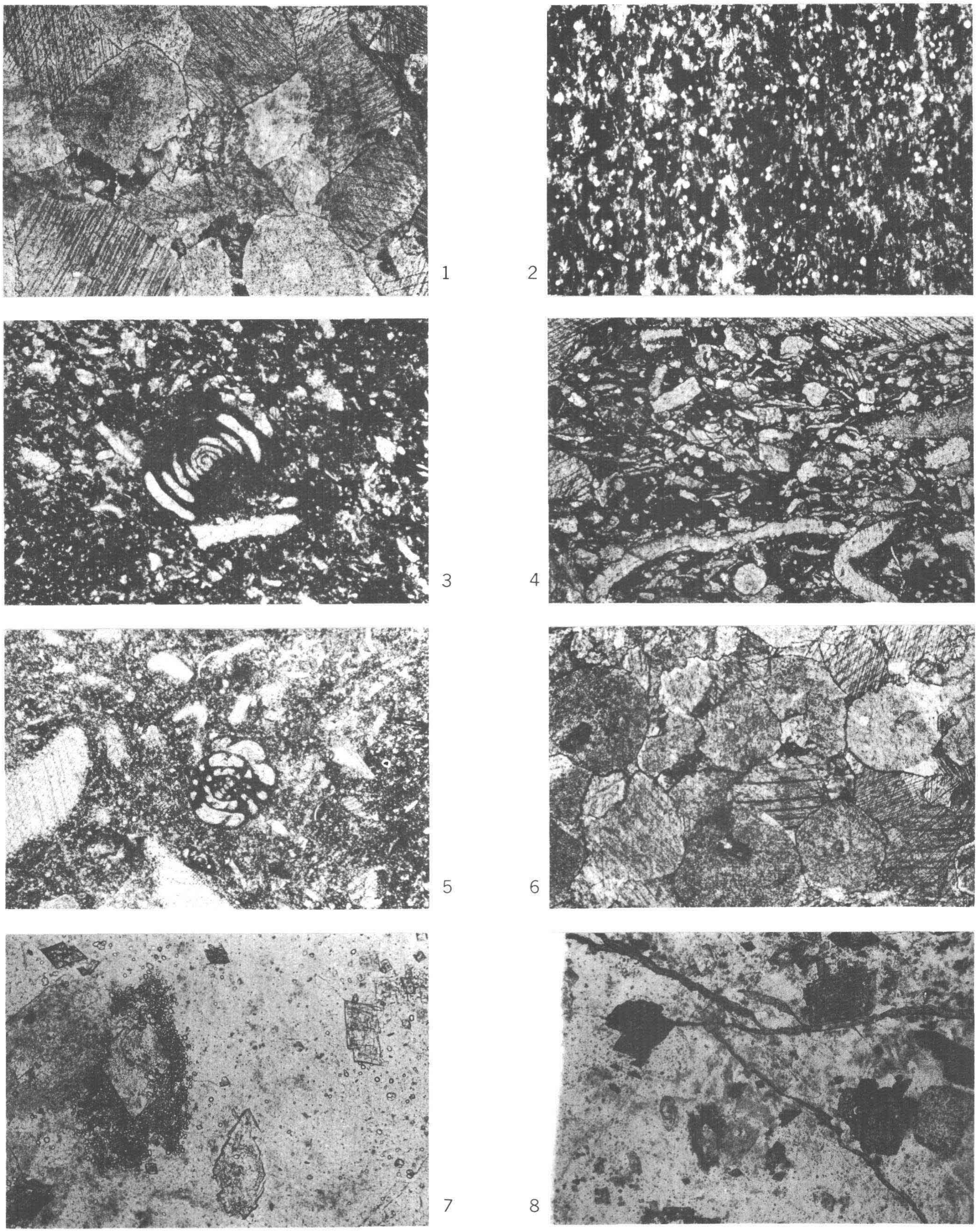
Poorly sorted, medium-grained, pelmatozoan-foraminiferal packstone or grainstone. The complete epitaxial overgrowth on the crinoidal ossicles does not permit the determination of the original pore filling (if any?) which may have been lime mud or sparry calcite. Microfauna is characterized by abundant tournayellids among which are recognized *Septatournayella pseudocamerata* Lipina in Lebedeva, *Tournayella discoidea* Dain, *Latiendothyra* sp., and *Carbonella* sp.

7. USNM 180008, 2,930 ft below top of section (× 25) Wachsmuth Limestone, Zone 9, latest Tournaisian, Osage equivalent.

Sponge spiculite.

8. USNM 180009, 2,860 ft below top of section (× 25) Wachsmuth Limestone, Zone 9, latest Tournaisian, Osage equivalent.

Poorly sorted, medium-grained, pelmatozoan foraminiferal packstone or grainstone? Same remarks as in figures 3 to 6. *Tournayella discoidea* Dain and an oblique section of *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova) are present.




ITKILLIK LAKE SECTION 60C-1 TO 72, ENDICOTT MOUNTAINS

## PLATE 13

**Itkillik Lake section 60C–1 to 72, Endicott Mountains**

FIGURE 1. USNM 180017, 1,339 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

Dolomitized brachiopod wackestone.

2. USNM 180018, 1,175 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Poorly sorted, medium-grained pelmatozoan-bryozoan recrystallized wackestone. Note extensive recrystallization of the matrix, but the freshness of the *Earlandia vulgaris* (Rauzer-Chernoussova and Reitlinger) wall.

3. USNM 180019, 1,130 ft below top of section (× 30) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Medium-sorted, medium-grained, pelmatozoan-brachiopod recrystallized wackestone. Foraminifera include an oblique section of *Endothyra* of the group *E. bowmani* Phillips emend. Brady and the attached *incertae sedis Eotuberitina* sp. A small *Calcisphaera* of the group *C. laevis* Williamson is also present.

4. USNM 180020, 1,060 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Well-sorted, coarse-grained, pelmatozoan-bryozoan foraminiferal grainstone. Epitaxial overgrowth on the fragments appear to have no micritic ghosts and the original rock was probably devoid of mud matrix. *Endothyra* of the group *E. bowmani* Phillips *in* Brown emend. Brady and an axial section of *Eoforschia* sp. are present.

5, 6. USNM 180020, 1,060 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

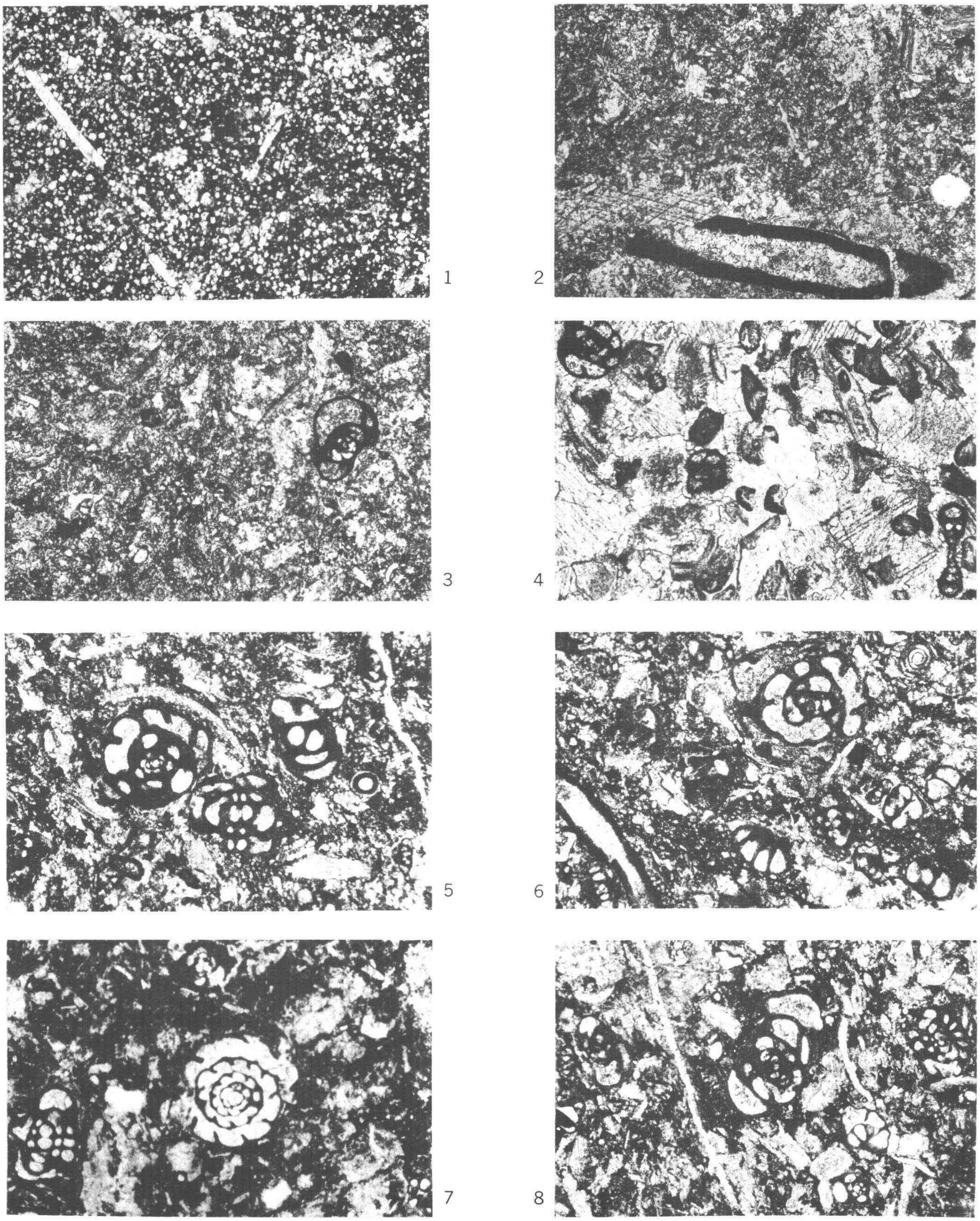
Poorly sorted, medium- to coarse-grained pelmatozoan-bryozoan-brachiopod–foraminifer packstone. Incipient recrystallization of the mud matrix. Rare dolomite rhombs. present. Foraminifera are numerous *Globoendothyra* of the group *G. tomiliensis* (Grozdilova *in* Lebedeva), *Earlandia* of the group *E. vulgaris* (Rauzer-Chernoussova and Reitlinger), *Eoendothyranopsis* sp., *Earlandia* sp., and an immature *Eoforschia* sp.

7. USNM 180021, 1,057 ft below top of section (× 30) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Poorly sorted, medium to coarse, pelmatozoan-bryozoan-foraminifer packstone. An equatorial section of *Eoendothyranopsis* of the group *E. rara* (Grozdilova in Lebedeva), (the "*Endothyra symmetrica*" of Zeller), an oblique view of *Eoendothyranopsis* sp., and an undeterminable endothyrid are present.

8. USNM 180022, 1,040 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Poorly sorted, medium to coarse, pelmatozoan-bryozoan-foraminiferal packstone. Note the distortion of the foraminifers and the crushing of their chambers; this phenomenon is due to sedimentary compaction of the dark, euxinic, clayey mud matrix. *Globoendothyra* of the group *G. tomiliensis* (Grozdilova *in* Levedeva), *Eoendothyranopsis* sp., and *Endothyra* sp. are present.




ITKILLIK LAKE SECTION 60C-1 TO 72, ENDICOTT MOUNTAINS

# PLATE 14

**Itkillik Lake section 60C–1 to 72, Endicott Mountains**

FIGURE 1. USNM 180023, 980 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

A well-sorted, coarse-grained, pelmatozoan-foraminiferal recrystallized packstone. Some sparry calcite cement is present; bryozoans are scarce. Foraminifers are mud filled, indicating extensive reworking (not transportation!). Note the presence of a thin, clear, pseudofibrous layer, coating the *Globoendothyra* sp. (upper right). This layer was formed previous to the mud filling. It should not be confused with a diaphanotheca. An equatorial section of *Endothyranopsis compressa* (Rauzer-Chernoussova and Reitlinger), *Globoendothyra* sp., *Globoendothyra* of the group *G. tomiliensis* (Grozdılova in Lebedeva), *Endothyra* sp., and *Eoendothyranopsis* sp., are observed.

2. USNM 180024, 970 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Very coarse dolomite. Dolomite pseudomorphs after pelmatozoan ossicles. The original rock is believed to be similar to plate 12, figures 1 and 6.

3. USNM 180025, 926 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Colloform chert. Original rock was probably a pelmatozoan-bryozoan grainstone. Note the difference between the gray carbonate replacement chert and the clear void-filling chert cement.

4. USNM 180026, 825 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Poorly sorted, pelmatozoan-foraminiferal packstone. Matrix is partly dolomitized and recrystallized. Calcispheres are abundant. Foraminifera include *Eoendothyranopsis* sp., *Globoendothyra* sp., and *Parathurammina* sp.

5. USNM 180027, 857 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Well-sorted, coarse-grained, lump pelmatozoan-algal-foraminiferal grainstone. Ostracods, foraminifers, and algae are mud filled. The matrix was protected from recrystallization. Microflora include *Stacheoides* sp., *Epistacheoides* sp., and *Stacheia*? sp. Foraminifers are *Eoendothyranopsis* and *Earlandia* of the group *E. vulgaris* (Rauzer-Chernoussova and Reitlinger).

6. USNM 180028, about 855 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

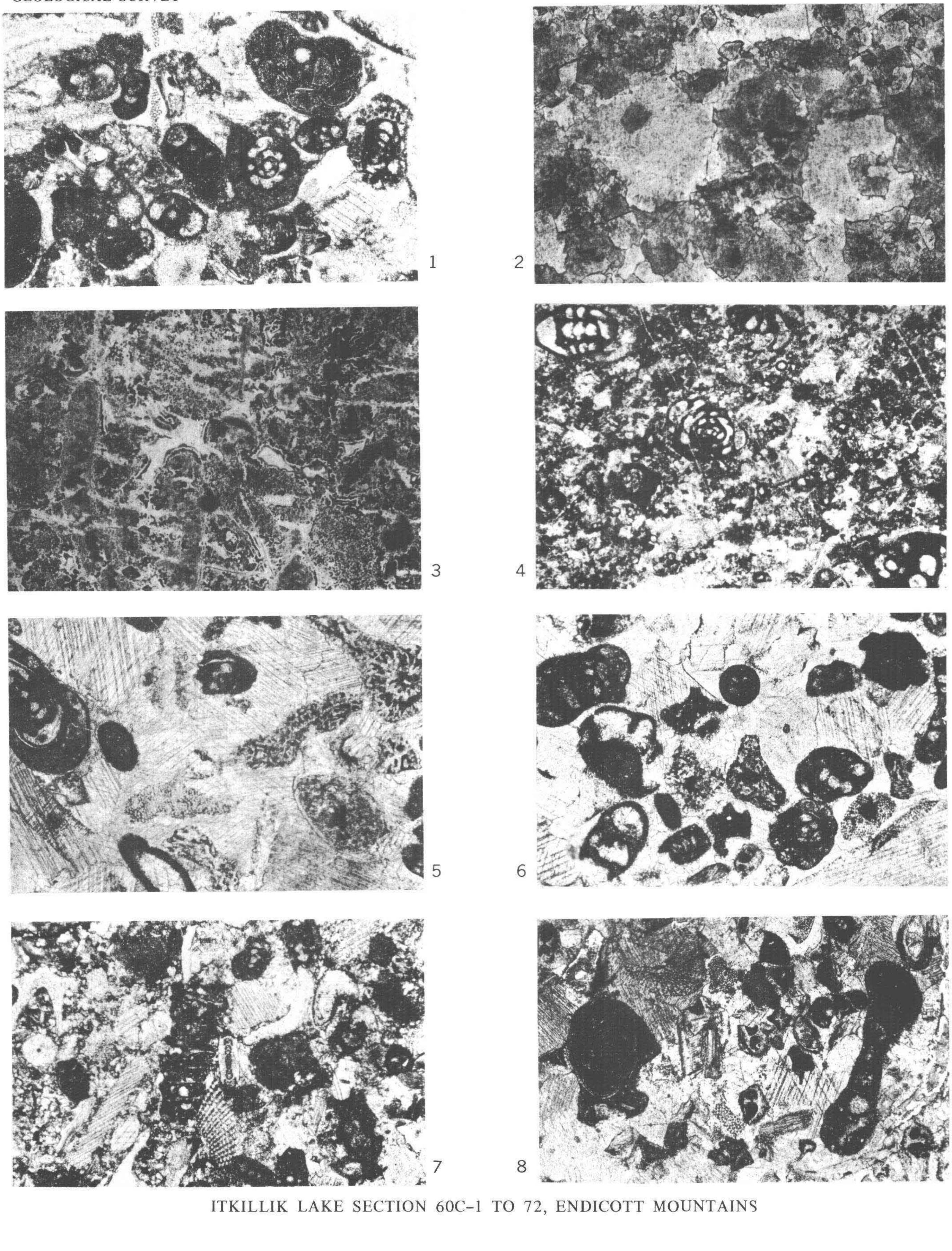
Well-sorted, coarse-grained, bryozoan-pelmatozoan-algal-foraminiferal grainstone. All microfloral (Stacheiinae) and foraminiferal elements (*Globoendothyra* sp., *Earlandia* sp., and *Eoforschia* sp.) are mud filled.

7. USNM 180029, about 840 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Medium-sorted, medium-grained, pelmatozoan-brachiopod-foraminiferal recrystallized packstone. Slight dolomitization. Most of the lumps are mud-filled foraminifers (*Globoendothyra* sp. and *Eoendothyranopsis* sp.). A dasyclad (*Koninckopora tenuiramosa* Wood) algae is also mud filled. *Propermodiscus* sp. is conspicuous in the center.

8. USNM 180029, about 840 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Medium-sorted, coarse-grained, pelmatozoan-bryozoan-foraminiferal recrystallized packstone. Some epitaxial cement is also present. Silicified brachiopod fragment in lower right, and gastropod in center right. Note the clear pseudofibrous rim in the mud-filled *Globoendothyra* sp. An axial section of *Eoforschia* sp. is also conspicuous.




ITKILLIK LAKE SECTION 60C-1 TO 72, ENDICOTT MOUNTAINS

## PLATE 15

**Itkillik Lake section 60C–1 to 72, Endicott Mountains**

FIGURE 1–4. USNM 180030, 785 ft below top of section (× 25) Alapah Limestone, Zone 14?, Late Viséan, St. Louis equivalent?

Figure 1, crossed nicols; figure 2, plane polarized light; figure 3, plane polarized light; figure 4, crossed nicols. Floating, clear, euhedral dolomite rhombs in large twinned lamellar calcite.

5. USNM 180031, 755 ft below top of section (× 25) Alapah Limestone, Zone 14?, Late Viséan, St. Louis(?) equivalent.

Chertified spiculite wackestone with floating dolomite rhombs.

6. USNM 180032, 460 ft below top of section (× 25) Alapah Limestone, Zone 15?, Late Viséan, Ste. Genevieve(?) equivalent.

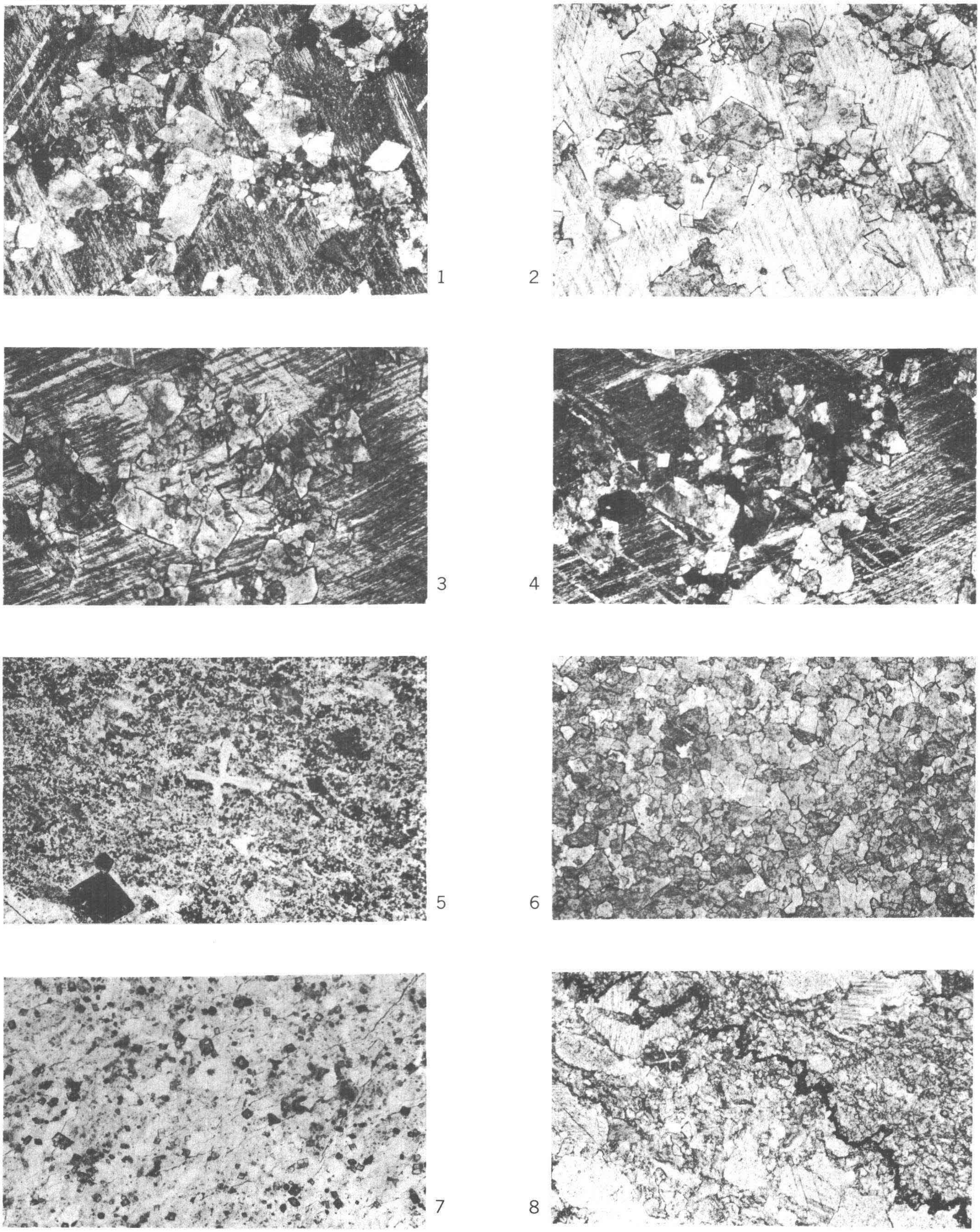
Dolomite interlocking crystals.

