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

GEOLOGICAL SURVEY PROFESSIONAL PAPER 849

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

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

GEOLOGICAL SURVEY PROFESSIONAL PAPER 849

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

UNITED STATES DEPARTMENT OF THE INTERIOR

CECIL D. ANDRUS, *Secretary*

GEOLOGICAL SURVEY

V. E. McKelvey, *Director*

Library of Congress Cataloging in Publication Data

Armstrong, Augustus K
Carboniferous microfacies, microfossils, and corals, Lisburne Group, Arctic Alaska.

(Geological Survey professional paper; 849)
Bibliography: p.
Includes index.
1. Geology, Stratigraphic—Carboniferous. 2. Foraminifera, Fossil. 3. Algae, Fossil. 4. Corals, Fossil. 5, Geology—Alaska—Brooks Range. 6. Geology—Yukon Territory. I. Mamet, Bernard L., joint author. II. Title. III. Series: United States. Geological Survey. Professional paper ; 849.
QE671.A73 560'.172 76-25478

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402
Stock Number 024-001-02980-4

CONTENTS

	Page
Abstract	1
Introduction	1
Acknowledgments	1
Previous work	2
Geographic setting	4
Geologic setting	5
Carboniferous rock outcrops of the Brooks Range	5
Carbonate microfacies	8
Rugose corals	9
Regional relations of coral faunas in the Lisburne Group	14
Foraminiferal and algal microbiota	14
Foraminiferal zones	15
Late Tournaisian (middle to upper Osage age equivalent)	15
Early Viséan (lower and middle Salem age equivalent)	15
Middle Viséan (upper Salem and lower St. Louis age equivalent)	16
Early Late Viséan Zones 14 and 15 (St. Louis and Ste. Genevieve age equivalent)	16
Late late Viséan Zones 16_{inf} and 16_{sup} (lower Chester age equivalent)	17
Early Namurian Zones 17 and 18 (middle and upper Chester age equivalent)	17
Middle Namurian Zone 19 (uppermost Chester age equivalent)	18
Late Namurian and Early Westphalian Zones 20 and 21 (Morrow and Atoka age equivalent)	18
Zonal integrity	18
Diachronism	19
Systematic paleontology	19
Phylum Protozoa?	19
Order Foraminiferida?	19
Family Parathuramminidae Bykova 1955	19
Genus *Vicinesphaera* Antropov 1950	19
Vicinesphaera sp	20
Genus *Parathurammina* Suleimanov 1945	20
Parathurammina of the group *P. spinosa* (Williamson 1881)	22
Parathurammina of the group *P. cushmani* Suleimanov 1945	22
Parathurammina of the group P. *suleimanovi* Lipina 1950	22
Family Tuberitinidae Mikluko-Maklai 1958	23
Genus *Eotuberitina* Mikluko-Maklai 1958	23
Eotuberitina reitlingerae Mikluko-Maklai 1958	23
Systematic paleontology—Continued	
Phylum Protozoa	24
Order Foraminiferida	24
Family Earlandiidae Cummings 1955	24
Genus *Earlandia* Plummer 1930	24
Earlandia of the group *E. elegans* (Rauzer-Chernoussova and Reitlinger 1937)	25
Earlandia of the group *E. moderata* (Malakhova 1954)	26
Earlandia of the group *E. clavatula* (Howchin 1888)	26
Earlandia of the group *E. vulgaris* (Rauzer-Chernoussova and Reitlinger 1937)	26
Genus *Earlandinella* Cummings 1955	27
Earlandinella sp	27
Family Pseudoammodiscidae Conil 1970	27
Genus *Pseudoammodiscus* Conil 1970	27
Pseudoammodiscus volgensis (Rauzer-Chernoussova 1948)	28
Pseudoammodiscus priscus (Rauzer-Chernoussova 1948)	28
Genus *Brunsia* Mikhailov 1939	28
Brunsia of the group *B. pulchra* Mikhailov 1939	29
Brunsia of the group *B. lenensis* Bogush and Yuferev 1966	30
Brunsia of the group *B. irregularis* (von Möller 1879)	30
Family Archaediscidae Cushman 1928	31
Genus *Propermodiscus* Mikluko-Maklai 1953	31
Propermodiscus sp	31
Genus *Planoarchaediscus* Mikluko-Maklai 1953	32
Planoarchaediscus spirillinoides (Rauzer-Chernoussova 1948)	32
Genus *Archaediscus* Brady 1873	33
Archaedisdus of the group *A. krestovnikovi* Rauzer-Chernoussova 1948	35
Archaediscus krestovnikovi Rauzer-Chernoussova 1948	35
Archaediscus koktjubensis Rauzer-Chernoussova 1948	36
Archaediscus of the group *A. chernoussovensis* Mamet 1966	37
Archaediscus of the group *A. moelleri* Rauzer-Chernoussova 1948	37
Archaediscus approximatus Ganelina 1956	38

Page

Systematic paleontology—Continued
Phylum Protozoa—Continued
Order Foraminiferida—Continued
Family Archaediscidae—Continued
Genus *Archaediscus* Brady 1873—Continued
Archaediscus? (Group unknown) 38
Archaediscus? pachytheca Petryk 1971 38
Genus *Neoarchaediscus* Mikluko-Maklai 1956 38
Neoarchaediscus parvus (Rauzer-Chernoussova 1948) 39
Neoarchaediscus parvus regularis (Suleimanov 1948) 39
Neoarchaediscus incertus (Grozdilova and Lebedeva 1954) 39
Neoarchaediscus subbaschkiricus grandis (Reitlinger 1950) 40
Genus *Planospirodiscus* Sossipatrova 1962 emend. Mamet 40
Planospirodiscus minimus (Grozdilova and Lebedeva 1953) 41
Planospirodiscus taimyricus Sossipatrova 1962 41
Planospirodiscus sp 41
Genus *Asteroarchaediscus* Mikluko-Maklai 1956 41
Asteroarchaediscus of the group *A. baschkiricus* (Krestovnikov and Teodorovitch 1936) 42
Genus *Quasiarchaediscus* Mikluko-Maklai 1960 43
Quasiarchaediscus? rugosus (Brazhnikova 1964) 43
Family Tournayellidae Dain 1953 43
Genus *Glomospiranella* Lipina in Dain 1953 43
Glomospiranella sp 44
Genus *Septaglomospiranella* Lipina 1955 44
Septaglomospiranella of the group *S. chernoussovensis* new name Mamet 45
Genus *Rectoseptaglomospiranella* Reitlinger 1961 45
Rectoseptaglomospiranella nalivkini (Malakhova 1956) 46
Genus *Tournayella* Dain 1953 46
Tournayella discoidea Dain 1953 47
Genus *Carbonella* Dain 1953 47
Carbonella spectabilis Dain 1953 48
Genus *Septatournayella* Lipina 1955 48
Septatournayella pseudocamerata Lipina in Lebedeva 1954 49
Family Forschiidae Dain 1953 49
Genus *Eoforschia* Mamet in Mamet, Mikhailov, and Mortelmans 1970 49
Eoforschia of the group *E. moelleri* (Malakhova in Dain 1953) 50

Page

Systematic paleontology—Continued
Phylum Protozoa—Continued
Order Foraminiferida—Continued
Family Endothyridae? Brady 1884 50
Genus *Latiendothyra* Lipina 1963 50
Latiendothyra of the group *L. parakosvensis* (Lipina 1955) 52
Latiendothyra kosvensis (Lipina in Grozdilova and Lebedeva 1954) 52
Latiendothyra? sp 52
Family Endothyridae Brady 1884 53
Genus *Endothyranella* Galloway and Harlton 1930 53
Endothyranella recta (Brady 1876) 53
Endothyranella sp 54
Genus *Inflatoendoendothyra* Vdovenko 1972 54
Inflatoendothyra of the group *I. multicamerata* (Lipina 1955) 54
Genus *Priscella* Mamet 1974 55
Priscella prisca (Rauzer-Chernoussova and Reitlinger 1936) 56
Priscella devexa (Rauzer-Chernoussova 1948) 56
Genus *Planoendothyra* Reitlinger in Rauzer-Chernoussova and Fursenko 1959 57
Planoendothyra rotayi (Lebedeva 1954) 58
Genus *Endothyra* Phillips 1846? emend. Brady 1876, emend. ICZN 1965 58
Endothyra of the group *E. bowmani* Phillips 1846?, emend. Brady 1876 67
Endothyra bowmani Phillips 1846?, emend. Brady 1876 emend. ICZN 1965 68
Endothyra of the group *E. similis* Rauzer-Chernoussova and Reitlinger in Rauzer-Chernoussova, Beljaev, and Reitlinger 1936 69
Endothyra similis Rauzer-Chernoussova and Reitlinger 1936 69
Endothyra paramosquensis new name Mamet 70
Family Endothyridae? or Globoendothyridae? 70
Transitional form between *Latiendothyra?* and *Globoendothyra?* 70
Family Globoendothyridae Reitlinger 1959 70
Genus *Dainella* in Brazhnikova 1962 70
Dainella anivikensis Mamet n. sp 71