7. USNM 180033, 425 ft below top of section (× 25) Alapah Limestone, Zone, 15?, Late Viséan, Ste. Genevieve(?) equivalent.

Chertified, fairly sorted, medium-grained pelmatozoan packstone. Crinoid ossicles are still clearly visible. Small euhedral dolomite rhombs.

8. USNM 180034, 410 ft below top of section (× 25) Alapah Limestone, Zone 16, Late Viséan, lower Chester equivalent.

Poorly sorted, medium- to coarse-grained, pelmatozoan-bryozoan packstone. Note the fine bryozoan hash, the stylolitic band, and the stylolitic outline of the interpenetrating debris.




ITKILLIK LAKE SECTION 60C-1 TO 72, ENDICOTT MOUNTAINS

# PLATE 16

**Shainin Lake sections W–77 to 134, and W–235 to 247, Endicott Mountains**

FIGURES 1–3. USNM 180035, 2,241 ft below top of section (× 30) Wachsmuth Limestone, Zone 9, Late Tournasian, Osage equivalent.

Poorly sorted, medium- to coarse-grained, pelmatozoan-foraminiferal packstone-grainstone. Most of the clear calcite is recrystallization of the mud matrix. Coarse calcite cement is also present in the lower part of figure 2. Bryozoans are scarce. Foraminifera are abundant *Septatournayella pseudocamerata* Lipina *in* Lebedeva, *Latiendothyra* sp., and *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova).

4. USNM 180036, 2,230 ft below top of section (× 30) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.

Poorly sorted, coarse-grained, pelmatozoan-bryozoan-foraminiferal recrystallized packstone. Although the mud matrix is completely recrystallized, the wall of the tournayellid *Septatournayella* is perfectly preserved, indicating that recrystallization was penecontemporaneous with lithification.

5. Univ. Montreal 64/26, approximately 2,100 ft below top of section (× 25) Wachsmuth Limestone, Zones 10 and 11, Early Viséan, Salem equivalent or older.

Poorly sorted, coarse-grained, pelmatozoan-bryozoan-packstone. Matrix is recrystallized. An *Eoforschia* sp. is conspicuous.

6. USNM 180037, approximately 2,100 ft below top of section (× 25) Wachsmuth Limestone, Zones 10 and 11, Early Viséan, Salem equivalent or older.

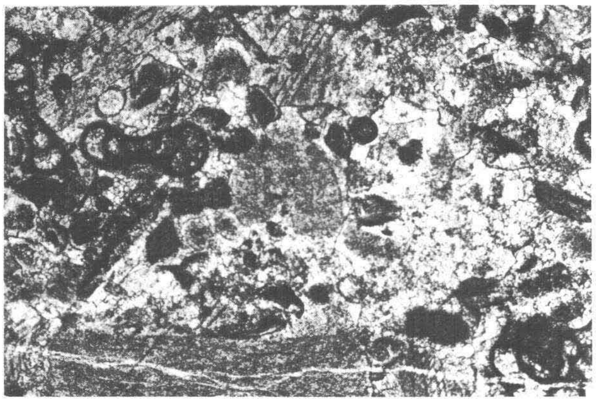
Dolomite, coarse-grained, interlocking crystals. Probably formed from a pelmatozoan packstone or grainstone.

7. USNM 180038, 1,883 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

Mostly in situ pelmatozoan-algal grainstone. Silicification and ferruginous coating of the *Stacheia*? *skimoensis* Mamet and Rudloff wall resulted in excellent preservation of the cell's morphology. (See also pl. 37, fig. 9.)

8. USNM 180039, 1,280 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

A coarse-grained, in situ pelmatozoan-bryozoan grainstone. Epitaxial rim cement of the crinoid fragments is well developed.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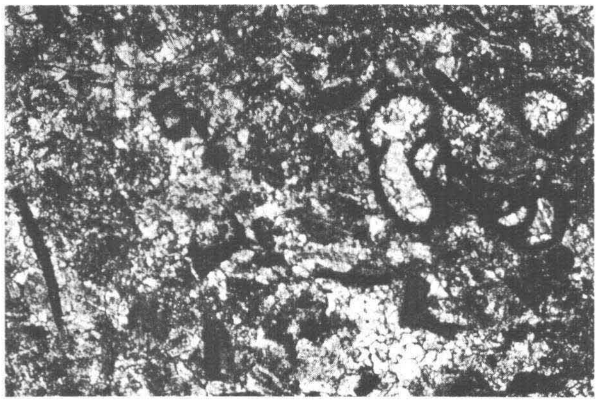
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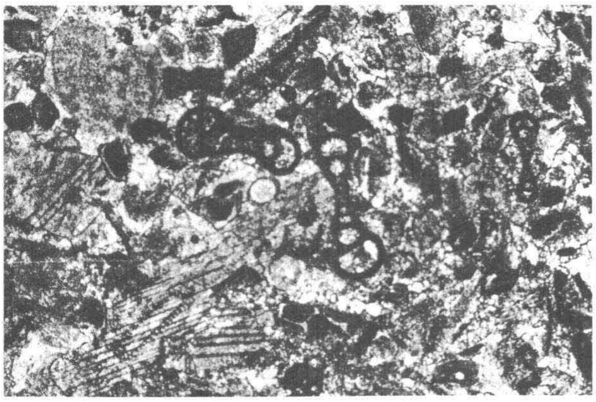
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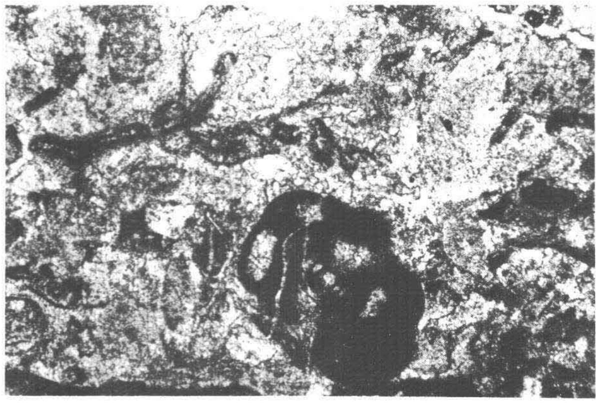
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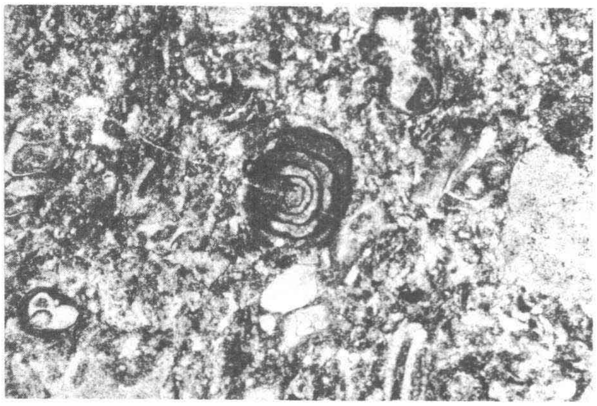
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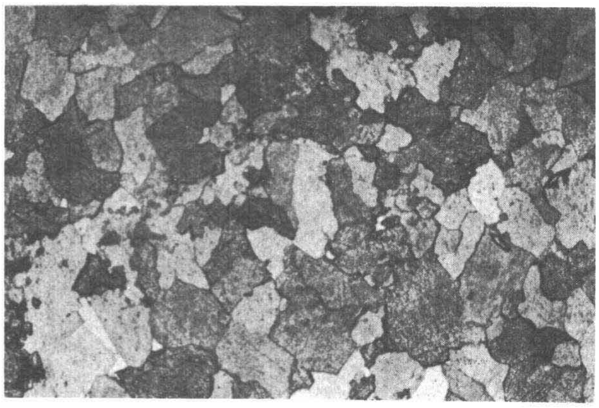
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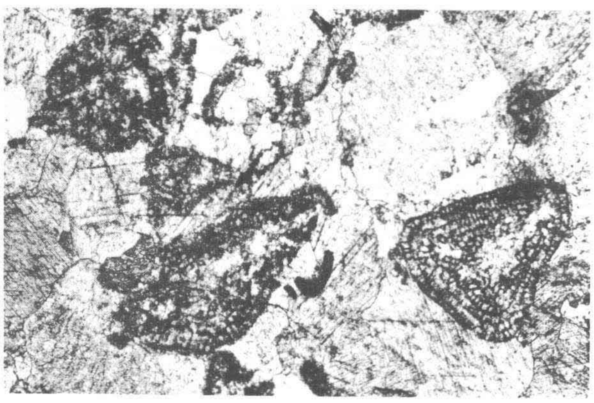
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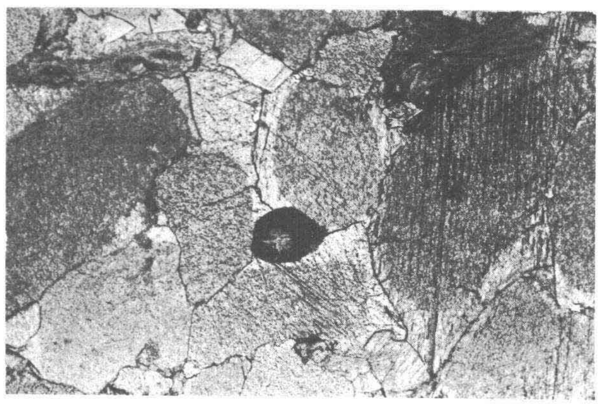
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SHAININ LAKE SECTIONS W-77 TO 134 AND W-235 TO 247, ENDICOTT MOUNTAINS

## PLATE 17

**Shainin Lake sections W–77 to 134, W–235 to 247, Endicott Mountains**

FIGURE 1. USNM 180040, 1,225 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

Coarse-grained, in situ, pelmatozoan packstone-grainstone. Large euhedral dolomite rhombs are present. Bryozoans present. Note cloudy inclusion in the dolomite rhombs when they have developed in lime mud matrix.

2. Univ. Montréal 204/30, about 1,290 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

Poorly sorted, medium-grained, pelmatozoan-bryozoan, slightly recrystallized wackestone. Some mud lumps are present. Also seen are *Earlandia* sp. and *Endothyra* sp.

3–5. USNM 180041, 850 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

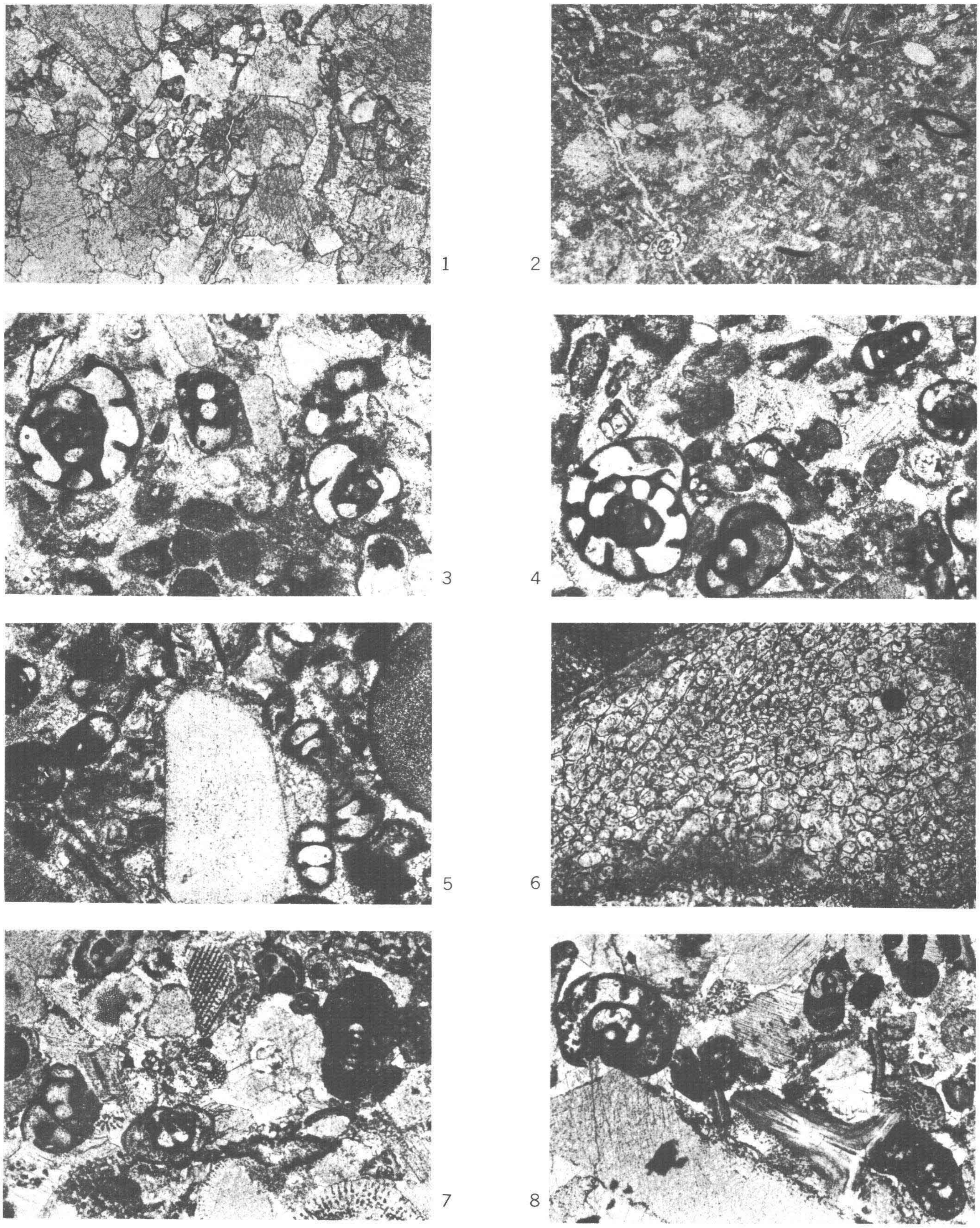
Medium-sorted, coarse-grained, foraminiferal-lump bryozoan-pelmatozoan packstone-grainstone. Recrystallized matrix and cement are both present. All elements have been abraded and rounded, but not coated. Note the very uncommon chertified mud filling of the foraminifers. The upper left *Globoendothyra* in figure 3 clearly shows mechanical truncation of the internal chert void filling in its chambers. This truncation indicates extensive reworking and penecontemporaneous nature of the chertification process. Foraminifera are *Globoendothyra* of the group *G. tomiliensis* (Grozdilova in Lebedeva), *G. paula* (*Vissarionova*), *Eoendothyranopsis* sp., *Endothyranopsis compressa* (Rauzer-Chernoussova and Reitlinger), and *Eoforschia* of the group *E. moelleri* (Dain).

6. USNM 180042, 851 ft below top of section (× 119) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Microstructure of a silicified pelmatozoan fragment. Chertification preserves the original framework. Pelmatozoan plates are in optical continuity; this characteristic is not due to the growth of one single crystal but by epitaxial filling of voids within a calcite framework. Weathering of this filling gives the well-known "pitted appearance" of the crinoid ossicles, but the calcite framework is usually destroyed. In this exceptional case, penecontemporaneous silicification has preserved the original structure.

7, 8. USNM 180043, 730 ft below top of section, (× 25) Alapah Limestone, top of Zone 13, Middle Viséan, St. Louis equivalent.

Poorly sorted, coarse-grained, pelmatozoan-foraminiferal recrystallized packstone-grainstone. Recrystallized lime mud matrix and sparry cement are present. Fragments of bryozoans and brachiopods are present. *Endothyranopsis* sp., *Eoendothyranopsis* of the group *E. ermakiensis* (Grozdilova *in* Lebedeva), *Globoendothyra* sp., *Paracaligelloides*? sp., and *Stacheoides tenuis* Petryk and Mamet are present.




SHAININ LAKE SECTIONS W-77 TO 134 AND W-235 TO 247, ENDICOTT MOUNTAINS

## PLATE 18

**Shainin Lake sections W–77 to 134, W–235 to 247, Endicott Mountains**

FIGURES 1–5. USNM 180044, 730 ft below top of section (× 25) Alapah Limestone, top of Zone 13, Middle Viséan, St. Louis equivalent.

Poorly sorted, coarse-grained, pelmatozoan-bryozoan foraminiferal pelletoid grainstone. Recrystallized mud matrix and cement present. Gastropods and brachiopods are present; foraminifers and algae are mud filled. Algae are represented by the dasyclad *Koninckopora inflata* de Koninck and by *Epistacheoides* sp. Foraminifera are *Globoendothyra* of the group *G. tomiliensis* (Grozdilova in Lebedeva), *G. paula* (Vissarionova) *Eoforschia* sp., *Eoendothyranopsis* of the group *E. ermakiensis* (Grozdilova *in* Lebedeva), *Eoendothyranopsis* of the group *E. rara* (Grozdilova *in* Lebedeva).

6. USNM 180045, 790 ft below top of section (× 25) Alapah Limestone, top of Zone 13, Middle Viséan, St. Louis equivalent.

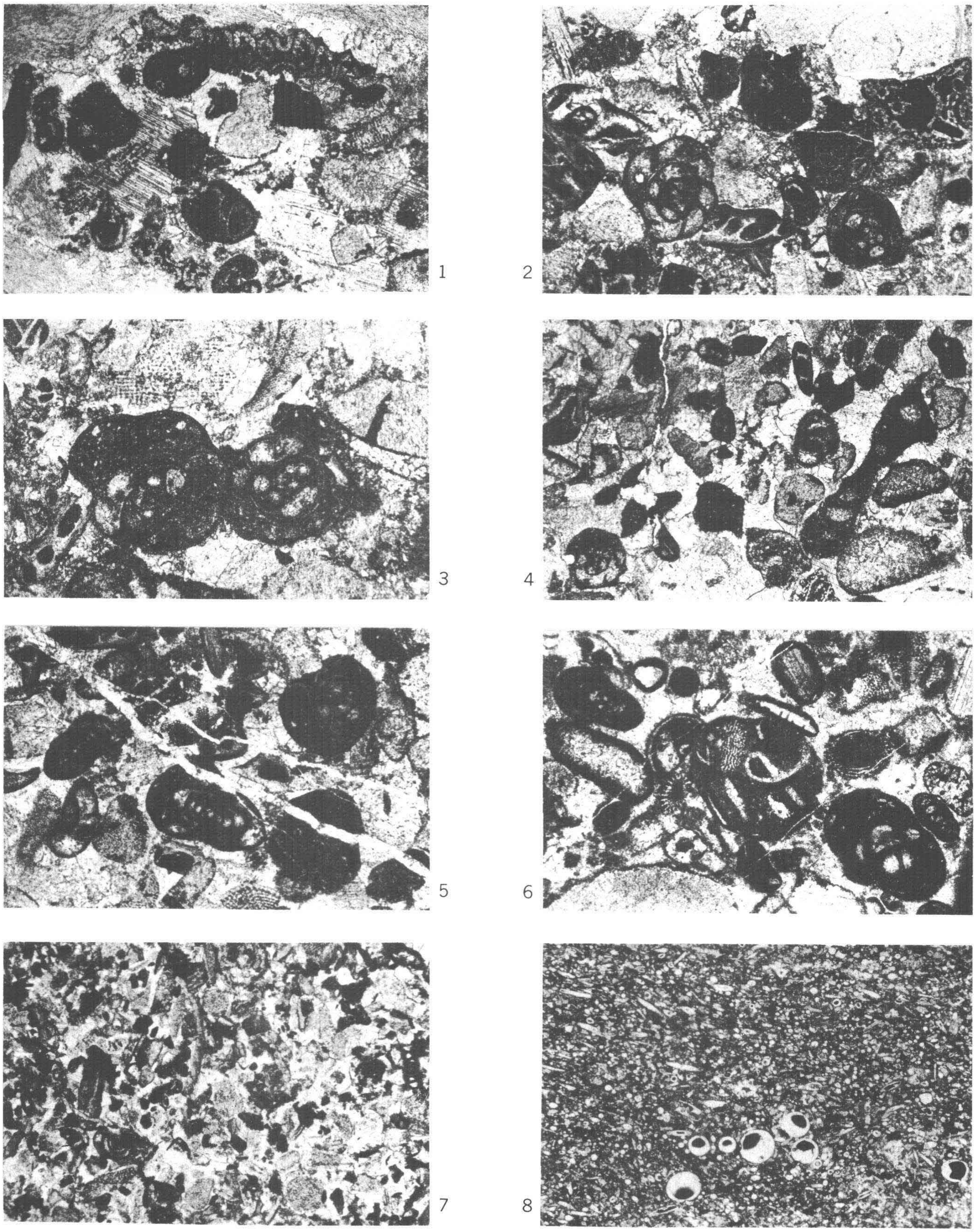
Poorly sorted, coarse-grained, bryozoan-pelmatozoan-foraminiferal recrystallized packstone. Algal coatings. Bryozoans are present. Mud-filled foraminifers are *Eoendothyranopsis* sp. and *Globoendothyra* sp.

7. Univ. Montréal 24/35, 350 ft below top of section (× 25) Alapah Limestone, Zone 14, Late Viséan, St. Louis equivalent.

Medium-sorted, medium-grained, pelmatozoan-pelletoidal recrystallized packstone. Brachiopods and ostracods are present. Numerous *Brunsia* sp. are conspicuous (this assemblage is characteristic of the "*Brunsia* facies").

8. USNM 180046, 10 ft below top of section (× 25) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.

Sponge-spiculite packstone. Undetermined spherical taxa filled with chert and phosphate.



SHAININ LAKE SECTIONS W-77 TO 134 AND W-235 TO 247, ENDICOTT MOUNTAINS

## PLATE 19

### Anivik Lake section W–1 to 42, Endicott Mountains

FIGURES 1–3. USNM 180047, 710 ft below top of section (× 25) Wachsmuth or Alapah Limestone, Zone 12/13 boundary. Middle Viséan, Salem-St. Louis boundary equivalent.

Poorly sorted, medium- to coarse-grained, pelmatozoan-foraminiferal recrystallized packstone. Ostracods, hard pellets, brachiopods, and algae are also present. Calcispherids [*Calcisphaera laevis* Williams and *Calcisphaera pachysphaerica* (Pronina)] abound. Foraminifera are *Globoendothyra* sp., *Dainella* sp., *Dainella anivikensis* n. sp. Mamet, *Eoendothyranopsis* of the group *E. spiroides* (Zeller), *Eoendothyranopsis hinduensis* (Skipp), and *Parathurammina* sp.

4. USNM 180048, 595 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Coarse-grained, medium-sorted, pelmatozoan-foraminiferal recrystallized packstone or grainstone. Some ostracods present. Foraminifera are *Earlandia* of the group *E. clavatula* (Howchin), *Endothyra* sp., and *Dainella anivihensis* n. sp. Mamet.

5. USNM 180049, 80 ft below top of section (× 25) Alapah Limestone, undetermined late Viséan zone, undetermined upper Meramec.

Dolomite, coarse-grained, interlocking crystals on a former pelmatozoan packstone or grainstone.

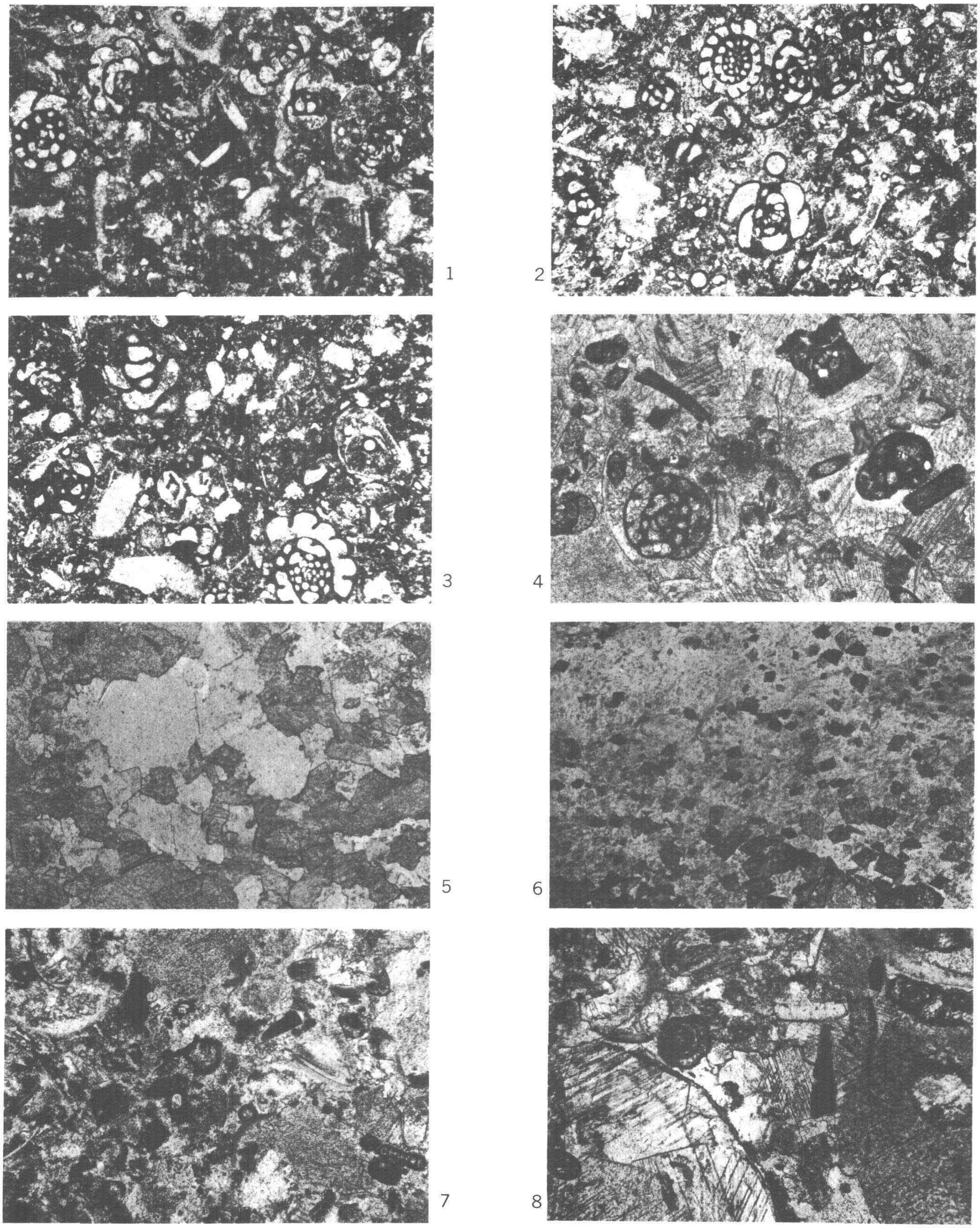
6. USNM 18050, top of the section (× 25) Alapah Limestone, undetermined late Viséan zone, undetermined upper Meramec equivalent.

Dolomitized chert. Euhedral dolomite rhombs. Original texture of the rock is completely obliterated.

### Skimo Creek section W–138 to 200, Endicott Mountains

7, 8. Univ. Montréal 205/2 and 205/21, 3,130 ft below top of section (× 30) Wachsmuth interfingering in Kayak Shale, Zone 8?, Late Tournaisian?, middle Osage equivalent? or older?

Poorly sorted, coarse-grained, pelmatozoan-ostracod-brachiopod recrystallized packstone. Angular mud lumps are present. Foraminifera include an uncoiled *Rectoseptaglomospiranella* sp., two sections of *Tournayella*, *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova), *Earlandia* of the group *E. clavatula* (Howchin), and *Parathurammina* sp.



ANIVIK LAKE SECTION W-1 TO 42, ENDICOTT MOUNTAINS,
AND SKIMO CREEK SECTION W-138 TO 200, ENDICOTT MOUNTAINS

## PLATE 20

**Skimo Creek section W–138 to 200, Endicott Mountains**

FIGURES 1, 2. Univ. Montréal 205/26 and 205/28, 3,100–3,080 ft below top of section (× 25) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.

Poorly sorted, coarse-grained, pelmatozoan foraminiferal recrystallized packstone. The lime mud matrix appears to be extensively recrystallized while the foraminiferal walls are intact. Foraminifera include *Latiendothyra* sp., *Earlandia* of the group *E. clavatula* (Howchin), and an intermediate form between *Latiendothyra* and *Globoendothyra*.

3. USNM 180051, 2,950 ft below top of section (× 25) Wachsmuth Limestone, Zones 10 and 11 undifferentiated, Early Viséan, Salem equivalent or older.

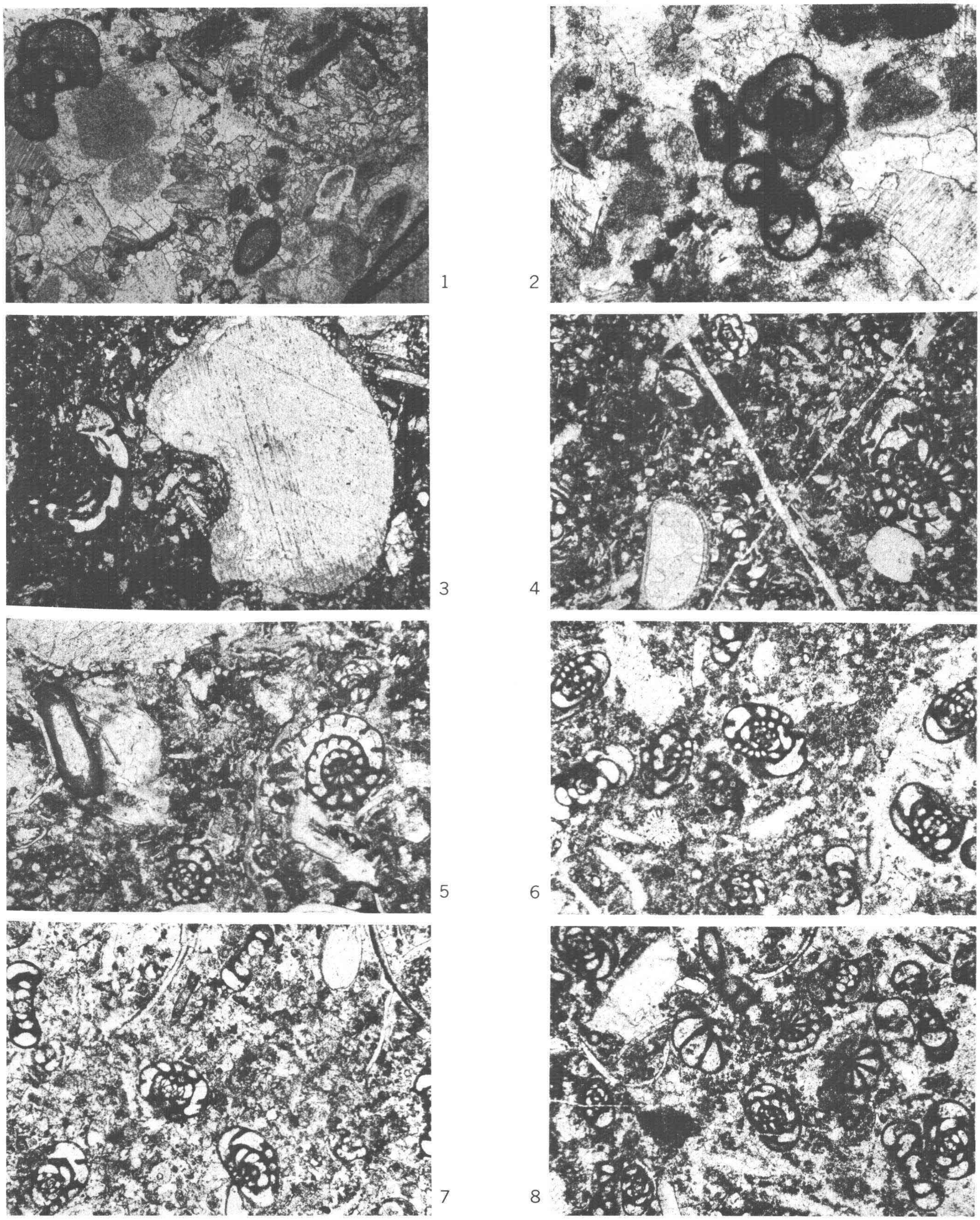
Poorly sorted, pelmatozoan-foraminiferal wackestone. Some chertification is restricted to the pelmatozoan ossicles. A large "*Septatournayella*" *henbesti* Skipp, Holcomb, and Gutschick is present.

4, 5. USNM 180052, 2,570 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

Poorly sorted, pelmatozoan-foraminiferal packstone. Ostracods are present. Foraminifera are *Eoendothyranopsis* of the group *E. spiroides* (Zeller), *Eoendothyranopsis hinduensis* (Skipp), *Earlandia* of the group *E. vulgaris* (Rauzer-Chernoussova and Reitlinger), and an undetermined endothyrid.

6–8. USNM 180053, 2,530 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

Poorly sorted, foraminiferal-pelmatozoan recrystallized packstone. Chonetid brachiopods, ostracods, and echinoid spines are also abundant. Foraminifera include *Eoendothyranopsis* of the group *E. spiroides* (Zeller), *Dainella anivikensis* n. sp. Mamet, *Endothyra* sp., *Planoendothyra rotayi* (Lebedeva), and *Earlandia* sp.




SKIMO CREEK SECTION W-138 TO 200, ENDICOTT MOUNTAINS

# PLATE 21

**Skimo Creek section W–138 to 200, Endicott Mountains**

FIGURES 1–3. Univ. Montréal 206/4, 205/6, and 205/37, 2,300 ft below top of section; figure 1 (× 30); figures 2 and 3 (× 25); Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

Poorly sorted, pelmatozoan-foraminiferal-ostracod packstone-wackestone. Rare brachiopod fragments. Foraminifera include *Eoendothyranopsois* of the group *E. spiroides* (Zeller), *Eoendothyranopsis hinduensis* (Skipp), *Dainella anivikensis* n. sp. Mamet, *Skippella redwallensis* (Skipp *in* McKee and Gutschick), and *Parathurammina* sp.

4. USNM 180054, 2,098 ft below top of section (× 30) Wachsmuth Limestone, boundary of Zones 12 and 13, Middle Viséan, Salem-St. Louis boundary equivalent.

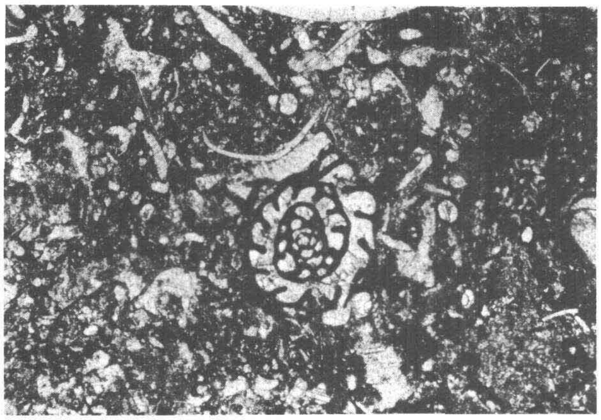
Poorly sorted, pelmatozoan-foraminiferal packstone. *Endothyranella* sp., *Parathurammina* sp., and a high equatorial section of *Globoendothyra* of the group *G. baileyi* (Hall), and an undeterminable endothyrid are present.

5–7. USNM 180055, 2,060 ft below top of section (× 25) Wachsmuth Limestone, boundary of Zones 12 and 13, Middle Viséan, Salem-St. Louis boundary equivalent.

Poorly sorted, coarse-grained, pelmatozoan-brachiopod-foraminiferal recrystallized packstone. Ostracods are present. Foraminifera are *Eoendothyranopsis* of the group *E. rara* (Grozdilova *in* Lebedeva), *E. hinduensis* (Skipp), *Globoendothyra* sp., *Endothyra* sp., *Planoendothyra rotayi* (Lebedeva), and *Parathurammina* sp.

8. USNM 180056, 1,960 ft below top of section (× 25); Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Poorly sorted, pelmatozoan-brachiopod-foraminiferal packstone. Note the crushing of the foraminifers due to compaction of the mud matrix during lithification. Foraminifera are *Skippella redwallensis* (Skipp *in* McKee and Gutschick), *Earlandia* sp., *Globoendothyra* sp., and crushed indeterminable endothyrids.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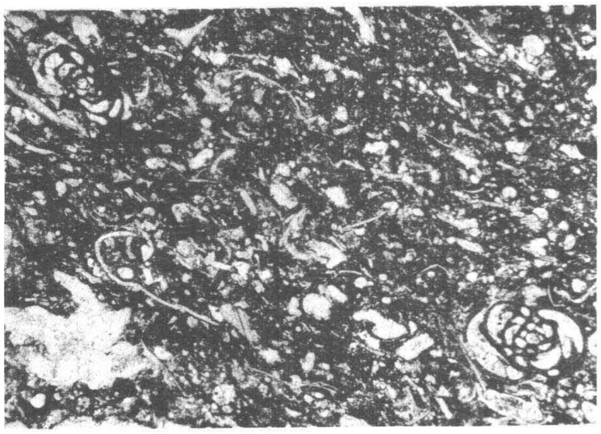
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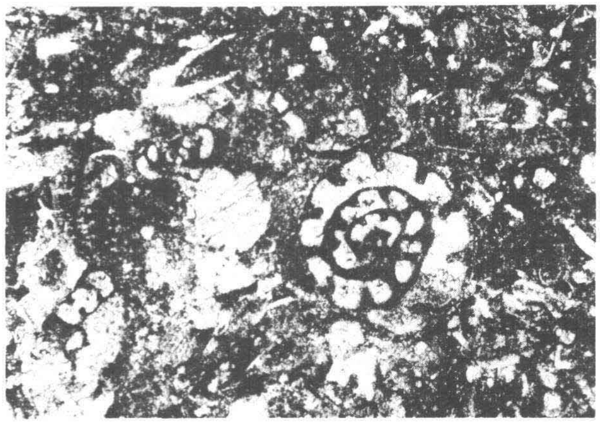
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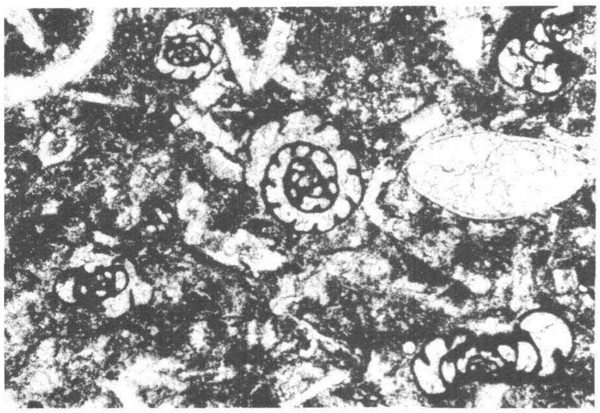
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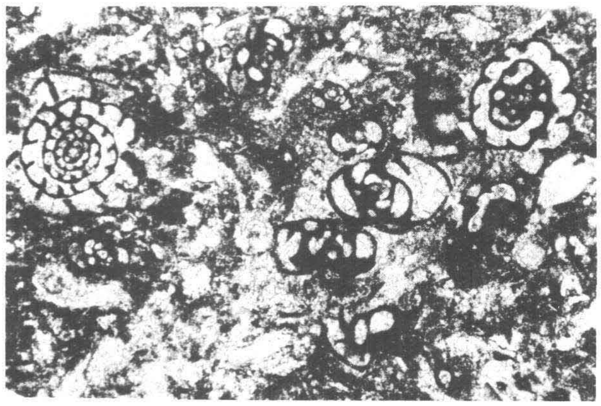
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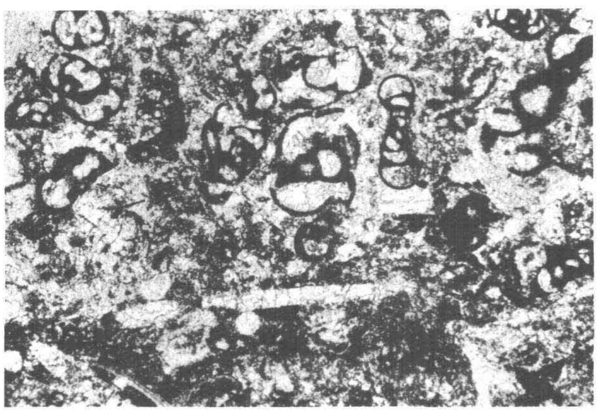
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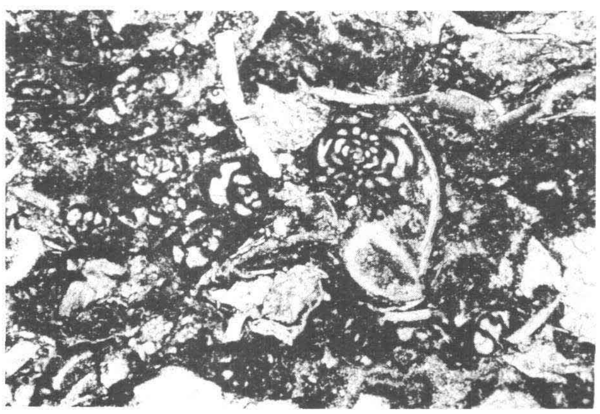
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SKIMO CREEK SECTION W-138 TO 200, ENDICOTT MOUNTAINS

# PLATE 22

**Skimo Creek section W–138 to 200, Endicott Mountains**

FIGURE 1. USNM 180057, 1,940 ft below top of section (× 30) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Coarse-grained, pelmatozoan grainstone with an oblique section of *Eoendothyranopsis* of the group *E. rara* (Grozdilova in Lebedeva).

2. USNM 180058, 1,770 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

Poorly sorted, pelmatozoan-spicule-foraminiferal packstone. Some brachiopod fragments. *Eoendothyranopsis* of the group *E. rara* (Grozdilova in Lebedeva), *E. scitula* (Zeller), and *Globoendothyra* sp. are present.

3. USNM 180059, 1,250 ft below top of section (× 25) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.

Poorly sorted, coarse-grained, pelmatozoan-algal-foraminiferal packstone. Brachiopods and bryozoans are conspicuous. Incipient dolomitization is present. *Globoendothyra* sp., *Endothyra* sp., and *Stacheia*? sp. are conspicuous.

4. Univ. Montréal 205/15, 850 ft below top of section (× 30) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.

Dolomite rhombs in a groundmass of chert.

5. Univ. Montréal 205/18, 710 ft below top of section (× 25) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.

Lime mudstone with mottled dark bands of soft lithoclasts. The matrix is recrystallized.

6. USNM 180060, 125 ft below top of section (× 25) Alapah Limestone, undetermined Namurian zone, undetermined Chester equivalent.