Page

Systematic paleontology—Continued
Phylum Protozoa—Continued
Order Foraminiferida—Continued
Family Globendothyridae Reitlinger 1959—Continued
Genus *Globoendothyra* Reitlinger in Rauzer-Chernoussova and Fursenko 1959 ---- 71
Globoendothyra of the group *G. baileyi* (Hall 1864) ---- 73
Globoendothyra of the group *G. tomiliensis* (Grozdilova in Lebedeva 1954) ---- 74
Globoendothyra paula (Vissarionova 1948) ---- 74
Genus *Skippella* Mamet, 1974 ---- 74
Skippella cf. S. *redwallensis* (Skipp in McKee and Gutschick 1969) ---- 75
Family Endothyranopsidae Reitlinger 1959 ---- 75
Genus *Eoendothyranopsis* Reitlinger and Rostovceva 1966 ---- 75
Eoendothyranopsis of the group *E. spiroides* (Zeller 1957) ---- 76
Eoendothyranopsis spiroides (Zeller 1957) ---- 76
Eoendothyranopsis hinduensis (Skipp in McKee and Gutschick 1969) ---- 77
Eoendothyranopsis of the group *E. rara* (Grozdilova in Lebedeva 1954) ---- 77
Eoendothyranopsis scitula (Toomey 1961) ---- 77
Eoendothyranopsis of the group *E. ermakiensis* (Lebedeva 1954) ---- 78
Eoendothyranopsis ermakiensis (Lebedeva 1954) ---- 78
Eoendothyranopsis? sp ---- 78
Endothyranopsidae? ---- 79
Genus *Endothyranopsis* Cummings 1955 ---- 79
Endothyranopsis compressa (Rauzer-Chernoussova and Reitlinger 1936) ---- 80
Family Pseudoendothyridae Mamet in Mamet, Mikhailov, and Mortelmans 1970 ---- 81
Genus *Pseudoendothyra* Mikhailov 1939 ---- 81
Pseudoendothyra britishensis Ross 1967 ---- 83
Pseudoendothyra ornata Brady 1876 ---- 83
Family Eostaffellidae Mamet in Mamet, Mikhailov, and Mortelmans 1970 ---- 84
Genus *Eostaffella* Rauzer-Chernoussova 1948 ---- 84
Eostaffella of the group *E. radiata* Brady 1876 ---- 86

Page

Systematic paleontology—Continued
Phylum Protozoa—Continued
Order Foraminiferida—Continued
Family Eostaffellidae Mamet in Mamet, Mikhailov, and Mortelmans 1970—Continued
Genus *Zellerina* Mamet in Mamet and Skipp 1970 ---- 87
Zellerina discoidea (Girty 1915) ---- 88
Zellerina designata (Zeller 1953) ---- 88
Family Ozawainellidae Thompson and Foster 1937 ---- 88
Genus *Millerella* Thompson 1942 ---- 88
Millerella pressa Thompson 1944 ---- 90
Millerella aff. *M. carbonica* Grozdilova and Lebedeva 1950 ---- 90
Millerella? sp ---- 91
Family Fusulinidae von Möller 1878 ---- 91
Subfamily Schubertellinae Skinner 1931 ---- 91
Genus *Eoschubertella* Thompson 1937 ---- 91
Eoschubertella? *yukonensis* (Ross 1967) ---- 91
Family Palaeotextulariidae Galloway 1933 ---- 92
Genus *Cribrostomum* von Möller 1879, emend. Eickhoff 1968 ---- 92
Cribrostomum bradyi von Möller 1879 ---- 93
Family undetermined ---- 94
Genus *Volvotextularia* Termier and Termier 1950 ---- 94
Volvotextularia mississippiana (Copper 1947) ---- 94
Family Tetrataxidae Galloway 1933 ---- 94
Genus *Tetrataxis* Ehrenberg 1854 emend. von Möller 1879 ---- 94
Tetrataxis of the group *T. angusta* Vissarionova 1948 ---- 97
Tetrataxis sp ---- 97
Tetrataxis of the group *T. conica* Ehrenberg emend von Möller 1879 ---- 97
Tetrataxis quasiconica Brazhnikova 1956 ---- 98
Tetrataxis media Vissarionova 1948 ---- 98
Genus *Monotaxinoides* Brazhnikova and Yartseva 1956 ---- 99
Monotaxinoides multivolutus (Reitlinger 1949) ---- 99
Family Biseriamminidae ---- 100
Genus *Biseriella* Mamet 1974 ---- 100
Biseriella of the group *B. parva* (Chernysheva 1948) ---- 100
Genus *Globivalvulina* Schubert 1921 ---- 101
Globivalvulina of the group *G. bulloides* Brady 1876 ---- 102

Page

Systematic paleontology—Continued
Phylum Chlorophycophyta Papenfuss 1946 ---- 102
Family Dasycladaceae Kützing 1843 orth. mut. Stizenberger 1860 ---- 102
Genus *Koninckopora* Lee 1912, emend. Wood 1942 ---- 102
Koninckopora inflata (de Koninck 1842) ---- 103
Koninckopora tenuiramosa Wood 1942 ---- 103
Genus *Sphinctoporella* Mamet and Rudloff 1972 ---- 103
Sphinctoporella lisburnensis Mamet and Rudloff 1972 ---- 104
Family Dasycladaceae? Kützing 1843 or Codiaceae? (Trevisan)) Zanardini 1843 ---- 104
Genus *Orthriosiphonoides* Petryk in Petryk and Mamet 1972 ---- 104
Orthriosiphonoides salterensis Petryk in Petryk and Mamet 1972 ---- 104
Family undetermined ---- 104
Genus *Yukonella* Mamet and Rudloff 1972 ---- 104
Yukonella bamberi Mamet and Rudloff 1972 ---- 104
Phylum Rhodophycophyta Papenfuss 1946 ---- 104
Family Ungdarellaceae Maslov 1956 ---- 104
Subfamily Stacheiinae Loeblich and Tappan 1961 ---- 104
Genus *Stacheia* Brady 1876 ---- 104
Stacheia? skimoensis Mamet and Rudloff 1972 ---- 105
Genus *Stacheoides* Cummings 1955 ---- 105
Stacheoides? meandriformis Mamet and Rudloff 1972 ---- 106
Stacheoides tenuis Petryk and Mamet 1972 ---- 106
Undetermined Stacheiinae ---- 106

Page

Systematic paleontology—Continued
Phylum Rhodophycophyla Papenfuss 1946 —Continued
Family Solenoporaceae Pia 1927 ---- 106
Genus *Solenopora* Dybowski 1878 ---- 106
Solenopora dionantina Pia 1937 ---- 107
Phylum Schizophyta (Falkenberg) Engler 1892 or Chlorophycophyta Papenfuss 1946? ---- 107
"Section" Porostromata Pia 1927 ---- 107
Genus *Girvanella* Nicholson and Etheridge 1878 ---- 107
Girvanella problematica Nicholson and Etheridge 1878 (=*Girvanella ducii* Wethered 1890) ---- 108
Genus *Stylocodium* Derville 1931 ---- 108
Stylocodium sp ---- 109
Undetermined algal phylum ---- 109
Family undetermined ---- 109
Genus *Asphaltina* Mamet in Petryk and Mamet 1972 ---- 109
Asphaltina cordillerensis Mamet in Petryk and Mamet 1972 ---- 109
Algal spore cases ---- 109
"Calcispheres" ---- 109
Genus *Calcisphaera* Williamson, 1881, emend. Andrews 1955 ---- 109
Calcisphaera laevis Williamson 1881 ---- 110
Calcisphaera pachysphaerica (Pronina 1963) ---- 111
Incertae sedis ---- 111
Genus *Eovolutina* Antropov 1950 ---- 111
Eovolutina elementata Antropov 1950 ---- 111
Genus *Paracaligelloides* Reitlinger in Tchuvashov 1965 ---- 112
Paracaligelloides? obicus Bogush in Bogush, Bushmina, and Domnikova 1970 ---- 112
Locations of stratigraphic sections ---- 113
References cited ---- 116
Index ---- 131

ILLUSTRATIONS

[Plates 1–39 follow index; plates 40–47 are in pocket]

PLATES 1–25. Photomicrographs of—
1. Joe Mountain section, Canada.
2. Egaksrak River section 68A–5, Romanzof Mountains.
3. Old Man Creek sections 69A–4 and 69A–4K, Romanzof Mountains and Sunset Pass section 68A–4A/4B, Sadlerochit Mountains.
4. Sunset Pass section 68A–4A/4B, Sadlerochit Mountains.
5. West Sadlerochit Mountains section 69A–1.
6. West Sadlerochit Mountains section 69A–1.
7. West Sadlerochit Mountains section 69A–1 and Sadlerochit Mountains section 68A–3.
8. Sadlerochit Mountains section 68A–3.
9. Ikiakpuk section 68A–1, Franklin Mountains, and West Echooka River section 60E–1 to 72.
10. Echooka River section 60E–601 to 690, Philip Smith Mountains.
11. Itkillik Lake section 60C–1 to 72, Endicott Mountains.
12. Itkillik Lake section 60C–1 to 72, Endicott Mountains.
13. Itkillik Lake section 60C–1 to 72, Endicott Mountains.

PLATES 1–25—Continued

14. Itkillik Lake section 60C–1 to 72, Endicott Mountains.
15. Itkillik Lake section 60C–1 to 72, Endicott Mountains.
16. Shainin Lake sections W–77 to 134 and W–235 to 247, Endicott Mountains.
17. Shainin Lake sections W–77 to 134 and W–235 to 247, Endicott Mountains.
18. Shainin Lake sections W–77 to 134 and W–235 to 247, Endicott Mountains.
19. Anivik Lake section W-1 to 42 and Skimo Creek section W–138 to 200, Endicott Mountains.
20. Skimo Creek section W–138 to 200, Endicott Mountains.
21. Skimo Creek section W-138 to 200, Endicott Mountains.
22. Skimo Creek section W-138 to 200, Endicott Mountains, and Cirque section 62C–15, De Long Mountains.
23. Cirque section 62C–15, De Long Mountains, and Trail Creek section 60A–400 to 403, De Long Mountains.
24. North Niak Creek section 68A–12, South Niak Creek section 68–13, and Cape Lewis section 68A–9 to 11 Lisburne Peninsula.
25. Cape Lewis 68A–9 to 11, Lisburne Peninsula.

26. *Vicinesphaera* sp., *Parathurammina* of the group *P. spinosa* (Williamson), *Parathurammina* of the group *P. cushmani* Suleimanov, *Parathurammina* of the group *P. suleimanovi* Lipina, *Eotuberitina reitlingerae* Mikluko-Maklai, *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova and Reitlinger), *Earlandia* of the group *E. moderata* (Malakhova), *Earlandia* of the group *E. clavatula* (Howchin), *Earlandinella* sp., *Pseudoammodiscus volgensis* (Rauzer-Chernoussova), *Pseudoammodiscus priscus* (Rauzer-Chernoussova), *Brunsia* of the group *B. pulchra* Mikhailov, *Brunsia* of the group *B. lenensis* Bogush and Yuferev, and *Brunsia* of the group *B. irregularis* (von Möller).

27. *Propermodiscus* sp., *Planoarchaediscus spirillinoides* (Rauzer-Chernoussova), *Archaediscus* of the group *A. krestovnikovi* Rauzer-Chernoussova, *Archaediscus*? *pachytheca* Petryk, *Archaediscus* of the group *A. chernoussovensis* Mamet *in* Mamet, Choubert, and Hottinger, *Archaediscus approximatus* Ganelina, *Neoarchaediscus parvus* (Rauzer-Chernoussova), *Neoarchaediscus parvus regularis* (Rauzer-Chernoussova), *Neoarchaediscus incertus* (Grozdilova and Lebedeva), *Neoarchaediscus subbaschkiricus grandis* (Reitlinger), *Planospirodiscus minimus* (Grozdilova and Lebedeva), *Planospirodiscus taimyricus* Sossipatrova, *Planospirodiscus* sp., *Asteroarchaediscus* of the group *A. baschkiricus* (Krestovnikov and Teodorovitch), and *Quasiarchaediscus*? *rugosus* (Brazhnikova).

28. *Glomospiranella* sp., *Septaglomospiranella* of the group *S. chernoussovensis* Mamet, new name, *Rectoseptaglomospiranella nalivkini* (Malakhova), *Tournayella discoidea* Dain, *Carbonella spectabilis* Dain, *Septatournayella pseudocamerata* Lipina *in* Lebedeva, and *Eoforschia* of the group *E. moelleri* (Malakhova *in* Dain).

29. *Priscella prisca* (Rauzer-Chernoussova), *Priscella devexa* (Rauzer-Chernoussova), *Latiendothyra* of the group *L. parakosvensis* (Lipina), *Endothyranella recta* (Brady), *Endothyranella* sp., *Latiendothyra* sp., *Latiendothyra kosvensis* (Lipina), and *Inflatoendothyra* of the group *I. multicamerata* (Lipina).

30. *Skippella redwallensis* (Skipp *in* McKee and Gutschick), *Planoendothyra rotayi* (Lebedeva), and *Eoendothyranopsis* of the group *E. spiroides* (Zeller).

31. Endothyranopsidae? *Eoendothyranopsis* of the group *E.rara* (Grozdilova *in* Lebedeva), *Eoendothyranopsis* of the group *E. ermakiensis* (Lebedeva), *Eoendothyranopsis*? sp., and *Endothyra* of the group *E. bowmani* Phillips emend. Brady.

32. *Endothyra paramosquensis* Mamet, new name, *Endothyra* of the group *E. similis* Rauzer-Chernoussova and Reitlinger, transitional form between *Latiendothyra*? sp. and *Globoendothyra*? sp., *Globoendothyra* of the group *G. baileyi* (Hall), and *Globoendothyra* of the group *G. tomiliensis* (Grozdilova *in* Lebedeva).

33. *Dainella anivikensis* n. sp. Mamet.

34. *Globoendothyra paula* (Vissarionova), *Endothyranopsis compressa* (Rauzer-Chernoussova and Reitlinger), *Zellerina discoidea* (Girty), *Zellerina designata* (Zeller), *Millerella* aff. *M. carbonica* Grozdilova and Lebedeva, *Millerella*? sp., *Pseudoendothyra ornata* (Brady), and *Pseudoendothyra britishensis* Ross.

35. *Millerella pressa* Thompson, *Eoschubertella*? *yukonensis* (Ross), *Biseriella* of the group *B. parva* (Chernysheva), *Eostaffella* of the group *E. radiata* (Brady), *Globivalvulina* of the group *G. bulloides* (Brady), *Tetrataxis* of the group *T. angusta* Vissarionova, *Tetrataxis* of the group *T. conica* Ehrenberg emend. von Möller, *Tetrataxis media* Vissarionova, *Cribrostomum bradyi* (von Möller), *Monotaxinoides multivolutus* (Reitlinger), and *Volvotextularia mississippiana* (Cooper).

36. *Koninckopora inflata* (de Koninck), *Koninckopora tenuiramosa* (Wood), *Sphinctoporella lisburnensis* Mamet and Rudloff, and *Yukonella bamberi* Mamet and Rudloff.

37. *Stacheia*? *skimoensis* Mamet and Rudloff.

38. *Stacheia*? *skimoensis* Mamet and Rudloff, *Stacheia* sp., *Stacheoides*? *meandriformis* Mamet and Rudloff, undetermined Stacheiinae, *Stacheoides tenuis* Petryk *in* Petryk and Mamet, *Orthriosiphonoides salterensis* Petryk *in* Petryk and Mamet.

39. *Stylocodium* sp., *Girvanella problematica* Nicholson and Etheridge, *Solenopora dionantina* Pia, *Eovolutina elementata* Antropov, *Calcisphaera laevis* Williamson, *Calcisphaera pachysphaerica* (Pronina), *Paracaligelloides*? *obicus* Bogush *in* Bogush, Bushmina, and Domnikova, *Asphaltina cordillerensis* Mamet *in* Petryk and Mamet, and coral wall debris.

PLATE 40. Lithologic stratigraphic correlation chart, Lisburne Group.
41. Stratigraphic correlation chart and carbonate petrography, Lisburne Group.
42. Stratigraphic correlation and distribution of the lithostrotionoid corals within the Lisburne Group.
43. Stratigraphic range of microfossils in the Lisburne Group.
44. Foraminiferal distribution chart for the Archaediscidae.
45. Microfossil distribution chart for the Tournayellidae, Forschiidae and algae.
46. Foraminiferal distribution chart for the Endothyranopsidae and primitive Fusulinaceae.
47. Foraminiferal distribution chart for the Endothyridae, Globoendothyridae, Endothyranopsidae, and Biseriamminidae.