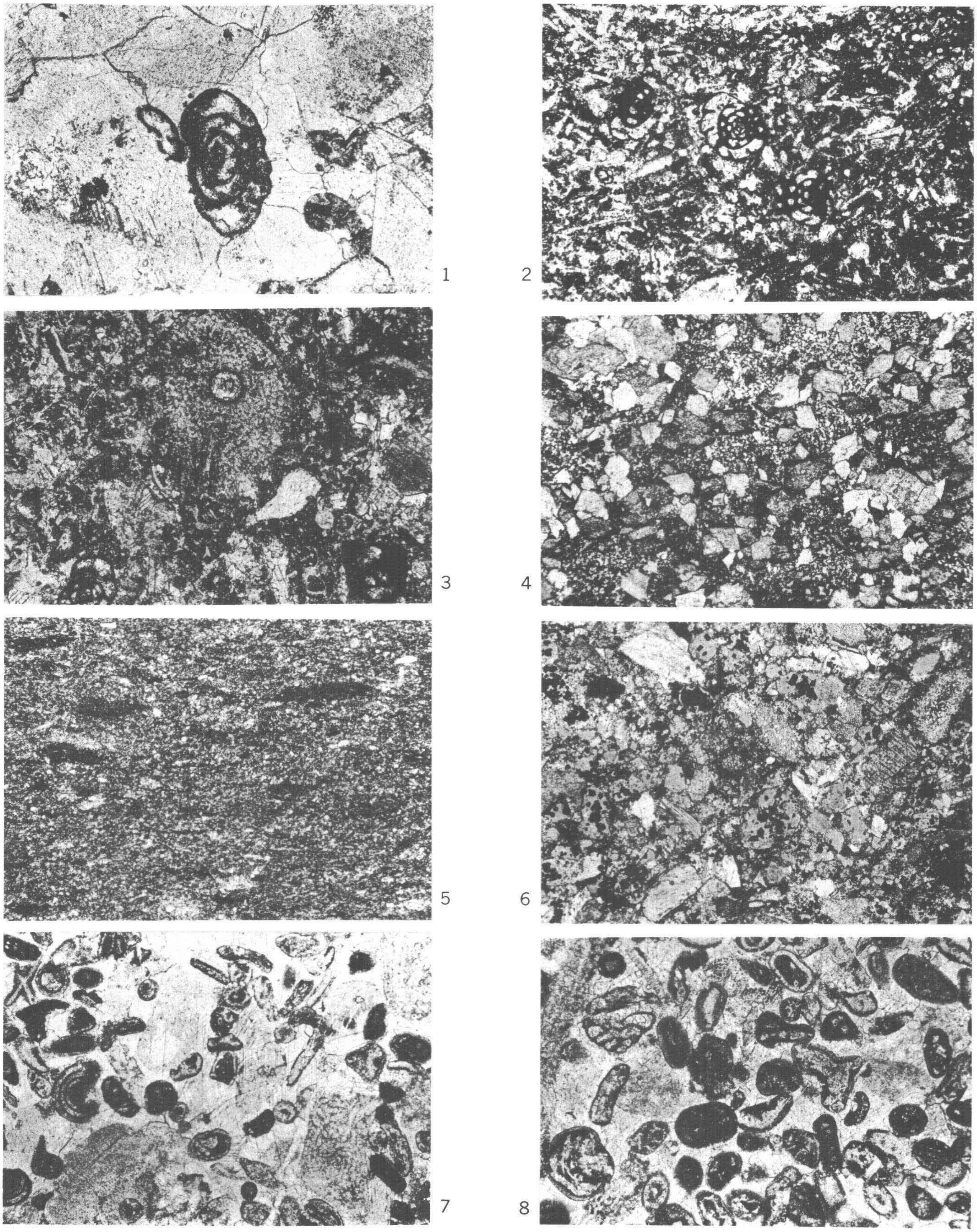
Medium-sorted, medium-grained pelmatozoan glauconitic packstone. Fresh, deep green glauconite represents 25 percent of the debris. A conodont is conspicuous in lower left center.

7. USNM 180061, 1,760 ft below top of outcrop (× 25) Kogruk Formation, Zone 13 or 14 undetermined late Middle or early Late Viséan zone, St. Louis? equivalent.

Poorly sorted, coarse-grained pelmatozoan-algal-proto-oolitic grainstone. Calcispherids are present. Numerous sections of *Brunsia* sp. are present associated with *Stacheia*? sp., and *Priscella* of the group *P. prisca* (Rauzer-Chernoussova and Reitlinger).

8. USNM 180062, 1,730 ft below top of section (× 30) Kogruk Formation, Zone 13 or 14, undetermined late Middle or early Late Viséan zones, St. Louis? equivalent.

Medium-sorted, medium-grained, pelmatozoan-lump proto-oolitic grainstone. Present are *Brunsia* sp. and *Pseudotaxis* of the group *P. eominima* (Rauzer-Chernoussova). Pseudofibrous appearance of this *Pseudotaxis* is a diagenetic feature.




SKIMO CREEK SECTION W–138 TO 200, ENDICOTT MOUNTAINS,
AND CIRQUE SECTION 62C–15, DE LONG MOUNTAINS

## PLATE 23

**Cirque section 62C–15, De Long Mountains**

FIGURE 1. USNM 180063, 1,510 ft below top of section (× 30) Kogruk Formation, Zone 13 or 14, undetermined late Middle or early Late Viséan zone, St. Louis? equivalent.
Well-sorted, coarse-grained, bryozoan-pelmatozoan grainstone. A dark conodont is visible in the upper left. Stacheiinae and *Tetrataxis* sp. are present.

**Trail Creek section 60A–400 to 403, De Long Mountains**

2. USNM 180064, 240 ft below top of section (× 30) Kogruk Formation, Zone 13 or 14, undetermined late Middle or early Late Viséan zone, St. Louis? equivalent.
Poorly sorted, uneven grained, pelmatozoan-bryozoan-brachiopod recrystallized packstone. Small pellets and ostracods are scattered. *Brunsia* sp. is present.

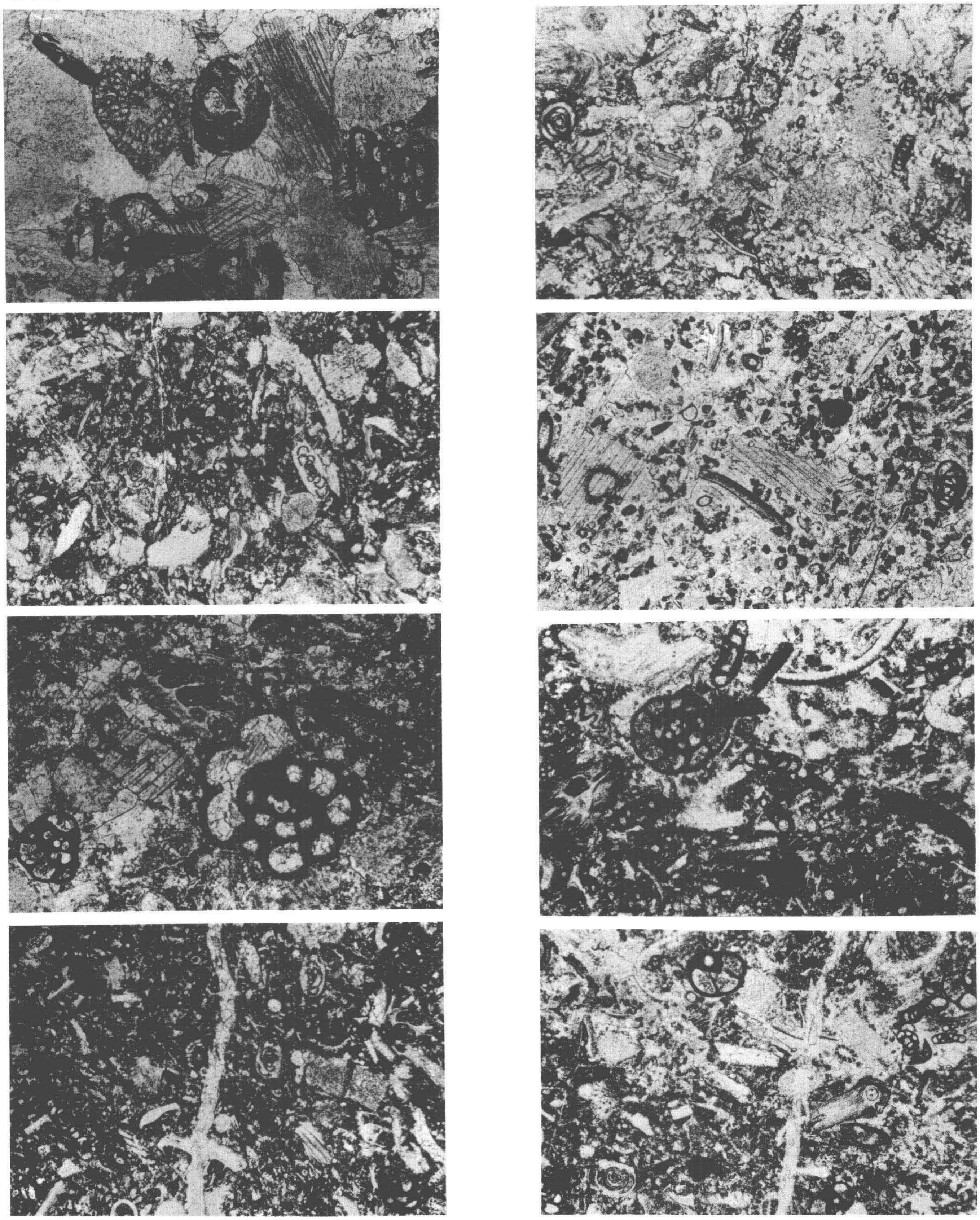
3. USNM 180065, 265 ft below top of section (× 30) Kogruk Formation, Zone 13 or 14, undetermined late Middle or early Late Viséan zone, St. Louis? equivalent.
Poorly sorted, uneven grained, pelmatozoan-brachiopod packstone. Some pellets and lumps are scattered. *Archaediscus* sp. and *Archaediscus* of the group *A. krestovnikovi* Rauzer-Chernoussova are present.

4. USNM 180066, 1,370 ft below top of section (× 25) Kogruk Formation, undetermined Viséan zone, undetermined Meramec equivalent.
Poorly sorted, uneven grained, pelmatozoan-pelletoid grainstone. Occasional brachiopod fragments and lumps. This facies is believed to indicate penecontemporaneous early diagenesis. Foraminifera are *Earlandia* sp. and *Endothyra* sp. Calcispherids and *Eotuberitina* sp. are also present.

5. USNM 180067, 1,615 ft below top of section (× 25) Kogruk Formation, undetermined Viséan zone, undetermined Meramec? equivalent.
Poorly sorted, uneven grained, pelmatozoan-bryozoan packstone. Some pellets are present. Foraminifera are *Globoendothyra* sp., *Earlandinella* sp., and *Endothyra* of the group *E. bowmani* Phillips emend. Brady.

6. USNM 180068, 1,885 ft below top of section (× 25) Kogruk Formation, undetermined Viséan zone, undetermined Meramec? equivalent.
Poorly sorted, uneven grained, bryozoan-brachiopod packstone. Pelmatozoans are scarce. Foraminifera include *Globoendothyra* sp., *Endothyra* sp., and numerous *Brunsia* sp.

7, 8. USNM 180069, 1,895 ft below top of section (× 25) Kogruk Formation, undetermined Viséan zone, undetermined Meramec equivalent.
Poorly sorted, uneven grained, pelmatozoan-bryozoan-pelletoid wackestone grading to packstone. Foraminífera are *Archaediscus* of the group *A. krestovnikovi* Rauzer-Chernoussova, *Endothyra* sp., *Brunsia* sp., and *Earlandia* sp.



CIRQUE SECTION 62C-15, DE LONG MOUNTAINS,
AND TRAIL CREEK SECTIONS 60A-400-403, DE LONG MOUNTAINS

## PLATE 24

**North Niak Creek section 68A–12, Lisburne Peninsula**

FIGURES 1–3. USNM 180070, 670 ft below top of section (× 25) Kogruk(?) Formation, Zone 13, Middle Viséan, St. Louis equivalent.

Poorly sorted, medium-grained, pelmatozoan-bryozoan-brachiopod packstone. Some ostracods, hard pellets and calcispheres are present. Foraminifera include *Eoendothyranopsis* of the group *E. rara* (Grozdilova *in* Lebedeva), *E. ermakiensis* (Lebedeva), *Globoendothyra* sp., *Endothyra* sp., and *Tetrataxis* of the group *T. angusta* Vissarionova.

4. USNM 180071, 315 ft below top of section (× 25) undetermined Viséan zone, undetermined Meramec zone.

Well-sorted, medium-grained, pelmatozoan-pelletoid grainstone. Some lumps and bryozoans are present. A minute *Archaediscus* sp. is present in the center (*Archaediscus krestovnikovi* Rauzer-Chernoussova).

**South Niak Creek section 68A–13, Lisburne Peninsula**

5. USNM 180072, top of the section (× 25) Nasorak Formation, Zone $16_{inf}$, Late Viséan, lower Chester equivalent. Medium-sorted, medium-grained, pelmatozoan-brachiopod-debris packstone.

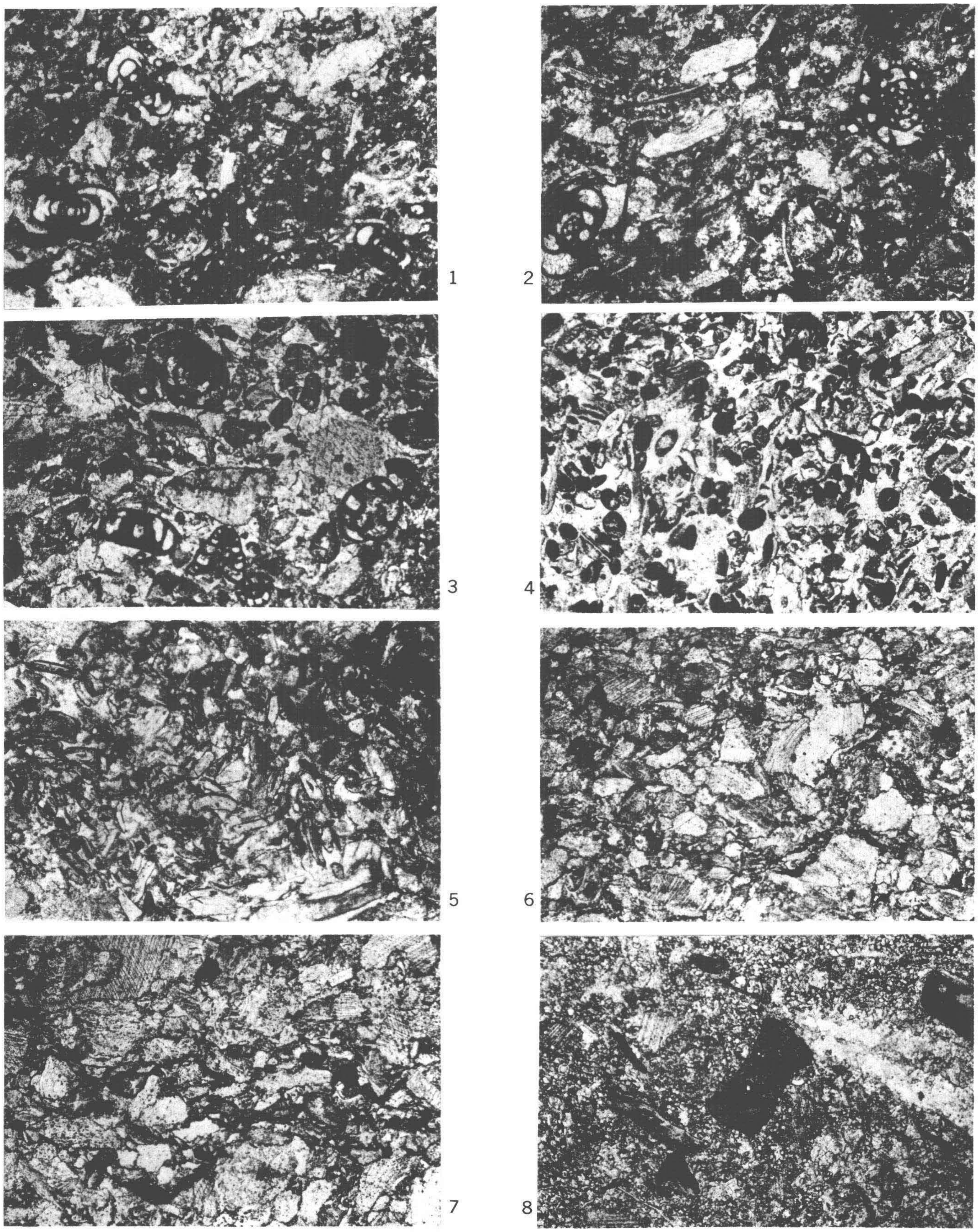
6, 7. USNM 180073, 175 ft below top of the section (× 25) Nasorak Formation, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.

Medium-sorted, medium-grained, pelmatozoan-phosphatic debris mud lump packstone. Pressure solution between grains is well developed.

**Cape Lewis section 68A–9 to 11, Lisburne Peninsula**

8. USNM 180074, 3,018 ft below top of the section (× 25) Nasorak Formation, Zone $_{inf}$, Late Viséan, lower Chester equivalent.

Poorly sorted, uneven grained, pelmatozoan-bryozoan highly recrystallized packstone. Small dolomitic rhombs are widespread. The pelmatozoan plates in the rock have been replaced by glauconite.



NORTH NIAK CREEK SECTION 68A-12, SOUTH NIAK CREEK SECTION 68A-13, AND CAPE LEWIS SECTIONS 68A-9 TO 11, LISBURNE PENINSULA

## PLATE 25

**Cape Lewis section 68A–9 to 11, Lisburne Peninsula**

FIGURE 1. USNM 180075, 2,955 ft below top of section (× 25) Nasorak Formation, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.

Poorly sorted, uneven grained, pelmatozoan-brachiopod recrystallized packstone. Ferruginous dolomite rhombs are scattered throughout the rock.

2. USNM 180076, 2,875 ft below top of section (× 25) Nasorak Formation, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.

Poorly sorted, uneven grained, pelmatozoan-bryozoan-brachiopod packstone. Foraminifera are *Endothyra* sp. and *Tetrataxis* sp.

3. USNM 180077, 2,825 ft below top of section (× 25) Nasorak Formation, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.

Poorly sorted, pelmatozoan-spiculite packstone-wackestone.

4, 5. USNM 180078, 2,514 ft below top of the section (× 25) Nasorak Formation, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.

Figure 4 is a radiolarian-spiculite wackestone. Figure 5 is a sponge spiculite packstone.

6. USNM 180079, 1,625 ft below top of the section (× 25) Kogruk? Formation, Zone $16_{sup}$, Late Viséan, lower Chester equivalent.

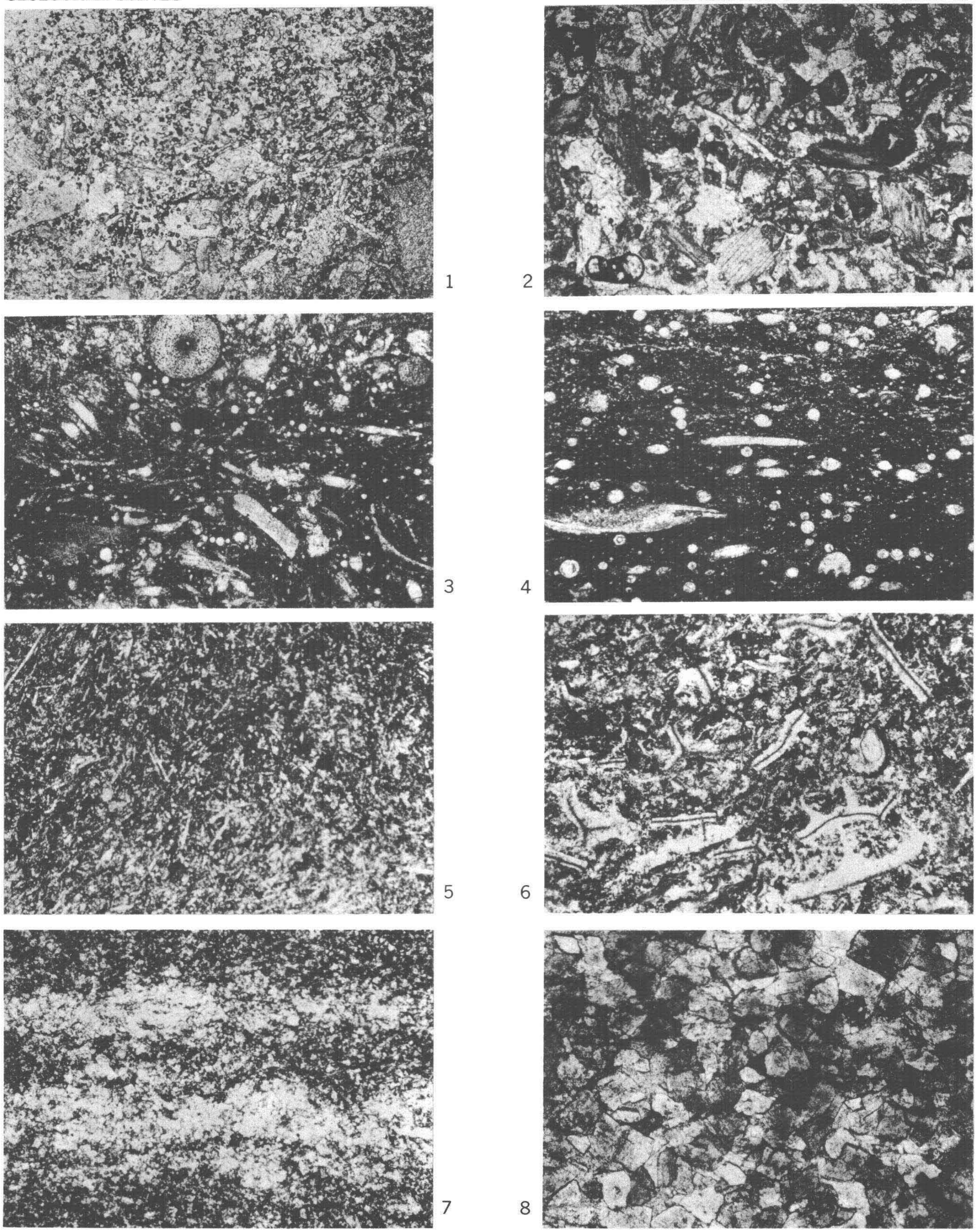
Disarticulated debris of *Lithostrotionella* walls in a bryozoan packstone.

7. USNM 180080, 1,220 ft below top of the section (× 25) Kogruk? Formation, Zone $16_{sup}$ or 17, Late Viséan or Early Namurian, lower or middle? Chester equivalent.

Layered dolomite derived from the diagenesis of banded lime mudstone.

8. USNM 180081, 432 ft below top of the section (× 25) Kogruk? Formation, Zone 17, Early Namurian, middle Chester equivalent.

Siliceous dolomitized lime mudstone.




CAPE LEWIS SECTION 68A–9 TO 11, LISBURNE PENINSULA

## PLATE 26

FIGURE 1. *Vicinesphaera* sp. (p. 20).

USNM 179312, Itkillik Lake section, 3,130 ft below the top of the section (× 119) Wachsmuth Limestone, Zone 8, Late Tournaisian, Osage equivalent.

2–4, 6–8. *Parathurammina* of the group *P. spinosa* (Williamson) (p. 22).

2. USNM 179313, Itkillik Lake section, 2,890 ft below the top of the section (× 119) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.
3. USNM 179314, Itkillik Lake section, 3,160 ft below the top of the section (× 119) Wachsmuth Limestone, Zone 8, Late Tournaisian, Osage equivalent.
4. USNM 179315, same as figure 3.
6. USNM 179316, Itkillik Lake section, 1,070 ft below the top of the section (× 119) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
7. Univ. Montréal 205/9, Skimo Creek section, approximately 2,120 ft below the top of the section (× 119) Wachsmuth Limestone, Zone 12, Middle Viséan, St. Louis equivalent.
8. Univ. Montréal 205/11, same as figure 7.

5. *Parathurammina* of the group *P. cushmani* Suleimanov. USNM 179319, same as figure 6 (p. 22).

9–12. *Parathurammina* of the group *P. suleimanovi* Lipina (p. 22).

9. USNM 179320, Anivik Lake section, 789 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
10. USNM 179321, Itkillik Lake section, 650 ft below the top of the section (× 119) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
11. USNM 179322, North Niak Creek section, 670 ft below the top of the section (× 119) Kogruk? Formation, Zone 13, Middle Viséan, St. Louis equivalent.
12. USNM 179323, same as figure 3.

13. *Eotuberitina reitlingerae* Mikluko-Maklai (p. 23).

USNM 179324, Trail Creek section, 325 ft below the top of the section (× 119) Kogruk Formation, Zone 13 or 14, late Middle or early Late Viséan, St. Louis equivalent.

14–16, 20. *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova and Reitlinger) (p. 25).

14. USNM 179325, Itkillik Lake section, 3,112 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 8, Late Tournaisian, Osage equivalent.
15. USNM 179326, Itkillik Lake section, 1,225 ft below the top of the section (× 119) Wachsmuth? Limestone, boundary of Zones 12/13, Middle Viséan, Salem-St. Louis boundary equivalent.
16. Univ. Montréal 205/5, Skimo Creek section, about 2,650 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
20. USNM 179327, Trail Creek section, 1,400 ft below the top of the section (× 119) Kogruk Formation, undetermined Viséan zone, undetermined Meramec equivalent.

17–19. *Earlandia* of the group *E. moderata* (Malakhova) (p. 26).

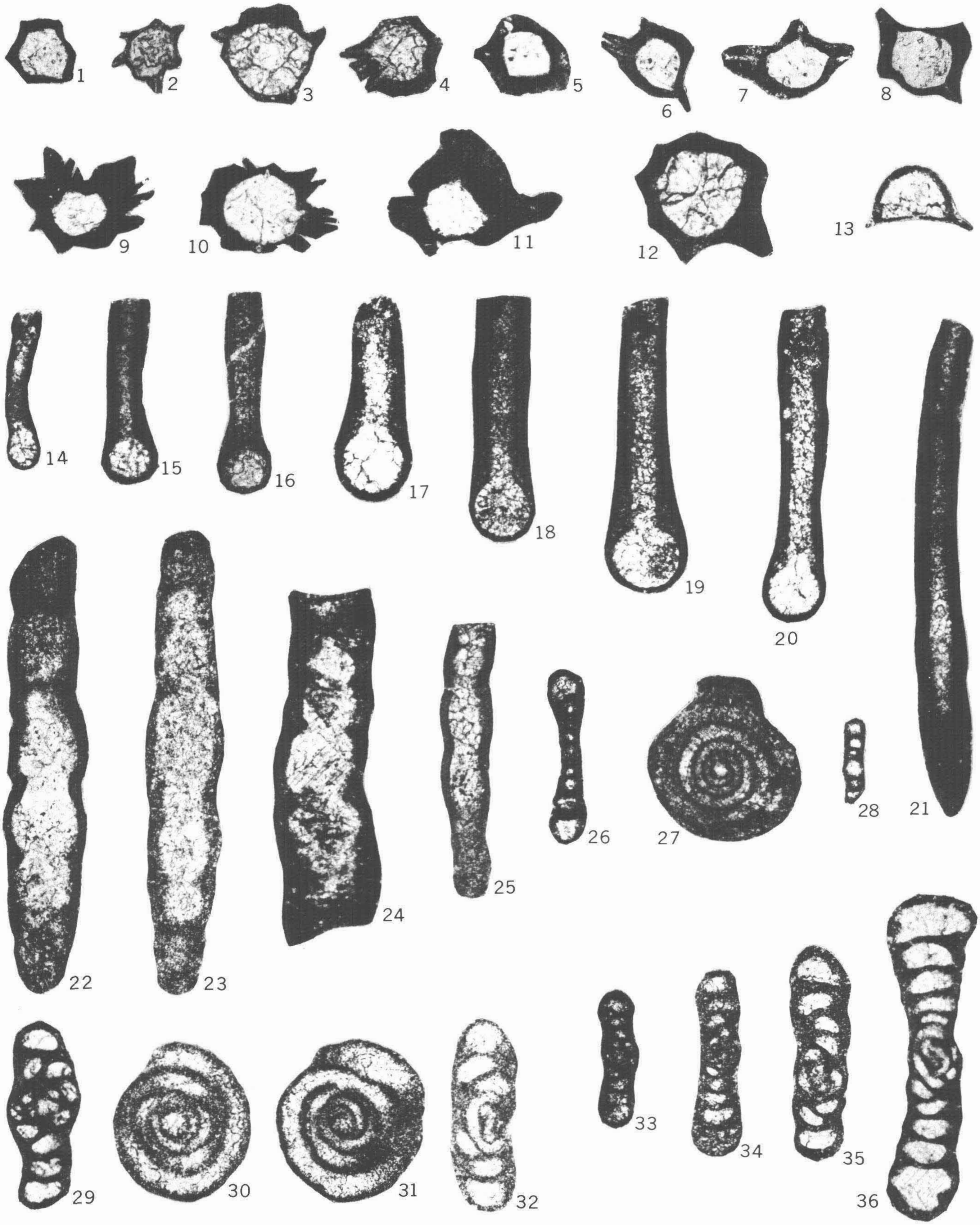
17. USNM 179332, Trail Creek section, 1,287 ft below the top of the section (× 97) Kogruk Formation, undetermined Viséan zone, undetermined Meramec? equivalent.
18. Univ. Montréal 205/19, Skimo Creek section, about 1,850 ft below the top of the section (× 97) Wachsmuth Limestone, Zones 10 and 11 undifferentiated, Early Viséan, Salem equivalent or older.
19. USNM 179333, Shainin Lake section, 770 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

21. *Earlandia* of the group *E. clavatula* (Howchin) (p. 26).

USNM 179338, Itkillik Lake section, 1,178 ft below the top of the section (× 40) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

22–25. *Earlandinella* sp. (p. 27).

22. Univ. Montréal 204/12, Joe Mountain section, 3,740–3,750 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
23. Univ. Montréal 204/30, as figure 22.
24. Univ. Montréal 204/1, Joe Mountain section, 3,710–3,720 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
25. USNM 179334, Itkillik Lake section, 3,215 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 8, Late Tournaisian, Osage equivalent.




*VICINESPHAERA*, *PARATHURAMMINA*, *EOTUBERITINA*, *EARLANDIA*, *EARLANDINELLA*, *PSEUDOCORNUSPIRA*, AND *BRUNSIA*

## PLATE 27

FIGURE 1. *Propermodiscus* sp. (p. 31).
USNM 179347, Itkillik Lake section, about 840 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

2. *Planoarchaediscus spirillinoides* (Rauzer-Chernoussova) (p. 32).
USNM 179348, Trail Creek section, 1,905 ft below the top of the section (× 97) Kogruk Formation, undetermined Viséan zone, undetermined Meramec equivalent.

3, 4. *Archaediscus* of the group *A. krestovnikovi* Rauzer-Chernoussova (p. 35).
3. *Archaediscus koktjubensis* Rauzer-Chernoussova. USNM 179349, Trail Creek section, 250 ft below the top of the section (× 97) Kogruk Formation, Zone 13 or 14, Late Middle or Early Late Viséan, St. Louis equivalent (p. 36).
4. *Archaediscus krestovnikovi* Rauzer-Chernoussova. USNM 179350, Trail Creek section, 2,030 ft below the top of the section (× 97) Kogruk Formation, undetermined Viséan zone, undetermined Meramec equivalent.

5. *Archaediscus*? *pachytheca* Petryk. (p. 38).
Univ. Montréal, 203/35, Joe Mountain section, 2,680 ft below the top of the section (× 119) Alapah Limestone, Zone $16_{sup}$, Late Viséan, lower Chester equivalent.

6–8. *Archaediscus* of the group *A. chernoussovensis* Mamet in Mamet, Choubert, and Hottinger (p. 37).
6. USNM 179351, West Sadlerochit Mountains section, 1,140 ft below the top of the section (× 97) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.
7. Univ. Montréal 221/35, West Sadlerochit Mountain section, approximately 900 ft below the top of the section (× 63) Alapah Limestone, Zone 17, Early Namurian, middle Chester equivalent.
8. USNM 179352, West Sadlerochit Mountain section, 1,045 ft below the top of the section (× 97) Alapah Limestone, Zone $16_{sup}$, Late Viséan, lower Chester equivalent.

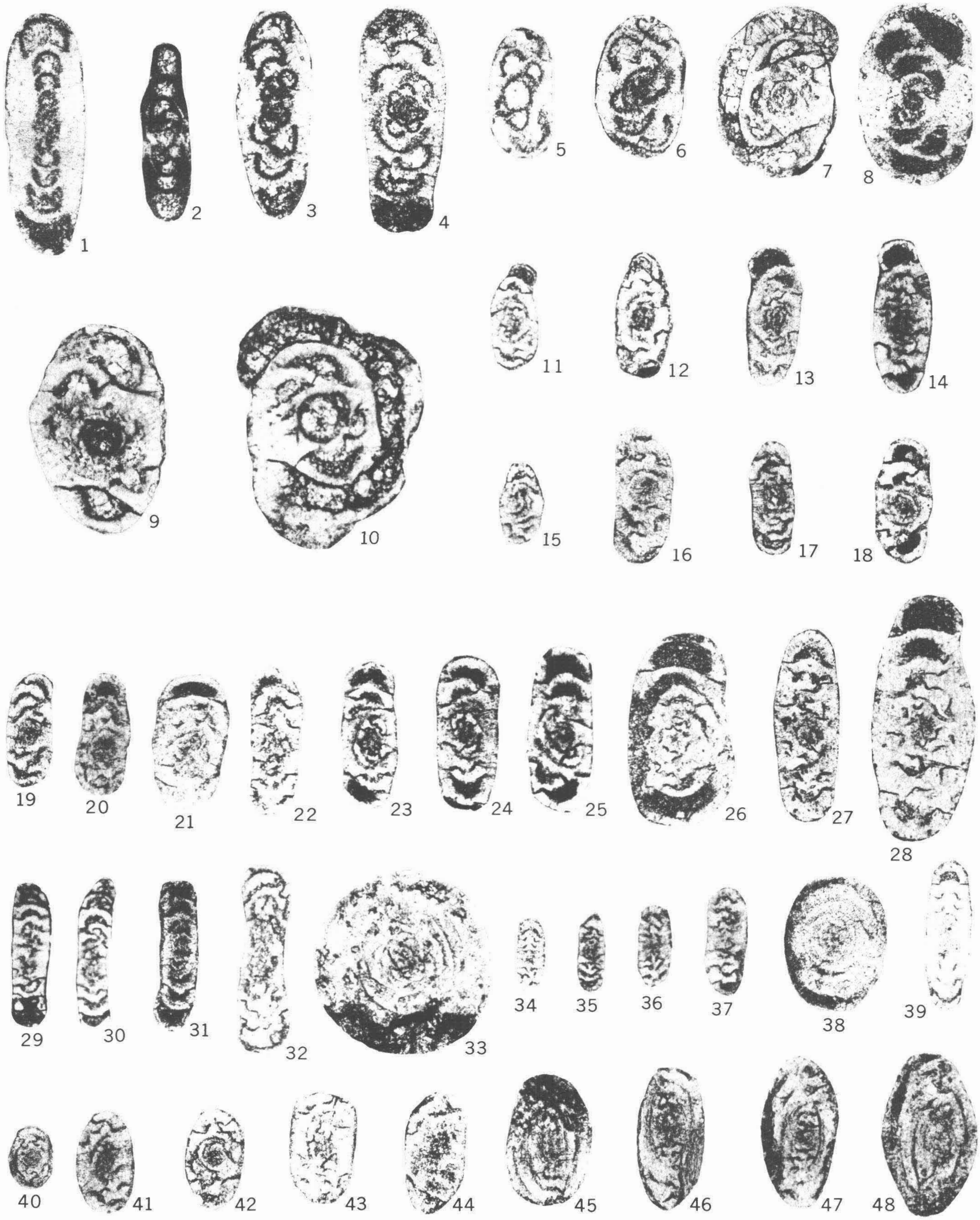
9, 10. *Archaediscus* of the group *A. moelleri* Rauzer-Chernoussova (p. 37).
*Archaediscus approximatus* Ganelina (p. 38).
9. Univ. Montréal 219/29, West Sadlerochit Mountain section, approximately 50 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.
10. Univ. Montréal 222/10, West Sadlerochit Mountain section, approximately 900 ft below the top of the section (× 97) Alapah Limestone, Zone $16_{sup}$ or 17, Latest Viséan or earliest Namurian, lower or middle? Chester equivalent.

11, 12. *Neoarchaediscus parvus* (Rauzer-Chernoussova) (p. 39).
11. USNM 179353, West Sadlerochit Mountain section, 130 ft below the top of the section (× 119) Alapah? Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.
12. USNM 179354, West Sadlerochit Mountain section, 167 ft below the top of the section (× 119) Alapah Limestone, Zone 18 or younger, Early Namurian or younger, upper Chester equivalent.

13–16. *Neoarchaediscus parvus regularis* (Rauzer-Chernoussova) (p. 39).
13. USNM 179355, Egaksrak River section, 415 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.
14. Univ. Montréal 219/17, West Sadlerochit Mountain section, about 50 ft below the top of the section (× 119) Wahoo Limestone, Zone 21, Atoka equivalent.
15. USNM 179356, West Sadlerochit Mountain section, 130 ft below the top of the section (× 119) Alapah? Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.
16. USNM 179357, Egaksrak River section, 490 ft below the top of the section (× 119) Wahoo Limestone, Zone 21, Atoka equivalent.

17–27. *Neoarchaediscus incertus* (Grozdilova and Lebedeva) (p. 39).
17. USNM 179358, West Sadlerochit Mountain section, 150 ft below the top of the section (× 144) Alapah? Limestone, Zone 18 or younger, Early Namurian or younger, Upper Chester? equivalent.
18. Univ. Montréal 219/15, West Sadlerochit Mountain section, 45 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.
19. Univ. Montréal, 219/13, West Sadlerochit Mountain section, same as figure 18.
20. USNM 179359, West Sadlerochit Mountain section, 130 ft below the top of the section (× 119) Alapah(?) Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.
21. USNM 179360, West Echooka River, undetermined level at the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.
22. USNM 179361, West Sadlerochit Mountain section, 230 ft below the top of the section (× 119) Alapah(?) Limestone, Zone 18 or younger, Early Namurian or younger, upper Chester? equivalent.
23. Univ. Montréal 219/10, West Sadlerochit Mountain section, same as figure 18.
24. Univ. Montréal 219/19, West Sadlerochit Mountain section, same as figure 18.
25. Univ. Montréal 219/30, West Sadlerochit Mountain section, same as figure 18.
26. USNM 179362, West Sadlerochit Mountain section, 5 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.
27. Univ. Montréal 219/24, West Sadlerochit Mountain section, same as figure 18.

28. *Neoarchaediscus subbaschkiricus grandis* (Reitlinger) (p. 40).
USNM 179363, West Sadlerochit Mountain section, 47 ft below the top of the section (× 119) Wahoo Limestone, Zone 21, Atoka equivalent.



*PROPERMODISCUS*, *PLANOARCHAEDISCUS*, *ARCHAEDISCUS*, *NEOARCHAEDISCUS*, *PLANOSPIRODISCUS*, *ASTEROARCHAEDISCUS*, AND *QUASIARCHAEDISCUS*?

## PLATE 28

FIGURE 1. *Glomospiranella* sp. (p. 44).

USNM 179379, Shainin Lake section, 2,241 ft below the top of the section (× 77) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.

2. *Septaglomospiranella* of the group *S. chernoussovensis* Mamet, new name (p. 45).

USNM 179380, Itkillik Lake section, 2,875 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.

3. *Rectoseptaglomospiranella nalivkini* (Malakhova) (p. 46).

Univ. Montréal, 199/14, Itkillik Lake section, about 3,250 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 8, Late Tournaisian, Osage equivalent.

4–7. *Tournayella discoidea* Dain (p. 47).

4. USNM 179381, Shainin Lake section, same as figure 1, but (× 63).
5. USNM 179382, Itkillik Lake section, 3,080 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.
6. USNM 179383, Skimo Creek section, 3,130 ft below the top of the section (× 97) Kayak Shale, Zone 8?, Late Tournaisian, Osage equivalent.
7. USNM 179384, Itkillik Lake section, 3,160 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 8 or 9, Late Tournaisian, Osage equivalent.

8. *Carbonella spectabilis* Dain (p. 48).

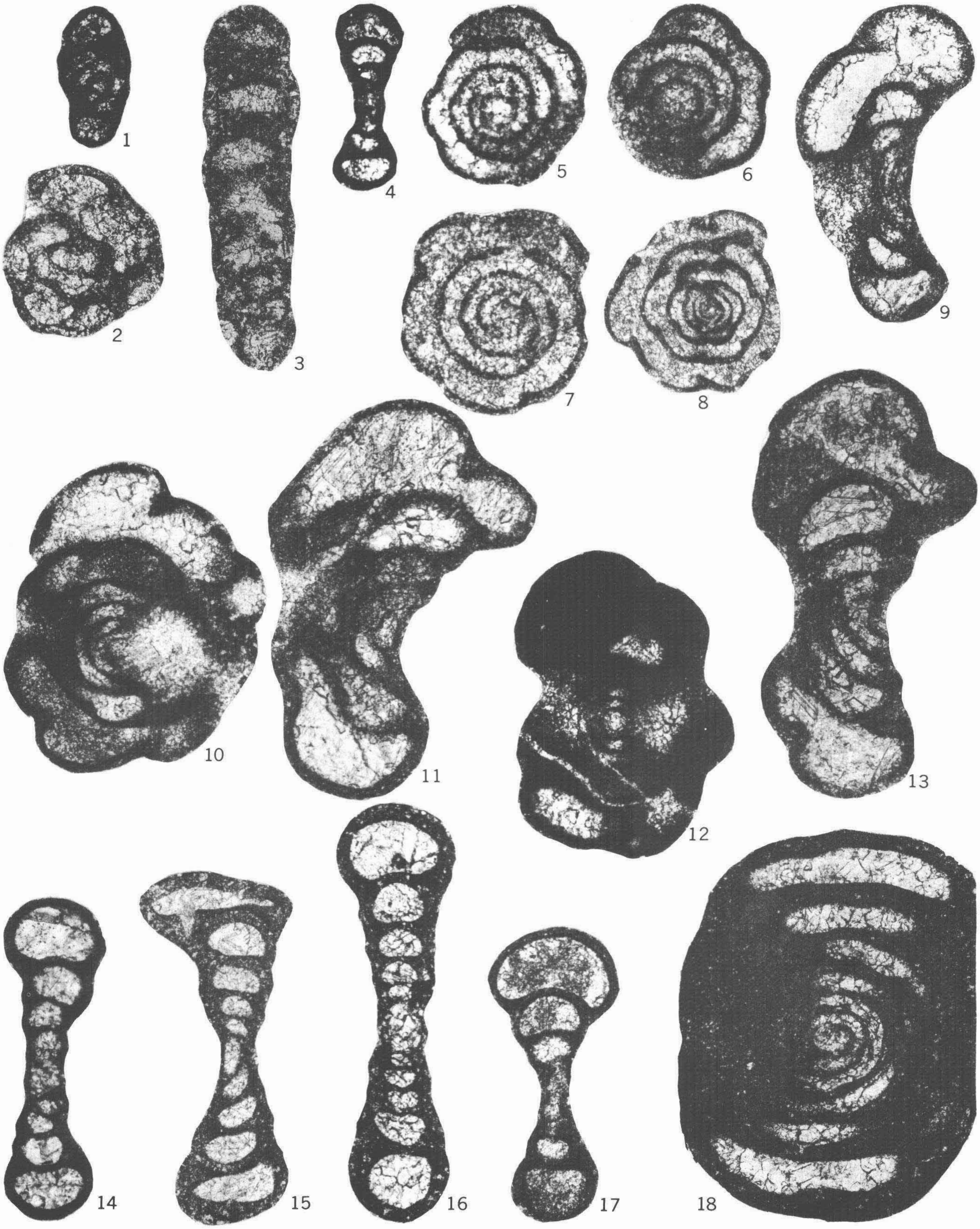
Univ. Montréal 200/13, Itkillik Lake section, 3,257 ft below the top of the section (× 65) Wachsmuth Limestone, Zone 8, Late Tournaisian, Osage equivalent.

9–14, 17. *Septatournayella pseudocamerata* Lipina *in* Lebedeva (p. 49).

9. USNM 179385, Shainin Lake section, 2,241 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.
10. Univ. Montréal 205/23, Skimo Creek section, 3,130 ft below the top of the section (× 63) Kayak Shale, Zone 8, Late Tournaisian, Osage equivalent.
11. USNM 179386, Itkillik Lake section, 3,080 ft below the top of the section (× 77) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.
12. USNM 179387, Shainin Lake section, 2,245 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.
13. USNM 179388, same as figure 11.
14. USNM 179389, Itkillik Lake section, 3,215 ft below the top of the section (× 77) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.
17. Univ. Montréal 205/24, Skimo Creek, about 3,130 ft below the top of the section (× 63) Kayak Shale, Zone 8, Late Tournaisian, Osage equivalent.