			Page
FIGURE	1.	Index map of arctic Alaska	2
	2.	Lithologic and paleontologic symbols used in this report	4
	3.	Regional correlation diagram for the Lisburne Group	6
	4.	Diagrammatic reconstruction of platform carbonate rocks, Lisburne Group	8
	5.	Idealized carbonate depositional model for the carbonate platform and the distribution of most of the carbonate microfacies, Lisburne Group	10
	6.	Idealized carbonate depositional model showing the distribution of fossils, organic and inorganic particles	12
	7.	Stratigraphic range of lithostrotionoid corals in the Lisburne Group	13
	8.	Location of Egaksrak River section 68A–5	113
	9.	Location of Old Man Creek sections 69A–4 and 69A–4K, Romanzof Mountains	113
	10.	Location of sections 68A–4A, 4B, Sunset Pass, Sadlerochit Mountains	114
	11.	Location of Sadlerochit Mountains section 68A–3	114
	12.	Location of West Sadlerochit Mountains section 69A–1	114
	13.	Location of Ikiakpuk Creek section 68A–1, Franklin Mountains	114
	14.	Location of Echooka River section 60E–601 to 690, Philip Smith Mountains	115
	15.	Location of Itkillik Lake section 60C–1 to 72, Endicott Mountains	115
	16.	Location of Shainin Lake sections W–77 to 135 and W–235 to 244, Anivik Lake section W–1 to 42, and Skimo Creek section W–138 to 200, Endicott Mountains	115
	17.	Location of Trail Creek section 60A–400 to 403, DeLong Mountains	115
	18.	Location of Cirque section 62C–15, DeLong Mountains	116
	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	116

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.

[1] U.S. Geological Survey.
[2] Université de Montréal.

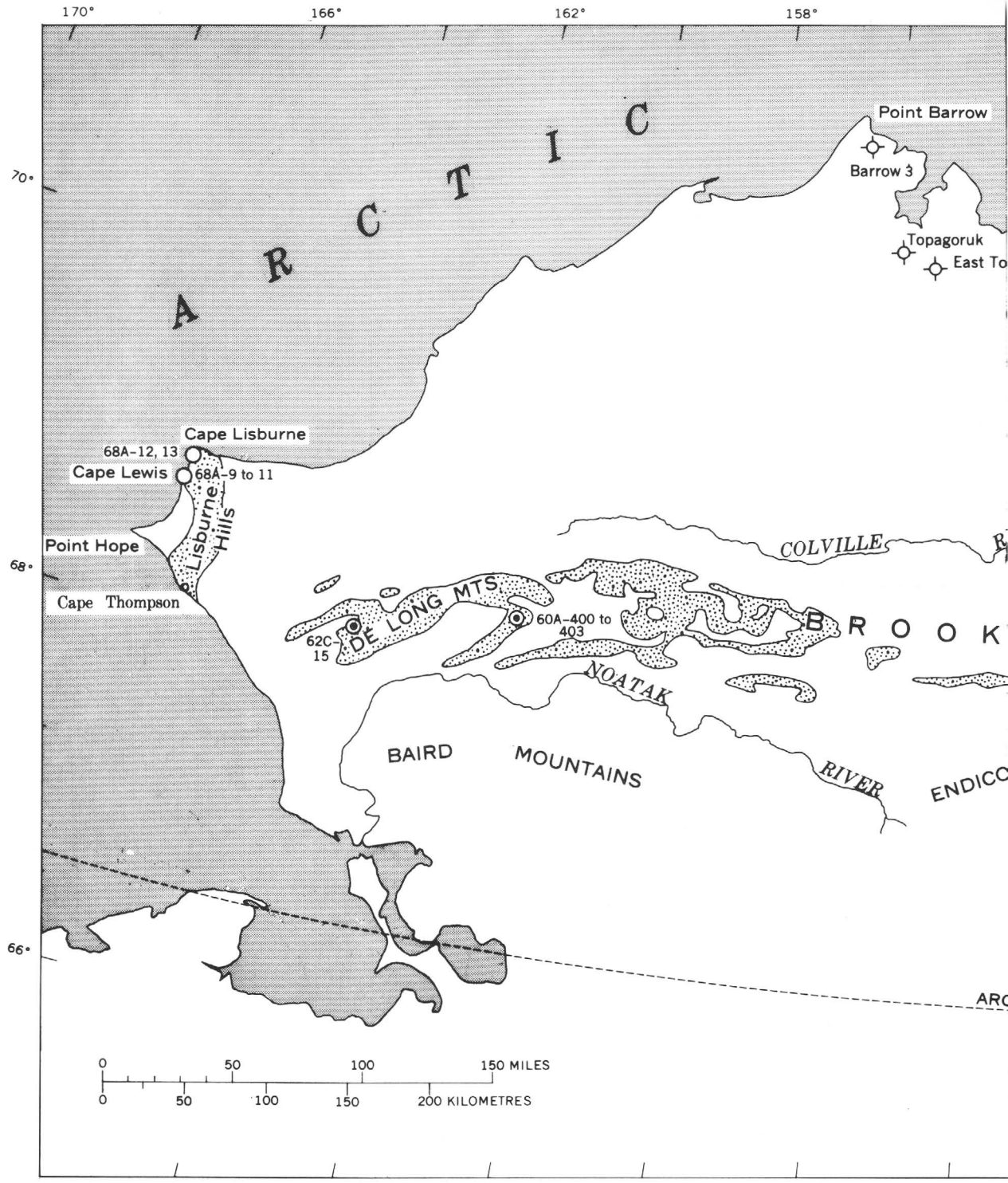


FIGURE 1.—Index map of arctic Alaska and adjacent Canada showing outcrops of Carboniferous

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

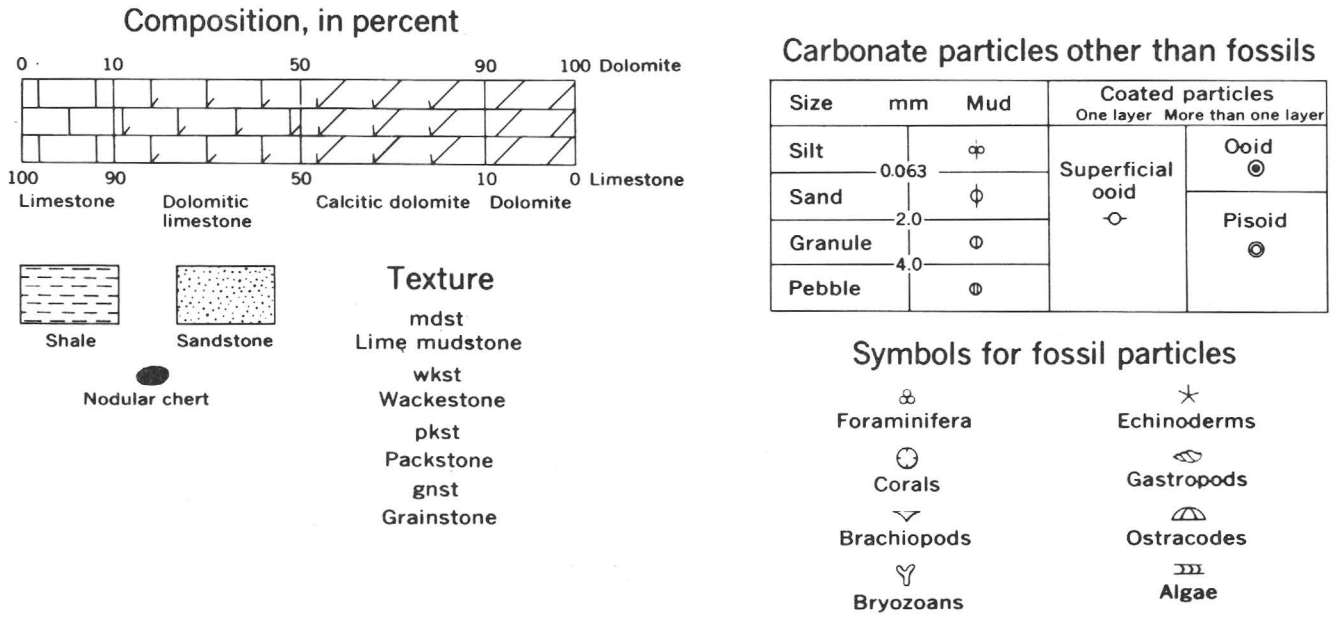


FIGURE 2.—Lithologic and paleontologic symbols used in this report.

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 seacliff 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_{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-

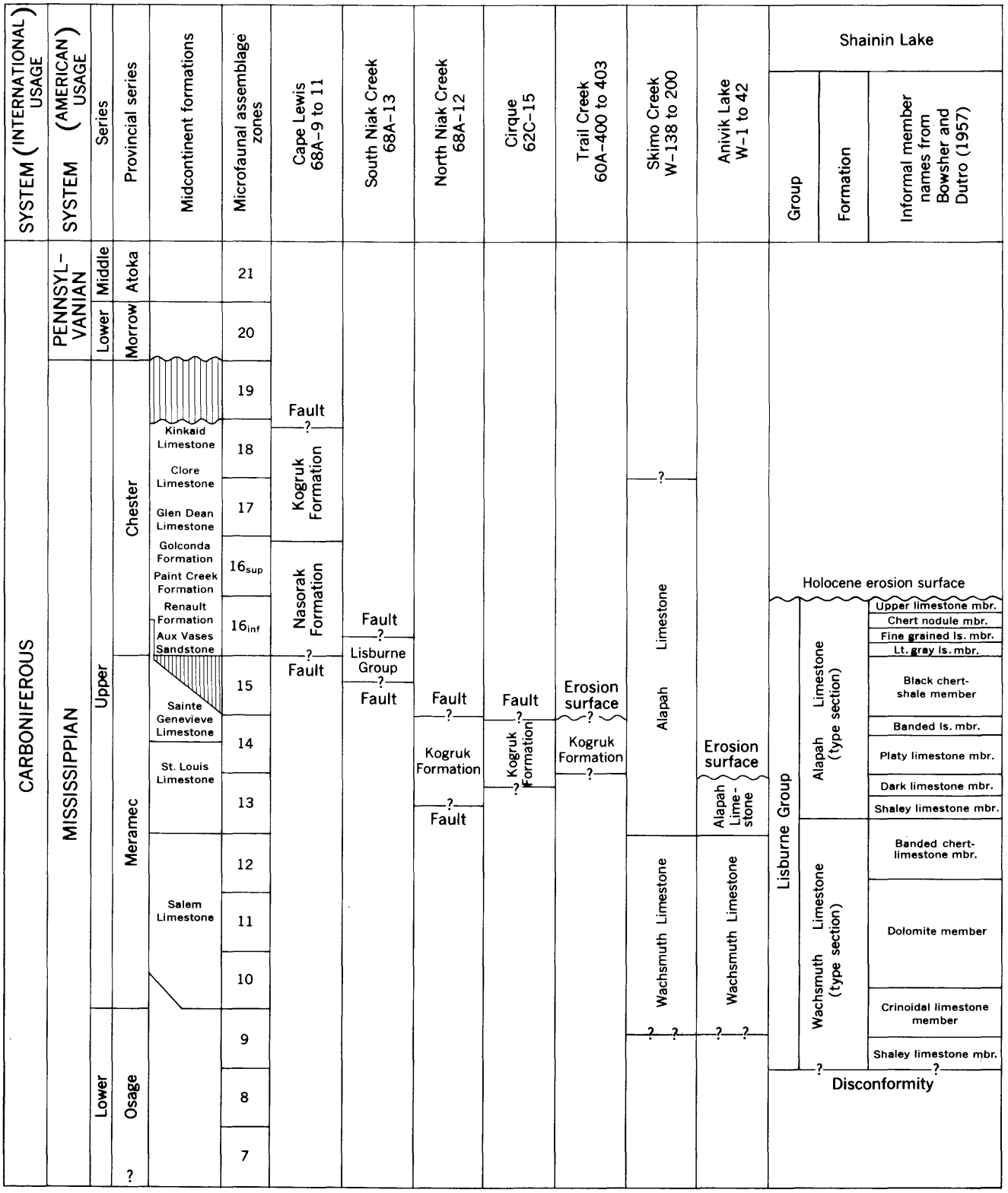


FIGURE 3.—Regional correlation diagram for the Lisburne Group.

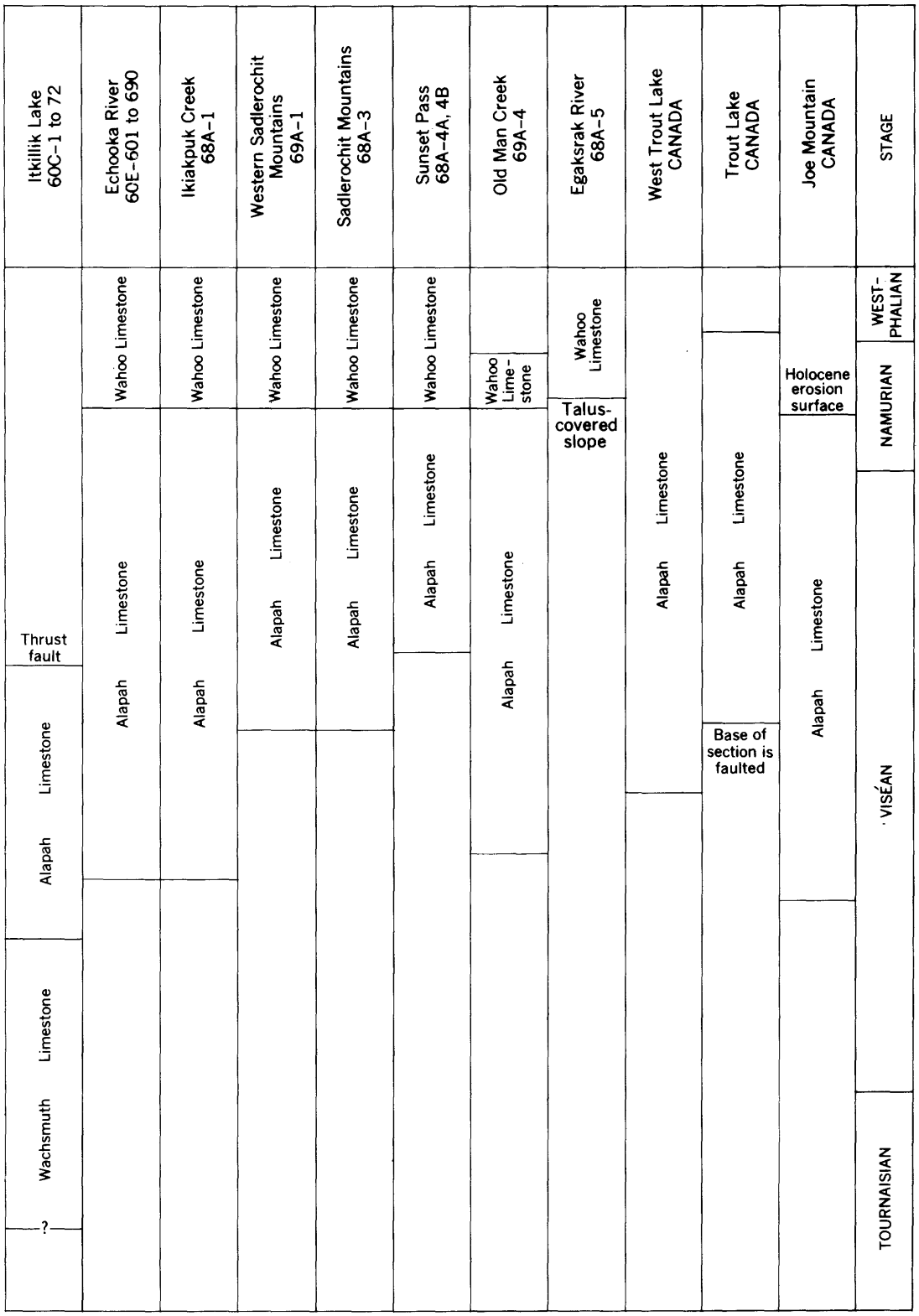


FIGURE 3.—Continued.

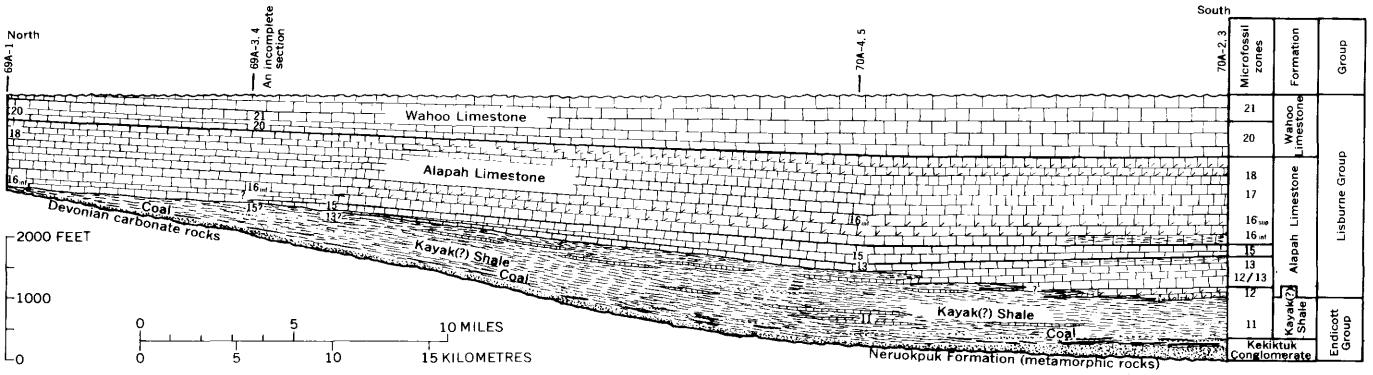


FIGURE 4.—Diagrammatic reconstruction of platform carbonate rocks, Lisburne Group, north-south along the Canning River. See figure 1 for location of section.