15, 16, 18. *Eoforschia* of the group *E. moelleri* (Malakhova in Dain) (p. 50).

15. USNM 179390, Anivik Lake section, 521 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
16. USNM 179391, Itkillik Lake section, 1,045 ft below the top of the outcrop (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
18. USNM 179392, Itkillik Lake section, 2,145 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.



*GLOMOSPIRANELLA*, *SEPTAGLOMOSPIRANELLA*, *RECTOSEPTAGLOMOSPIRANELLA*, *TOURNAYELLA*, *CARBONELLA*, *SEPTATOURNAYELLA*, AND *EOFOSCHIA*

## PLATE 29

FIGURES 1–4, 7. *Priscella prisca* (Rauzer-Chernoussova) (p. 56).

1. Univ. Montréal 203/28, Joe Mountain section, 3,730–3,740 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
2. USNM 179394, Itkillik Lake section, 1,340 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
3. USNM 179395, Shainin Lake section, 874 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
4. Univ. Montréal 204/9, Joe Mountain section, 3,750 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
7. USNM 179396, Itkillik Lake section, 890 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

5. *Priscella devexa* (Rauzer-Chernoussova) (p. 56).

USNM 179397, Itkillik Lake section, 1,160 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.

6, 14, 16. *Latiendothyra* of the group *L. parakosvensis* (Lipina) (p. 52).

6. USNM 179398, Itkillik Lake section, 2,772 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.
14. USNM 179399, Itkillik Lake section, same as figure 6.
16. USNM 179400, Itkillik Lake section, same as figure 6.

8–10. *Endothyranella recta* (Brady) (p. 53).

8. USNM 179401, Shainin Lake section, 762 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
9. USNM 179402, Shainin Lake section, approximately 1,600 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
10. USNM 179403, Shainin Lake section, same as figure 9.

11–12. *Endothyranella* sp. (p. 54).

11. USNM 179404, Itkillik Lake section, 2,772 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.
12. USNM 170405, Itkillik Lake section, same as figure 11.

13. *Latiendothyra* sp. (p. 52).

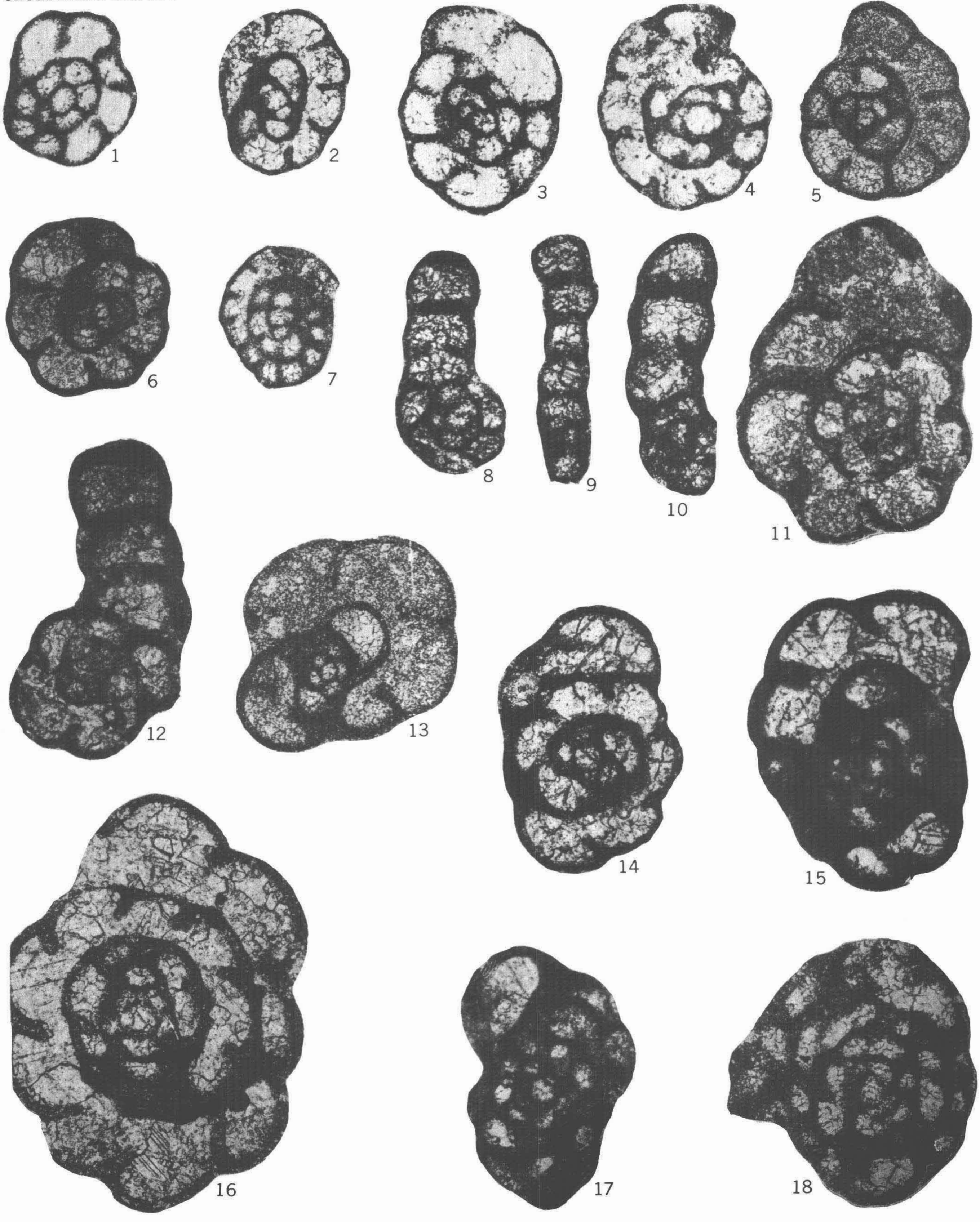
USNM 179406, Itkillik Lake section, 1,160 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

15. *Latiendothyra kosvensis* (Lipina) (p. 52).

USNM 179407, Itkillik Lake section, same as figure 11.

17, 18. *Inflatoendothyra* of the group *I. multicamerata* (Lipina) (p. 54).

17. USNM 179408, Itkillik Lake section, same as figure 11.
18. Univ. Montréal 204/27, Shainin Lake section, approximately 1,900 ft below the top of the section (× 197) Wachsmuth Limestone, Zones 10 and 11 undifferentiated, Early Viséan, Salem equivalent or older.




*PRISCELLA*, *LATIENDOTHYRA*, *ENDOTHYRANELLA*, AND *INFLATOENDOTHYRA*

# PLATE 30

FIGURES 1–3, 6, 12. *Skippella* cf. *S. redwallensis* (Skipp *in* McKee and Gutschick) (p. 75).

1. USNM 179409, Anivik Lake section, 710 ft below the top of the section (× 73) Wachsmuth Limestone, Zone 12-13 boundary, Middle Viséan, Salem-St. Louis boundary equivalent.
2. USNM 179410, Anivik Lake section, 1,082 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
3. Univ. Montréal 205/38, Skimo Creek section, 2,300 ft below the top of the section (× 76) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
6. Univ. Montréal 205/36, Skimo Creek section, same as figure 3.
12. Univ. Montréal 206/3, Skimo Creek section, about 2,270 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

4, 5. *Planoendothyra rotayi* (Lebedeva) (p. 58).

4. Univ. Montréal 206/5, Skimo Creek section, same as figure 12, but (× 76).
5. USNM 179411, Itkillik Lake section, 878 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

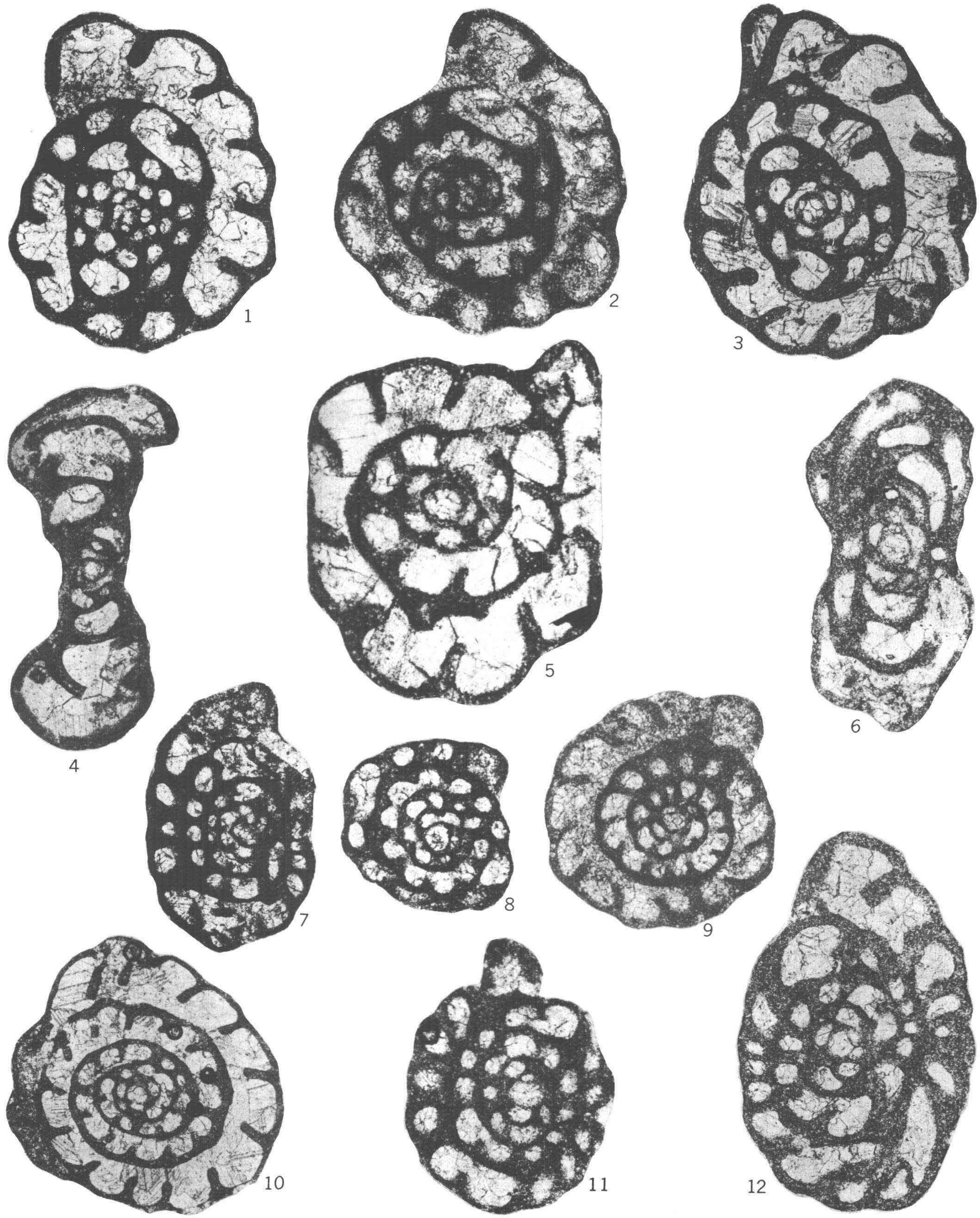
7–11. *Eoendothyranopsis* of the group *E. spiroides* (Zeller) (p. 76).

7, 10–11. *Eoendothyranopsis hinduensis* (Skipp *in* McKee and Gutschick) (p. 77).

7. USNM 179412, Anivik Lake section, 833 ft below the top of the section, (× 63) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
10. USNM 179413, Anivik Lake section, same as figure 7.
11. USNM 179414, Anivik Lake section, 1,405 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

8, 9. *Eoendothyranopsis spiroides* (Zeller) (p. 76).

8. USNM 179415, Anivik Lake section, same as figure 1, but (× 97).
9. USNM 179416, Skimo Creek section, 2,345 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.




*SKIPPELLA*, *PLANOENDOTHYRA*, AND *EOENDOTHYRANOPSIS*

# PLATE 31

FIGURES 1, 11. Endothyranopsidae? (p. 79).

1. USNM 179417, Skimo Creek section, 2,260 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

11. USNM 179418, Itkillik Lake section, 1,057 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

2–9. *Eoendothyranopsis* of the group *E. rara* (Grozdilova in Lebedeva) (p. 77).

4, 6–8. *Eoendothyranopsis scitula* (Toomey) (p. 77).

2. USNM 179419, Anivik Lake section, 789 ft below the top of the section (× 63) Wachsmuth? Limestone, Zone 12-13 boundary, Middle Viséan, Salem-St. Louis boundary equivalent.

3. USNM 179420, Itkillik Lake section, 857 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

4. USNM 179421, Itkillik Lake section, 1,057 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

5. USNM 179422, Itkillik Lake section, same as figure 4.

6. USNM 179423, Shainin Lake section, 851 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

7. USNM 179424, Shainin Lake section, same as figure 6.

8. USNM 179425, Itkillik Lake section, 1,040 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

9. USNM 179426, Itkillik Lake section, 875 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

10. *Eoendothyranopsis* of the group *E. ermakiensis* (Lebedeva) (p. 77).

10. *Eoendothyranopsis ermakiensis* (Lebedeva). USNM 179427, Shainin Lake section, 790 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

12–13. *Eoendothyranopsis*? sp. (p. 78).

12. USNM 179428, Itkillik Lake section, same as figure 4.

13. USNM 179429, Itkillik Lake section, 1,182 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

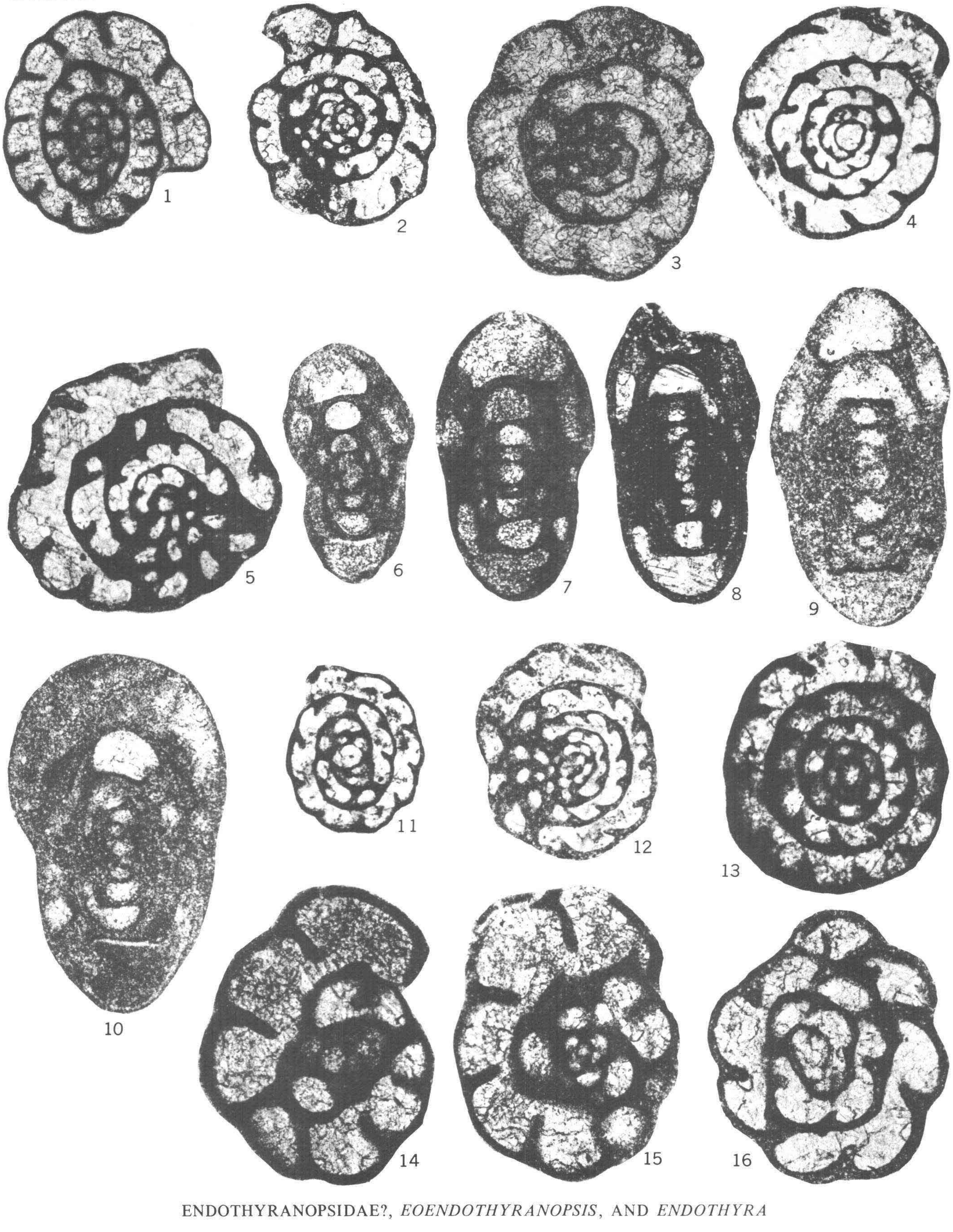
14–16. *Endothyra* of the group *E. bowmani* Phillips emend. Brady (p. 67).

14–15. *Endothyra bowmani* Phillips emend. Brady (p. 68).

14. USNM 179430, Anivik Lake section, 595 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

15. USNM 179431, Itkillik Lake section, same as figure 4.

16. USNM 179432, Skimo Creek section, 2,084 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.




ENDOTHYRANOPSIDAE?, *EOENDOTHYRANOPSIS*, AND *ENDOTHYRA*

## PLATE 32

FIGURE 1. *Endothyra paramosquensis* Mamet new name (p. 70).

USNM 179433, West Sadlerochit Mountain section, 50 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.

2, 3. *Endothyra* of the group *E. similis* Rauzer-Chernoussova and Reitlinger (p. 69).

2. USNM 179434, Trail Creek section, 1,615 ft below the top of the section (× 97) Kogruk Formation, undetermined Viséan zone, undetermined Meramec equivalent.
3. USNM 179435, Itkillik Lake section, 1,057 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

4. Transitional form between *Latiendothyra*? sp. and *Globoendothyra*? sp. (p. 70).

Univ. Montreal 205/25, Skimo Creek section, 3,100 ft below the top of the section (× 76) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.

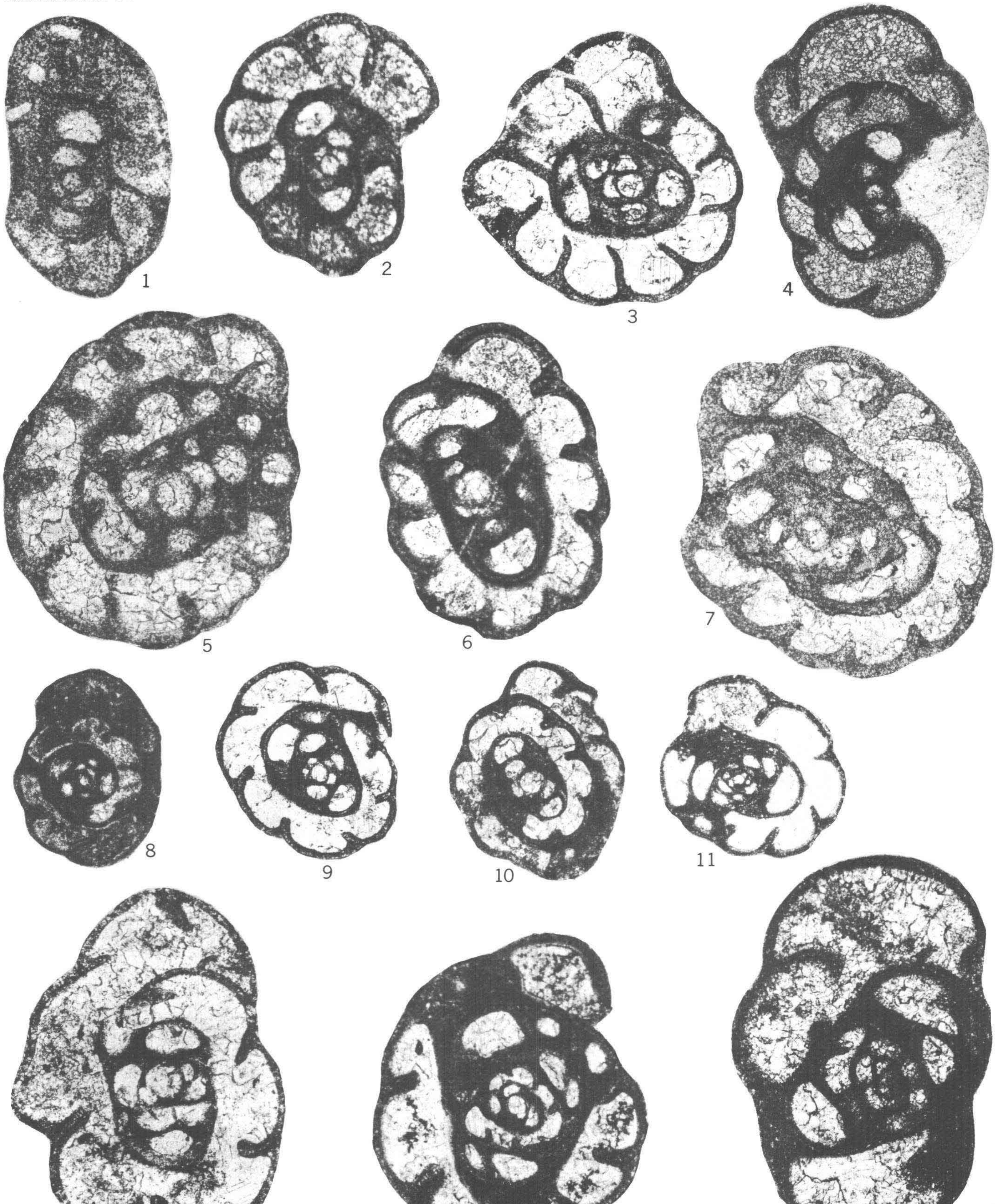
5–7. *Globoendothyra* of the group *G. baileyi* (Hall) (p. 73).