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*.

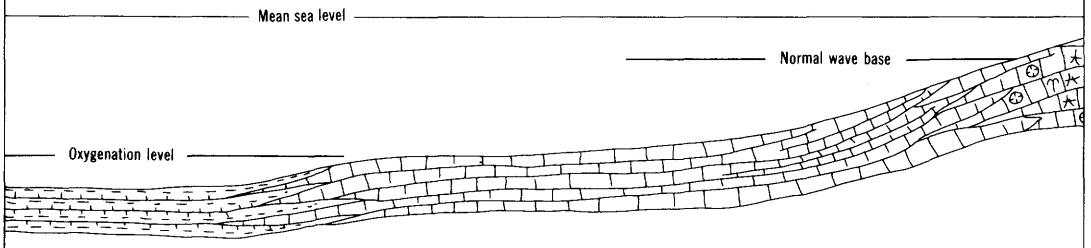
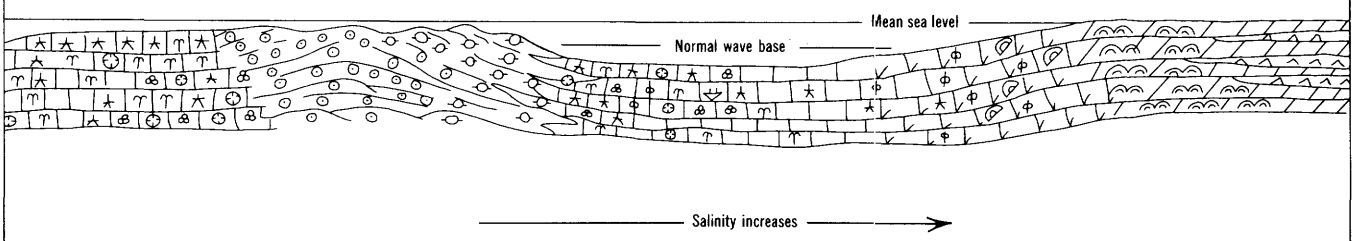
Plate no.	Figure number on plate and the interpreted environment of			
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12		2		
13				
14				
15				
16				
17				
18		8		
19				
20				
21				
22				
23				
24				6 7
25	4	5		3
Diagrammatic cross section Lisburne Group carbonate platform (free of significant terrigenous clastic influx)				
Environment	Basin or euxinic	Tidal shelf	Toe of slope	Foreslope
Lithology	Shales, radiolarian cherts, and siltstones; 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.

8, 1		1, 2, 3, 4, 5, 6, 7		
3	4	3, 5	2 6	
			5 1, 2	8
	3, 4, 5, 6, 7, 8			1, 2
5, 4		8 7	3 6 1, 2	
1, 5, 6, 7, 8		8		
	2, 3, 4		5 7, 8 6	
1 6, 5, 4, 7		4, 7, 8 3		2
4	5, 6, 7	4, 3	1, 2	
4		6, 7, 8		
1, 2, 3, 4, 5, 6, 8		1, 2, 3, 4, 5, 6, 8	7	
1, 6		5, 4	3	
4		5, 6, 7, 8	2, 3	
1, 6, 7, 5, 8		5, 1, 6, 7, 8 4		
8			5	
1, 2, 3, 4, 5, 7		7 1, 2, 3, 4, 5		
1 3, 4, 5, 7, 8		3, 4, 5, 7, 8 2		
1, 2, 3, 4, 5, 6		1, 2, 3, 4, 5, 6 7		
1, 2, 3 4		7, 8		
5, 6, 7, 8, 1, 2		1, 2, 5, 6, 7, 8 4 3		
		5, 6, 7, 8 1, 2, 3, 4		
7, 8, 1		7, 8 2, 3 6	4 5	
1		2, 5, 4, 6, 7, 8, 3		
		4, 3, 1, 2, 5	8	
		1, 2	6 7	



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.

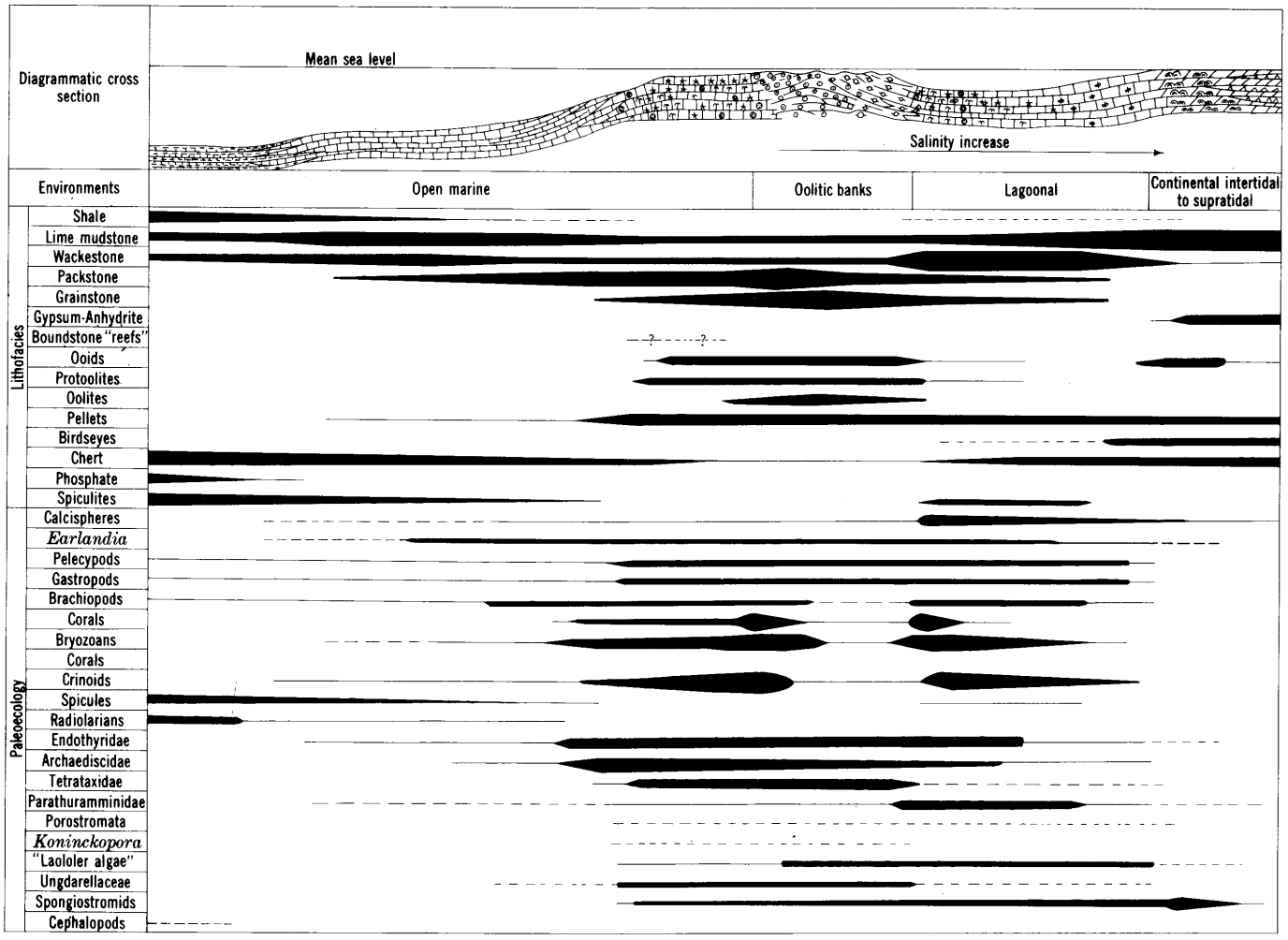


FIGURE 6.—Idealized carbonate depositional model showing the distribution of fossils, organic and inorganic particles. See figure 2 for explanation of symbols. Concept of depositional model modified from Wilson, 1970.