5. USNM 179436, Skimo Creek section, 2,115 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
6. USNM 179437, Anivik Lake section, 1,080 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
7. USNM 179438, Skimo Creek section, 2,245 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

8–14. *Globoendothyra* of the group *G. tomiliensis* (Grozdilova *in* Lebedeva) (p. 74).

8–14. *Globoendothyra paula* (Vissarionova) (p. 74).

8. USNM 179439, Shainin Lake section, 730 ft below the top of the section (× 30) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
9. USNM 179440, Itkillik Lake section, 865 ft below the top of the section (× 40) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
10. USNM 179441, Anivik Lake section, 742 ft below the top of the section (× 40) Wachsmuth Limestone?, Zone 12-13 boundary, Middle Viséan, Salem-St. Louis boundary equivalent.
11. USNM 179442, Anivik Lake section, 1,405 ft below the top of the section (× 30) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
12. USNM 179443, Skimo Creek section, 2,010 ft below the top of the section (× 76) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
13. USNM 179444, Itkillik Lake section, 1,045 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Viséan, St. Louis equivalent.
14. USNM 179445, Shainin Lake section, 1,090 ft below the top of the section (× 63) Wachsmuth? Limestone, Zone 12-13 boundary, Middle Viséan, Salem-St. Louis boundary equivalent.

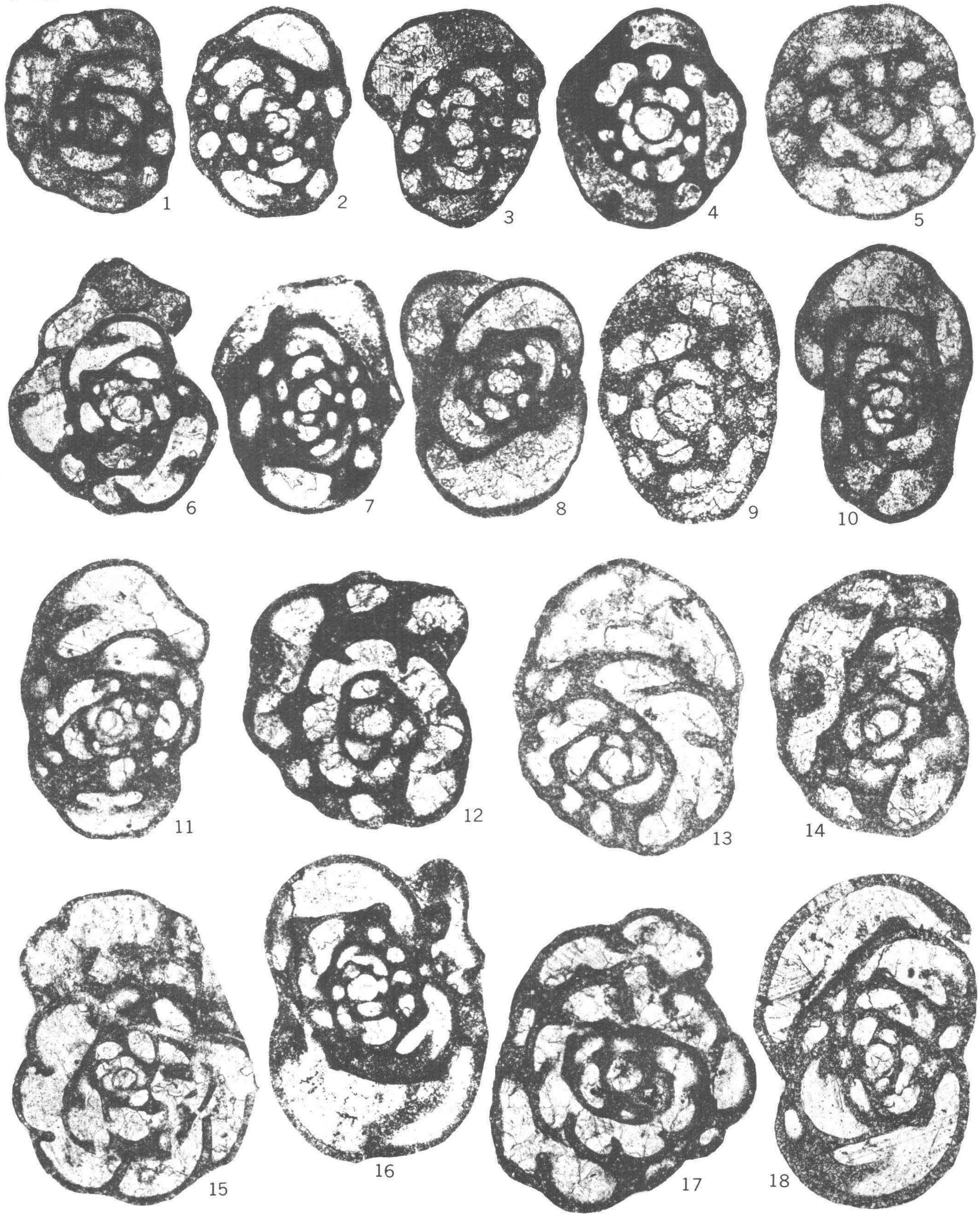



*ENDOTHYRA*, TRANSITIONAL FORM BETWEEN *LATIENDOTHYRA*?
AND *GLOBOENDOTHYRA*?, AND *GLOBOENDOTHYRA*

# PLATE 33

FIGURES 1–18. *Dainella anivikensis* n. sp. Mamet (p. 71).

1. USNM 179446, Anivik Lake section, 702 ft below the top of the section (× 63) Wachsmuth? Limestone, Zone 12-13 boundary, Middle Viséan, Salem-St. Louis boundary equivalent.
2. USNM 179447, Anivik Lake section, 705 ft below the top of the section, same as figure 1.
3. USNM 179448, Anivik Lake section, 833 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
4. USNM 179449, Anivik Lake section, 594 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
5. USNM 179450, Anivik Lake section, 595 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
6. Univ. Montréal 205/34, Skimo Creek section, 2,300 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
7. USNM 179451, Anivik Lake section, same as figure 4.
8. USNM 179452, Skimo Creek section, 2,225 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
9. USNM 179453, Skimo Creek section 2,092 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12-13 boundary, Middle Viséan, Salem-St. Louis boundary equivalent.
10. USNM 179454, Skimo Creek section, same as figure 8.
11. USNM 179455, Skimo Creek section, 2,118 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
12. USNM 179456, Anivik Lake section, 833 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
13. USNM 179457, Skimo Creek section, same as figure 11.
14. USNM 179458, Skimo Creek section, 2,345 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
15. USNM 179459, Skimo Creek section, 2,245 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
16. USNM 179460, Skimo Creek section, 2,105 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
17. Type of the species. USNM 179461, Skimo Creek section, 2,164 ft below the top of the section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
18. Univ. Montréal, 205/35, Skimo Creek section, same as figure 6.




*DAINELLA*

## PLATE 34

FIGURES

1–6. *Globoendothyra paula* (Vissarionova) (p. 74).

1. USNM 179462, Shainin Lake section, 745 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
2. USNM 179463, Itkillik Lake section, 857 ft below the top of the section (× 63) Alapah Limestone, Zone 13?, Middle Viséan?, St. Louis? equivalent.
3. USNM 179464, Itkillik Lake section, same as figure 2.
4. USNM 179465, Shainin Lake section, same as figure 1.
5. USNM 179466, Itkillik Lake section, 1,045 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
6. USNM 179467, Shainin Lake section, 815 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

7–10. *Endothyranopsis compressa* (Rauzer-Chernoussova and Reitlinger) (p. 80).

7. Univ. Montréal 206/6, Skimo Creek section, 2,250 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
8. USNM 179468, Anivik Lake section, 789 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
9. USNM 179469, Itkillik Lake section, 1,045 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
10. USNM 179470, Itkillik Lake section, 857 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Loui sequivalent.

11. *Zellerina discoidea* (Girty) (p. 88).

Univ. Montréal. 131/7, West Sadlerochit Mountain section, 1,050 ft below the top of the section (× 97) Alapah Limestone, Zone $16_{sup}$, Late Viséan, lower Chester equivalent.

12, 13. *Zellerina designata* (Zeller) (p. 88).

12. USNM 179471, West Sadlerochit Mountain section, 47 ft below the top of the section (× 97), Wahoo Limestone, Zone 21, Atoka equivalent.
13. Univ. Montréal 219/25, West Sadlerochit Mountain section, 50 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.

14, 17. *Millerella* aff. *M. carbonica* Grozdilova and Lebedeva (p. 90).

14. Univ. Montréal 219/32, West Sadlerochit Mountain section, same as figure 13.
17. Univ. Montréal 200/1, West Sadlerochit Mountain section, same as figure 13.

15, 16, 18. *Millerella?* sp. (p. 91).

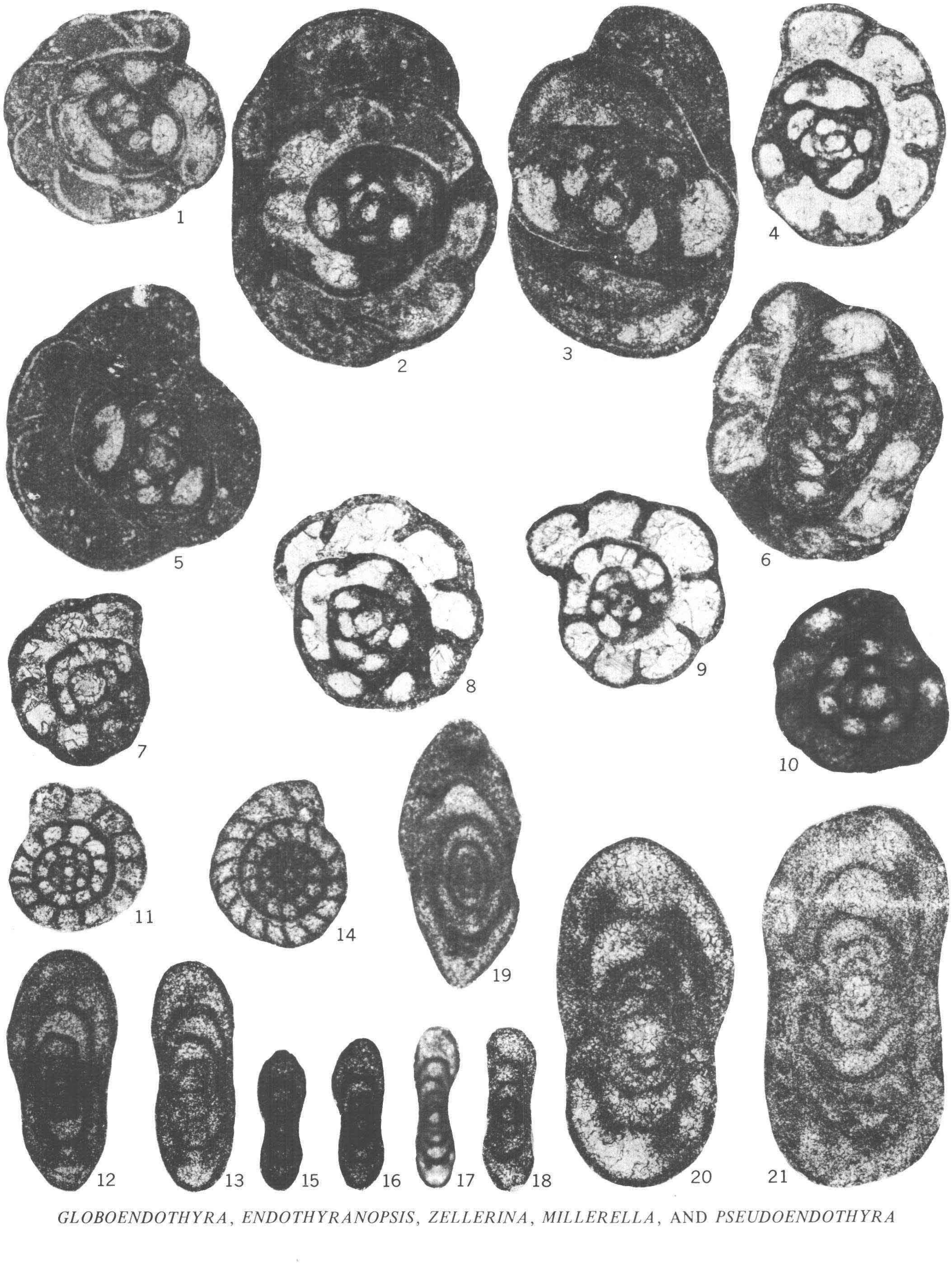
15. Univ. Montréal 219/33, West Sadlerochit Mountain section, same as figure 13.
16. Univ. Montréal 219/12, West Sadlerochit Mountain section, same as figure 13.
18. Univ. Montréal 219/11, West Sadlerochit Mountain section, same as figure 13.

19. *Pseudoendothyra ornata* (Brady) (p. 83).

Univ. Montréal 220/28, West Sadlerochit Mountain section, same as figure 13.

20, 21. *Pseudoendothyra britishensis* Ross. (p. 83).

20. USNM 179472, West Sadlerochit Mountain section, 47 ft below the top of the section (× 119) Wahoo Limestone, Zone 21, Atoka equivalent.
21. USNM 179473, West Sadlerochit Mountain section, same as figure 20, but (× 97).




*GLOBOENDOTHYRA*, *ENDOTHYRANOPSIS*, *ZELLERINA*, *MILLERELLA*, AND *PSEUDOENDOTHYRA*

## PLATE 35

FIGURES 1, 2. *Millerella pressa* Thompson (p. 90).

1. Univ. Montréal 220/4, West Sadlerochit Mountain section, 80 ft below the top of the section (× 97) Wahoo Limestone, Zone 20, Morrow equivalent.
2. Univ. Montréal 131/19, West Sadlerochit Mountain section, 80 ft below the top of the section (× 97) Wahoo Limestone, Zone 20, Morrow equivalent.

3. *Eoschubertella? yukonensis* (Ross) (p. 91).
USNM 179474, Egaksrak River section, 250 ft below the top of the section (× 97) Wahoo Limestone Zone 21, Atoka equivalent.

4, 8. *Biseriella* of the group *B. parva* (Chernysheva) (p. 100).

4. Univ. Montréal 131/2, West Sadlerochit Mountain section, 630 ft below the top of the section (× 97) Alapah Limestone, Zone 18, Early Namurian, upper Chester equivalent.
8. USNM 179475, Old Man Creek section, 310 ft below the top of the section (× 97) Alapah Limestone, Zone 18, Early Namurian, upper Chester equivalent.

5, 7, 10. *Eostaffella* of the group *E. radiata* (Brady) (p. 86).

5. Univ. Montréal 174/8, West Sadlerochit Mountain section, 1,150 ft below the top of the section (× 97) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.
7. Univ. Montréal 206/2, West Sadlerochit Mountain section, same as figure 5.
10. USNM 179476, Itkillik Lake section, 995 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

6. *Globivalvulina* of the group *G. bulloides* (Brady) (p. 102).
USNM 179477, Sadlerochit Mountain section, about 310 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.

9. *Tetrataxis* of the group *T. angusta* Vissarionova (p. 97).
Univ. Montréal 222/5, West Sadlerochit Mountain section, about 1,000 ft below the top of the section (× 30) Alapah Limestone, Zone $16_{sup}$, Late Viséan, lower Chester equivalent.

11–13. *Tetrataxis* of the group *T. conica* Ehrenberg emend. von Möller (p. 97).

11, 13. *Tetrataxis quasiconica* Brazhnikova. (p. 98).

11. Univ. Montréal 221/34, West Sadlerochit Mountain section, about 950 ft below the top of the section (× 63) Alapah Limestone, Zone 17, Early Namurian, middle Chester equivalent.
13. Univ. Montréal 131/26, West Sadlerochit Mountain section, about 650 ft below the top of the section (× 63) Alapah Limestone, Zone 18, Early Namurian, upper Chester equivalent.

12. *Tetrataxis media* Vissarionova (p. 98).
USNM 179478, Trail Creek section, 1,615 ft below the top of the section (× 97) Kogruk Formation, undetermined Viséan zone, undetermined Meramec equivalent.

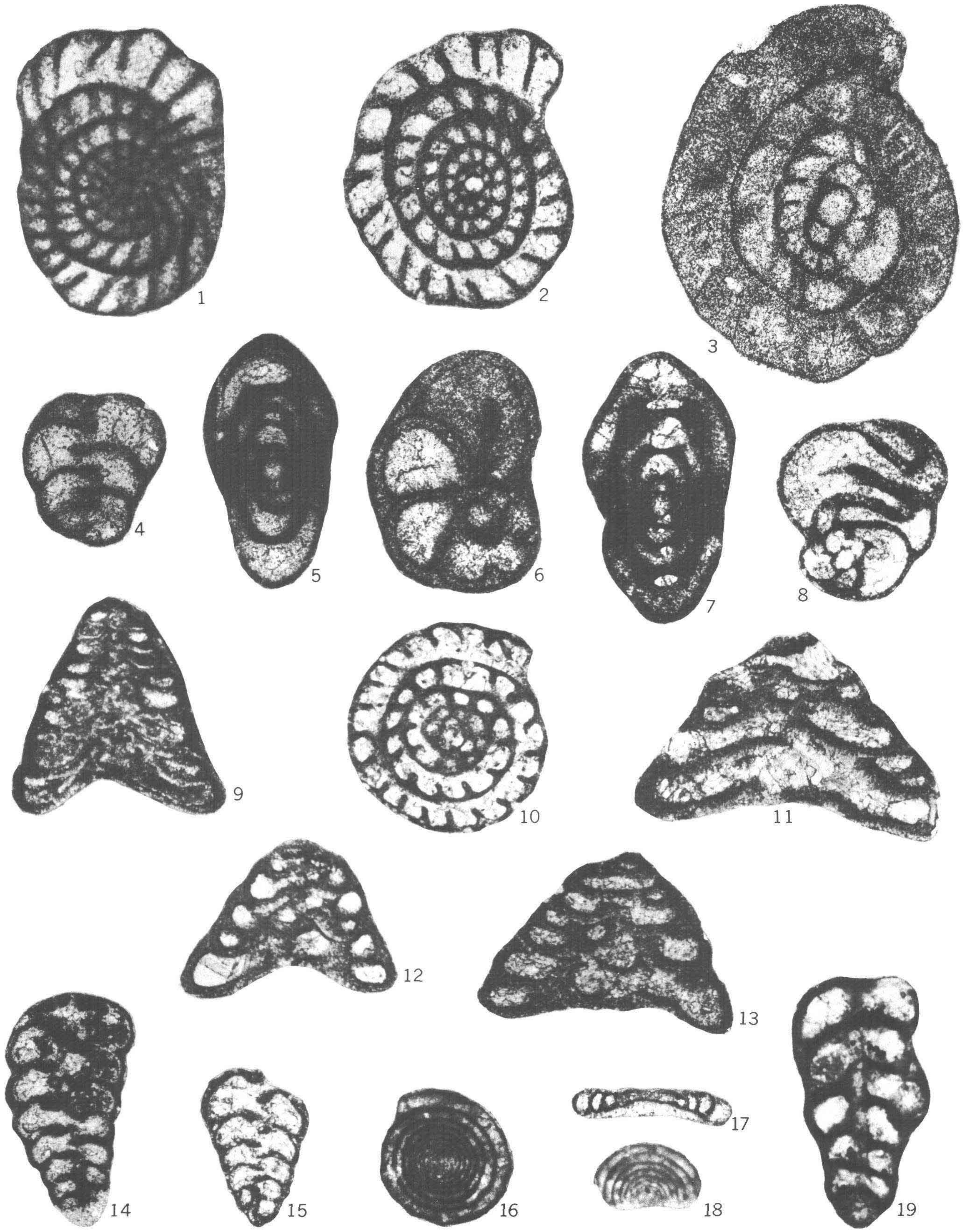
14, 15. *Cribrostomum bradyi* (von Möller) (p. 93).

14. Univ. Montréal 174/7, West Sadlerochit Mountain section, about 1,000 ft below the top of the section (× 30), Alapah Limestone, Zone $16_{sup}$, Late Viséan, lower Chester equivalent.
15. USNM 179479, Cape Lewis section, 1,070 ft below the top of the section (× 30) Kogruk? Formation, Zone 17?, Early Namurian?, middle Chester equivalent?.

16–18. *Monotaxinoides multivolutus* (Reitlinger) (p. 99).

16. Univ. Montréal 221/37, West Sadlerochit Mountain section, about 950 ft below the top of the section (× 97) Alapah Limestone, Zone 17, Early Namurian, middle Chester equivalent.
17. Univ. Montréal 220/3, West Sadlerochit Mountain section, same as figure 2.
18. Univ. Montréal 221/37, West Sadlerochit Mountain section, same as figure 16.

19. *Volvotextularia mississippiana* (Cooper) (p. 94).
Univ. Montréal 222/1, West Sadlerochit Mountain section, same as figure 14, but (× 97).




*MILLERELLA*, *EOSCHUBERTELLA*?, *BISERIELLA*, *EOSTAFFELLA*, *GLOBIVALVULINA*, *TETRATAXIS*, *CRIBROSTOMUM*, *MONOTAXINOIDES*, AND *VOLVOTEXTULARIA*

## PLATE 36

FIGURES 1–4. *Koninckopora inflata* (de Koninck) (p. 103).

1. Univ. Montréal 204/8, Joe Mountain section, 3,750 ft below the top of the section (× 97) Alapah stone, Zone 13, Middle Viséan, St. Louis equivalent.
2. USNM 179480, Itkillik Lake section, 875 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
3. USNM 179481, Cirque section, 1,760 ft below the top of the section (× 25) Kogruk Formation, Zone 13 or 14?, late Middle or early Late? Viséan, St. Louis equivalent.
4. USNM 179482, Cirque section, 1,730 ft below the top of the section (× 25) Kogruk Formation, Zone 13 or 14? late Middle or early Late Viséan, St. Louis? equivalent.

5. *Koninckopora tenuiramosa* Wood (p. 103).