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

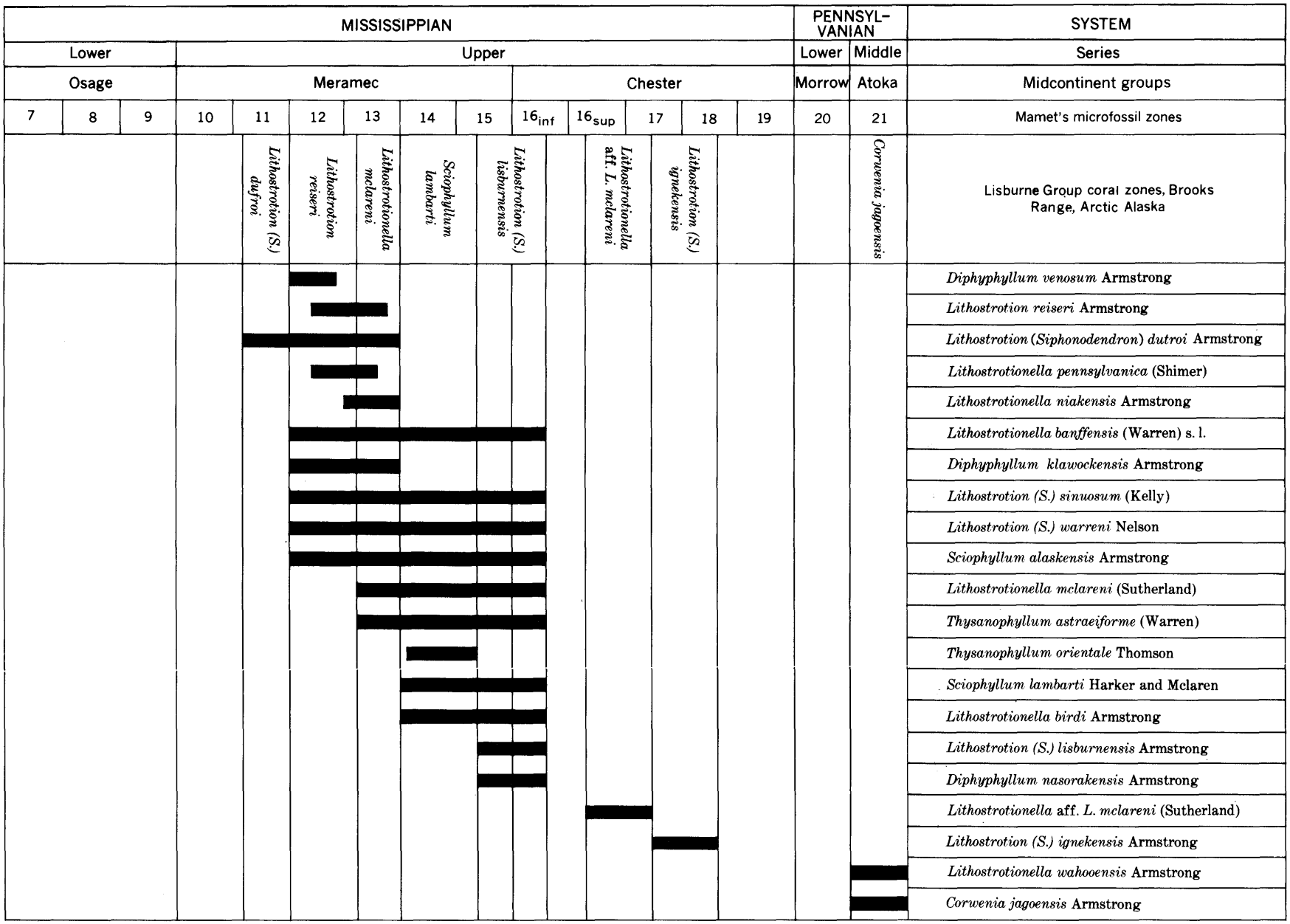


FIGURE 7.—Stratigraphic range of lithostrotionoid corals in the Lisburne Group.

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 $_{inf}$.

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 $15–16_{inf}$ 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 120μ to 200μ in diameter, the most frequent dimensions being 130μ to 140μ. Wall dense, dark, not agglutinated, ranging from 8μ to 20μ.

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 200μ to 350μ, ordinarily 250μ to 300μ in diameter. Wall dark, secreted, microcrystalline, thick, irregular; maximum observed thickness may reach up to 85μ. Spines irregular, thick, long. Canals very thin (3μ to 6μ). 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 150μ hemispherical chamber? and a thin attachment disk. Wall thin, 10μ to 12μ, 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, microcrys-

talline, 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, Uchennye 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 180μ to 220μ. Wall thick, calcareous secreted, one layered, 20μ to 30μ 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, 300μ for three to 550μ for five whorls. Spire expansion rapid. Wall dark, calcareous secreted, microcrystalline, composed of a nonagglutinated tectum; thickness, in last whorl around 10μ.

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 (50μ) followed by evolute, planispirally coiled cylindrical tube. Rate of expansion of spire is small. Diameter of test 170μ to 250μ 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, 300μ to 400μ. Height of tubular chamber, 40μ to 50μ in the last coil. Wall dark, dense, microgranular (tectum); its thickness reaches 14μ to 20μ, 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 250μ to 370μ. Thickness, 100μ to 130μ. Adult forms usually have four volutions, rarely five. Height of tubular chamber 30μ to 65μ. Wall calcareous secreted, dark, microcrystalline, a single tectum, thin, around 10μ to 12μ.

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, 350μ to 650μ for mature forms. Thickness, 80μ to 150μ. Thickness of wall increases from 10μ to 12μ in early coils to 20μ 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 450μ. Thickness 140μ. 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 spirillinoides 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 300μ to 350μ. Thickness 80μ to 100μ. Ratio of diameter to thickness around 0.25. Proloculus small, around 35μ. Height of tubular chamber increases rapidly. Wall thin, dark, microcrystalline, about 10μ, 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 55μ in last whorl. Diameter of test 300μ to 450μ, rarely 500μ. Width 120μ to 170μ. 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 50μ in last whorl. Diameter of test, 300μ to 450μ, rarely as much as 500μ. Width 120μ to 200μ. 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 (60μ to 100μ), followed by three to four whorls, three last ones with constant 30° deviation. Diameter, 350μ to 450μ. Width, 200μ to 300μ. Flanks convex. Height of lumen in last whorl 60μ to 70μ. 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 (50μ and more) followed by three to four whorls of an erratically coiled tubular chamber. Diameter 200μ to 250μ. Width approximately 100μ. 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 200μ to 400μ. Width 60μ to 110μ. Wall thin, ranging from 12μ to 18μ 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 350μ to 450μ, rarely 480μ. Width 150μ to 200μ. Wall bilayered, ranging from 15μ to 20μ 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 180μ to 300μ. Width 80μ to 120μ. 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 160μ to 240μ. Width 80μ to 110μ. 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 300μ to 420μ for average of 2½ whorls. Wall calcareous secreted, unilayered, about 15μ 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 300μ to 450μ. Diameter of uncoiled segment 180μ to 280μ in adult forms. Total length of test as much as 1,000μ. Seven chambers in uniserial segment. Wall thick, 25μ to 45μ, 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 300μ to 450μ for four whorls. Width 120μ to 180μ. Three to six pseudochambers are found per whorl. Wall moderately thick, 15μ to 18μ 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 550μ to 650μ. Width about 250μ. Thickness of wall gradually increases (as much as 30μ 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 700μ to 950μ for adult specimens of 3½ to 5½ whorls. Six to eight chambers in last whorl. Wall calcareous secreted, microcrystalline, one layered, about 25μ to 30μ 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 dia-

phanotheca 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, infrasubspecific)
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 450μ to 800μ 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, 15μ to 20μ.

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 15μ 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 400μ to 550μ for adult specimens of 3½ whorls. Usually six to seven chambers in last whorl. Spire expands rapidly. Wall rather thin, around 12μ 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 200μ. 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 100μ to 140μ. Secondary deposits apparently absent. Wall thin, calcareous, with faint tectoria?, about 10μ. 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, 300μ to 400μ for 3½ whorls, 550μ to 600μ 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 200μ to 360μ. Wall calcareous secreted, microgranular, about 10μ to 12μ 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 300μ to 450μ. Wall calcareous secreted, 15μ to 20μ. 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 Voprosy 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.
1950. *Endothyra* Termier and Termier. Paléontologie marocaine, Invertébrés Ere Primaire, pt. 1, p. 35 [part].
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].
1952. [not] *Endothyra* Chernysheva. VSEGEI Trudy, Paleont. Strat. Ser., no. 16, p. 16.
1952. *Plectogyra* Wray. Jour. Paleontology, v. 26, p. 946–952 [part].
1953. *Endothyra* Henbest. Cushman Found. Foram. Research Contr., v. 4, no. 2, p. 63–65 [part].
1953. [not] *Endothyra* Zeller. Jour. Paleontology, v. 27, p. 183–199.
1953. *Plectogyra* Zeller. Jour. Paleontology, v. 27, p. 183–199.
1953. *Plectogyra* Lehmann. Cushman Found. Foram. Research Contr., v. 4, no. 2, p. 68–69 [part].