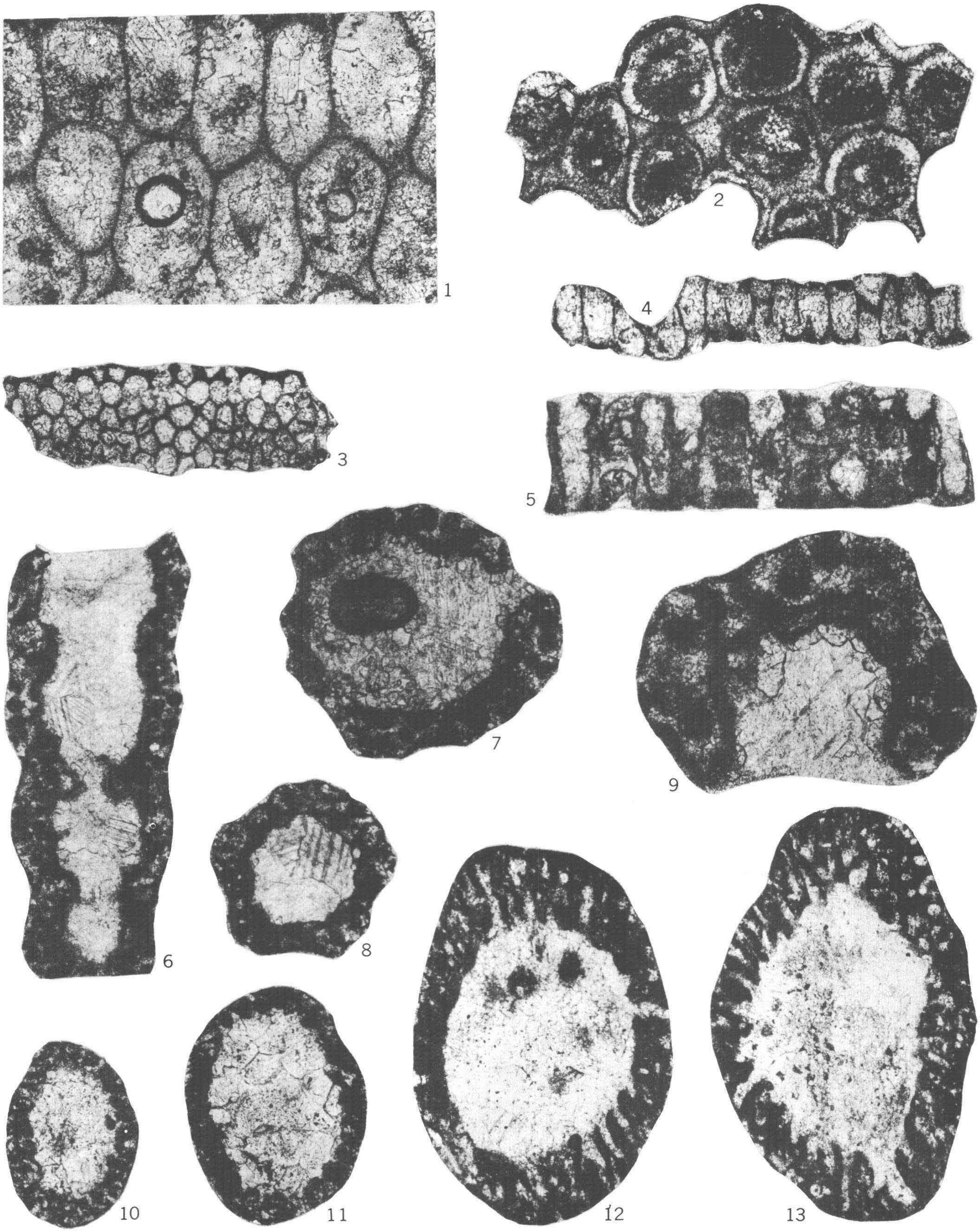
5. USNM 179483, Itkillik Lake section, 857 ft below the top of the section (× 40) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

6–9. *Sphinctoporella lisburnensis* Mamet and Rudloff (p. 104).

6. USNM 179484, same as figure 5.
7. USNM 179485, same as figure 5, but (× 97).
8. USNM 179486, same as figure 5.
9. USNM 179487, same as figure 5, but (× 63).

10–13. *Yukonella bamberi* Mamet and Rudloff (p. 104).

10. Univ. Montréal 204/13, Joe Mountain section, 3,750 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
11. Univ. Montréal 204/16, same as figure 10.
12. Univ. Montréal 203/13, same as figure 10.
13. Univ. Montréal 204/17, same as figure 10, but (× 63).

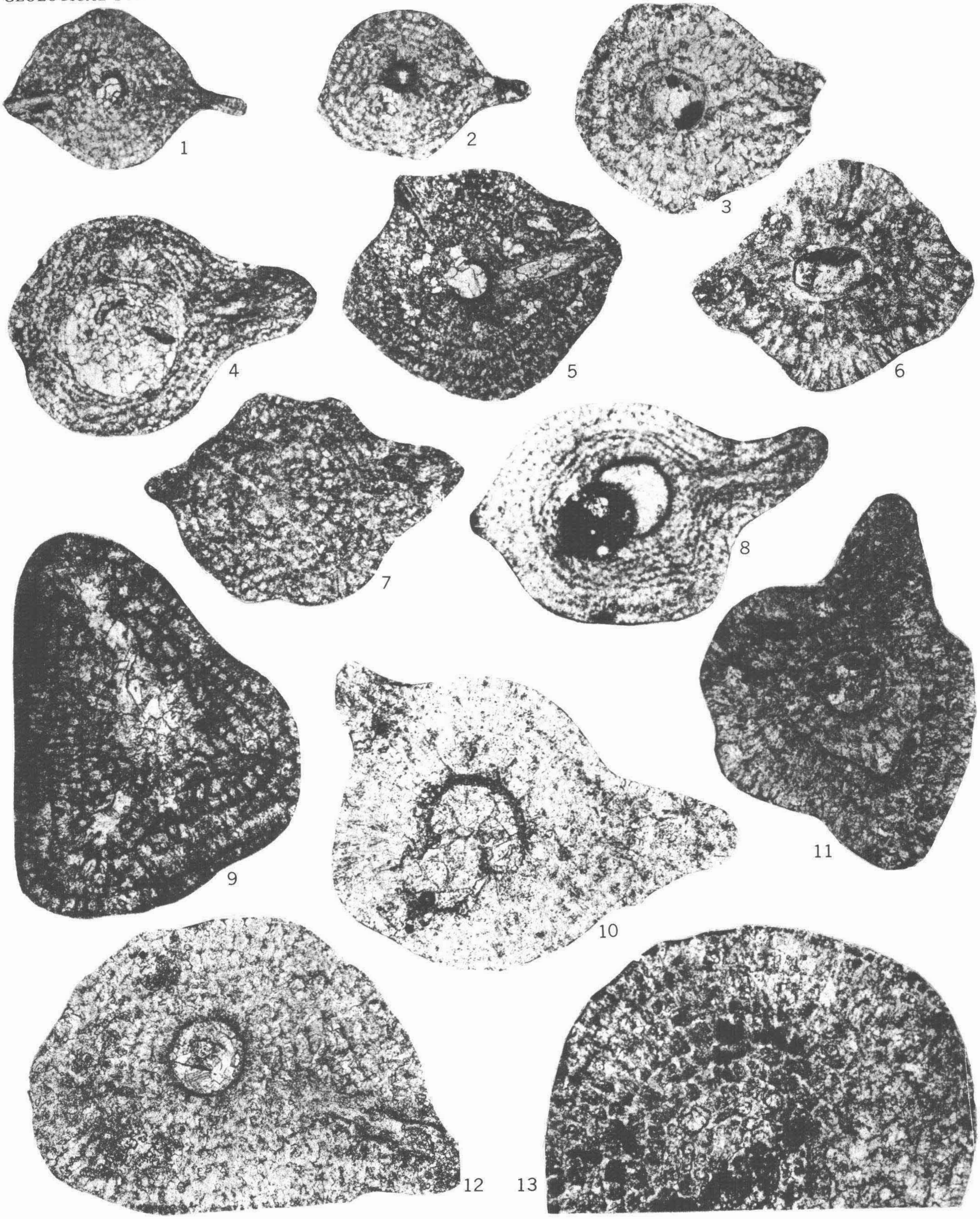



*KONINCKOPORA*, *SPHINCTOPORELLA*, AND *YUKONELLA*

## PLATE 37

FIGURES 1–13. *Stacheia*? *skimoensis* Mamet and Rudloff. (p. 105).

1. USNM 179488, Cirque section, 1,490 ft below the top of the section (× 40) Kogruk Formation, Zone 13 or 14, late Middle or early Late Viséan, St. Louis? equivalent.
2. USNM 179489, Cirque section, 1,510 ft below the top of the section (× 40) Kogruk Formation, Zone 13? or 14, late Middle or early Late? Viséan, St. Louis? equivalent.
3. USNM 179490, West Sadlerochit Mountain section, 995 ft below the top of the section (× 40) Alapah Limestone, Zone $16_{sup}$, Late Viséan, lower Chester equivalent.
4. USNM 179491, Cape Lewis section, 3,047 ft below the top of the section (× 30) Nasorak Formation, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.
5. USNM 179492, same as figure 1.
6. USNM 179493, Skimo Creek section, 2,740 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
7. USNM 179494, Skimo Creek section, 1,305 ft below the top of the section (× 30) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.
8. USNM 179495, Cape Lewis section, 2,886 ft below the top of the section (× 30) Nasorak Formation, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.
9. USNM 179496, Shainin Lake section, 1,876 ft below the top of the section (× 73) Wachsmuth Limestone, Zone 11?, Early Viséan?, Salem equivalent.
10. USNM 179497, Skimo Creek section, 2,740 ft below the top of the section (× 63) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
11. Univ. Montréal 206/8, Echooka River section (× 63) Alapah Limestone, undetermined Late Viséan zone, probable lower Chester equivalent.
12. USNM 179498, Skimo Creek section, about 1,250 ft below the top of the section (× 63) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.
13. USNM 179499, Itkillik Lake section, about 990 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.




*STACHEIA*?

## PLATE 38

FIGURE 1. *Stacheia*? *skimoensis* Mamet and Rudloff (p. 105).
USNM 179500, Skimo Creek section, 2,225 ft below the top of the section (× 30) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

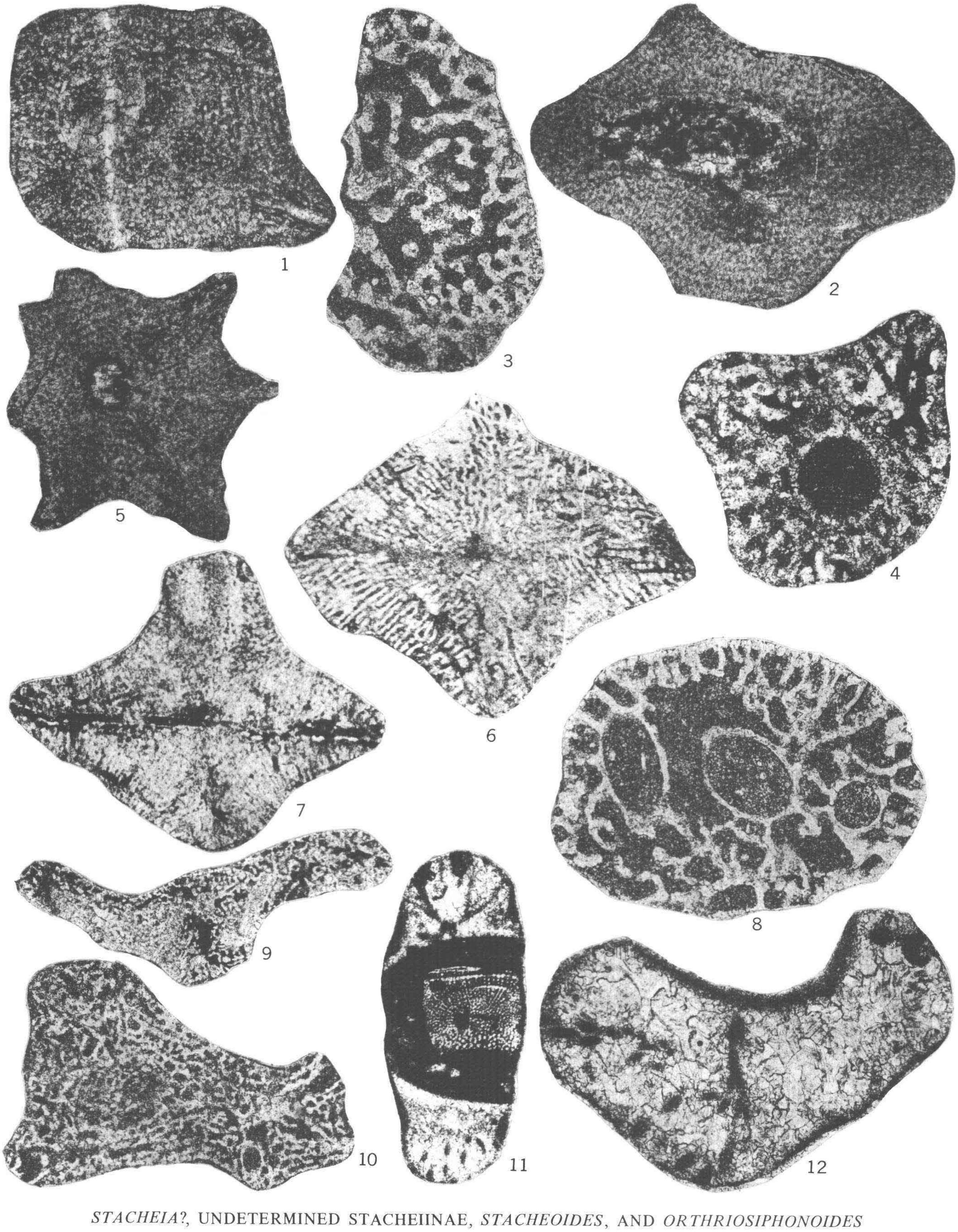
2. *Stacheia*? sp.
USNM 179501, Skimo Creek section, 1,950 ft below the top of the section (× 30) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

3, 4. *Stacheoides*? *meandriformis* Mamet and Rudloff (p. 106).
3. USNM 179502, West Sadlerochit Mountain section, 150 ft below the top of the section (× 97) top of Alapah Limestone? or base of the Wahoo Limestone, Zone 18 or younger, Middle Namurian or younger, probable upper Chester equivalent or younger.
4. USNM 179503, Shainin Lake section, 790 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

5–7. Undetermined Stacheiinae (p. 106).
5. USNM 179504, Skimo Creek section, 1,955 ft below the top of the section (× 30) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
6. Univ. Montréal 203/32, Joe Mountain section, 3,775 ft below the top of the section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
7. USNM 179505, Itkillik Lake section, 975 ft below the top of the section (× 30) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

8–10. *Stacheoides tenuis* Petryk and Mamet (p. 106).
8. USNM 179506, same as figure 3.
9. USNM 179507, Sadlerochit Mountain section, about 650 ft below the top of the section (× 25) Alapah Limestone, Zone 18, Early Namurian, upper Chester equivalent.
10. USNM 179508, Shainin Lake section, 790 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

11, 12. *Orthriosiphonoides salterensis* Petryk in Petryk and Mamet (p. 104).
11. USNM 179509, Shainin Lake section, 805 ft below the top of the section (× 40) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
12. USNM 179937, Itkillik Lake section, 857 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.




*STACHEIA*?, UNDETERMINED STACHEIINAE, *STACHEOIDES*, AND *ORTHRIOSIPHONOIDES*

## PLATE 39

FIGURE 1. *Stylocodium* sp. (p. 109).
USNM 179941, Sunset Pass section, 120 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.

2. *Girvanella problematica* Nicholson and Etheridge (=*Girvanella ducii* Wethered) (p. 108).
USNM 179942, Cirque section, 1,760 ft below the top of the section (× 97) Kogruk Formation, Zone 13 or 14?, late Middle or early Late? Viséan, St. Louis equivalent.

3. *Solenopora dionantina* Pia (p. 107).
Univ. Montréal 204/31, Shainin Lake section, about 2,870 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

4. *Eovolutina elementata* Antropov (p. 111).
USNM 179943, Trail Creek section, about 1,287 ft below the top of the section (× 119) Kogruk Formation, undertermined Viséan zone, undetermined Meramec equivalent.

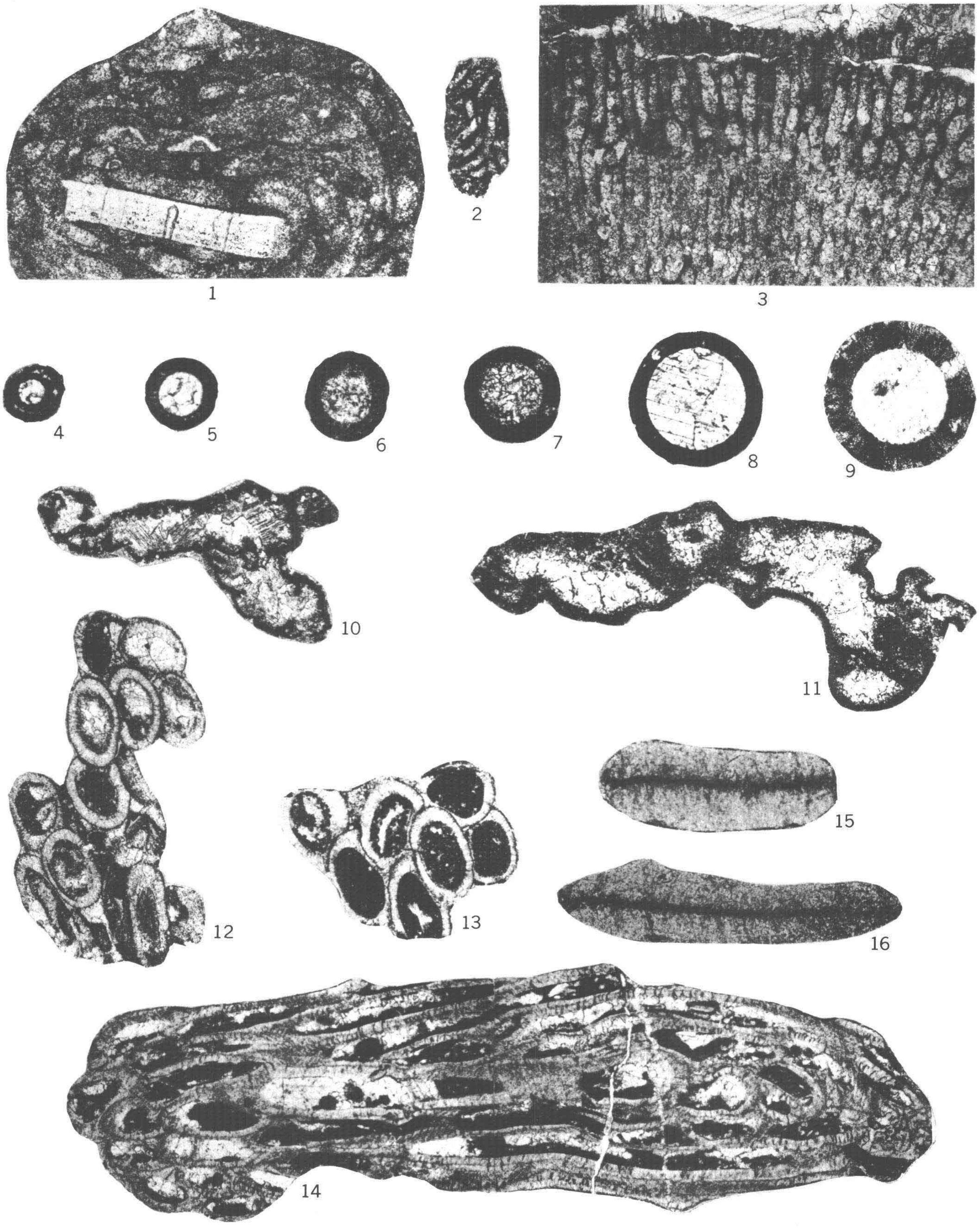
5–7. *Calcisphaera laevis* Williamson
5. USNM 179944, Itkillik Lake section, 3,160 ft below the top of the section (× 119) Wachsmuth Limestone, Zone 8, Late Tournaisian, Osage equivalent.
6. USNM 179945, Itkillik Lake section, 865 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
7. USNM 179946, Itkillik Lake section 2,890 ft below the top of the section (× 119) Wachsmuth Limestone, Zone 9, Late Tournaisian, upper Osage equivalent.

8, 9. *Calcisphaera pachysphaerica* (Pronina) (p. 110).
8. USNM 179947, Itkillik Lake section, 1,067 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
9. USNM 179948, West Echooka River section, base of the section (× 119) Alapah Limestone, Zone 14, Late Viséan, St. Louis equivalent.

10, 11. *Paracaligelloides*? *obicus* Bogush *in* Bogush, Bushmina, and Domnikova (p. 112).
10. USNM 179949, Itkillik Lake section, about 840 ft below the top of the section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
11. USNM 179950, Shainin Lake section, 801 ft below the top of the section (× 63) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

12–14. *Asphaltina cordillerensis* Mamet *in* Petryk and Mamet (p. 109).
12. USNM 179938, Ikiakpuk River section, 530 ft below the top of the section (× 25) Alapah Limestone, Zone 17? or 18?, Early Namurian, middle or upper Chester equivalent.
13. USNM 179939, West Sadlerochit Mountain section, 252 ft below the top of the section (× 25) Alapah Limestone?, Zone 18 or younger, Early Namurian or younger, upper Chester equivalent.
14. USNM 179940, West Sadlerochit Mountain section, 58 ft below the top of the section (× 25) Wahoo Limestone, Zone 20, Morrow equivalent.

15–16. Coral wall debris.
15. West Sadlerochit Mountain section, 1,195 ft below the top of the section (× 97) Alapah Limestone, Zone $16_{inf}$, Late Viséan, lower Chester equivalent.
16. Same as figure 15.



*STYLOCODIUM*, *GIRVANELLA*, *SOLENOPORA*, *EOVOLUTINA*, *CALCISPHAERA*, *PARACALIGELLOIDES*?, *ASPHALTINA*, AND CORAL WALL DEBRIS