1954. *Endothyra* Malakhova. Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., Geol. Ser., Trudy 29, no. 1, p. 58.
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].
1957. *Plectogyra* Zeller. Jour. Paleontology, v. 31, no. 4, p. 697–700 [part].
1957. [not] *Endothyra* Zeller. Jour. Paleontology, v. 31, no. 4, p. 700–704.
1957. [not] *Endothyra* Malakhova. Akad. Nauk SSSR, Ural Fil., Gorno-Geol. Inst. Trudy 27, p. 5.
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.
1958. [not] *Endothyra* Woodland. Jour. Paleontology, v. 32, no. 5, p. 799–802.
1958. *Plectogyra* Woodland. Jour. Paleontology, v. 32, no. 5, p. 797–799 [part].
1958. *Endothyra* Pokorny. Grundzüge Zool. Mikropal., p. 218, 219 [part].
1959. [not] *Endothyra* Deleau and Marie. Pub. Service Carte Géol. Algérie, new ser., Bull. 25, p. 105–109.
1959. *Plectogyra* Deleau and Marie. Pub. Service Carte Géol. Algérie, new ser., Bull. 25, p. 101–104 [part].
1959. *Endothyra* Durkina. VNIGRI Trudy 136, p. 157–185 [part].
1959. [not] *Endothyra* Malakhova. Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 38, p. 93, 94.
1959. *Plectogyra* Voloshina and Reitlinger *in* Rauzer-Chernoussova and Fursenko. Osnovy Paleontologii, v. 1, p. 58, 59 [part].
1959. [not] *Endothyra* Lipina. VNIGRI Trudy 14, p. 33.
1959. *Plectogyrina* Reitlinger *in* Rauzer-Chernoussova and Fursenko. Osnovy Paleontologii, v. 1, p. 196.
1960. *Plectogyra* Grozdilova and Lebedeva. VNIGRI Trudy 150, p. 53–69 [part].
1960. *Plectogyra* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 359–363 [part].
1960. [not] *Endothyra* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 358.
1960. *Plectogyra* Bogush and Yuferev. Paleont. Zhur., no. 4, p. 20–23 [part].
1960. [not] *Plectogyra* Lipina. Akad. Nauk SSSR Geol. Inst. Trudy 14, p. 123–125.
1961. [not] *Endothyra* Toomey. Cushman Found. Foram. Research Contr., v. 12, pt. 1, p. 26.
1961. *Plectogyra* Voizhekovskaia. VNIGA Bull. 24, sbornik Stat. Paleob. Biostrat. p. 26–35 [part].
1961. [not] *Endothyra* Voizhekovskaia. VNIGA Bull. 24 sbornik Stat. Paleob. Biostrat., p. 17–24.
1961. *Plectogyra* Saurin. Ann. Fac. Sci. Univ. Saigon, p. 220, 221 [part].
1961. [not] *Endothyra* Skipp. U.S. Geol. Survey Prof. Paper 424–C, p. C241.
1962. *Plectogyra* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 126–149 [part].
1962. *Plectogyra* Lebedeva *in* Kalfina. SNIIGGIMS, Bull. 21, p. 103 [part].
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.
1963. *Plectogyra* Pronina. Akad. Nauk SSSR Ural. Fil., Inst. Geol. Trudy 65, p. 136, 137 [part].
1963. *Plectogyrina* Mikluko-Maklai. Upper Paleozoic of central Asia, p. 186, 187.
1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 28-45 [part], p. 62, 63 [part].
1964. *Endothyra* Loeblich and Tappan. Treatise Invertebrate Paleontology, Protista, part C, p. C343–C346 [part].

1964. [not] *Endothyra* Rostovceva *in* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 8, p. 52.
1964. *Plectogyra* Potievskaia. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 48, p. 36, 37.
1964. *Plectogyra* Conil and Lys. Louvain Univ. Inst. Géol. Mém., v. 23, p. 155–225 [part].
1964. *Plectogyra* Conil and Pirlet. Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, p. 194, 195 [part].
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.
1966. *Plectogyra* Conil and Lys. Soc. Géol. Belgique Annales. v. 89, Bull. 6, p. 221 [part].
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, 50μ to 60μ, 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 450μ to 650μ. 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, 18μ to 22μ 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 30μ to 50μ, followed by irregular oscillating spirotheca. Diameter 400μ to 600μ 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, 15μ to 20μ, 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 30μ to 50μ, followed by deviating spirotheca. As deviation oscillates, coil appears rather regular. Diameter 350μ to 500μ 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, 15μ to 18μ, 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 500μ to 650μ 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 120μ) 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 580μ to 750μ 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 18μ to 25μ 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 600μ to 1,200μ 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 20μ to 30μ 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

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 30μ to 50μ, followed by erratically coiled spirotheca. Later two or three coils regular, planispiral, involute. Diameter 600μ to 900μ, 700μ 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, 20μ to 25μ, 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].

1963. *Mediocris* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 32 [part].
1963. *Eostaffella* Rozovskaia. Akad. Nauk SSSR Inst. Paleontologii Trudy 97, p. 32 [part].
1963. *Endothyra* McKay and Green. Research Council Alberta Bull. 10, p. 37, 38 (part), p. 41–42 [part].
1964. *Eoendothyranopsis* Reitlinger (OBJ, nom. nud.). Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 8, p. 52.
1966. *Eoendothyranopsis* Reitlinger and Rostovceva *in* Reitlinger. Akad. Nauk SSSR Voprosy Mikropaleontologii no. 10, p. 55–57.
1967. *Endothyra* Armstrong. New Mexico Bur. Mines and Mineral Resources Mem. 20, p. 56 [part].
1967. *Eoendothyranopsis* Solovieva. NIIGA, Uchennye Zapiski, Paleont. Biostrat., Bull. 18, p. 35 [part].
1967. *Eoendothyranopsis* Brazhnikova and Rostovceva. Akad. Nauk Ukrain. SSR Inst. Geol. Nauk, p. 12–15.
1969. *Eoendothyranopsis* Hewitt et Conil. Soc. Belge Géologie Paléontologie et Hydrologie Bull., v. 78, pl. 1, figs. 1, 2.
1969. *Eomillerella* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 216–221.
1970. ?*Eoendothyranopsis* Bogush and Yuferev. Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, Bull. 60, p. 104.

Diagnosis.—Test free, discoidal, laterally compressed. Umbilics well marked, often deep. Proloculus followed by involute planispirally coiled spirotheca. Periphery rounded to subrounded, not keeled. Three and a half to five whorls. Nine to 12 chambers in last whorl (exceptionally 8 to 14). Chambers subrounded to grossly subquadratic. Sutures well defined. Septa endothyroid, slightly curved forward, 50°–85° from spirotheca. Secondary deposits as low floor deposits and terminal projection ("spine") in last chamber. In the most evolved forms, simulate low pseudochomata, by formation of double curved projection from lateral base of chamber. Wall calcareous secreted, with thin "clear layer" similar to that of *Pseudoendothyra*. Pores probably present. Aperture a low slit, at base of apertural face.

Type of genus.—1954 *Parastaffella pressa* Grozdilova *in* Lebedeva. VNIGRI Trudy 81, p. 276, 277, pl. 10, figs. 4, 5.

Taxa included in the genus *Eoendothyranopsis:*

1954 *ermakiensis* Lebedeva
1967 *lebedevae* Solovieva
1957 *macra* Zeller
1967 *mediocriformis* Solovieva
1961 *originis* Voizhekovskaia
1954 *pressa* Grozdilova *in* Lebedeva
1958 *prodigiosa* Armstrong
1954 *rara* Grozdilova *in* Lebedeva
1963 ?*robusta* McKay and Green
1961 *scitula* Toomey (pro 1957 *symmetrica* Zeller, preoccupied by 1949 *symmetrica* Morozova)
1957 *spiroides* Zeller
1967 *subtilis* Solovieva
1963 *thompsoni* Anisgard and Campau
1954 *triznae* Lebedeva
1957 *utahensis* Zeller
1963 *zelleri* McKay and Green (OBJ = *scitula* Toomey)

Three groups can be distinguished: the *Eoendothyranopsis spiroides, E. rara,* and *E. ermakiensis* groups.

Stratigraphic range and distribution.—Eurasia and North America.

Abundant in the North American-Kuznetz realm and in the Alaska-Taimyr realm. Scarce in the Tethyan realm.

First occurrence in Early Viséan. Acme in Middle and basal Late Viséan. Extinction in middle Late Viséan.

Eoendothyranopsis of the group E. spiroides (Zeller 1957)

Plate 30, figures 7–11

Group exemplified by:

1957. *Endothyra spiroides* Zeller. Jour. Paleontology, v. 31, no. 4, p. 702 [part], pl. 75, fig. 25; pl. 80, figs. 18, 19, 28.
1957. *"Endothyra spiroides"* Zeller. Jour. Paleontology, v. 31, no. 4, p. 702 (part), pl. 76, figs. 6, 7 [only].
1969. *Eomillerella spiroides* Skipp *in* McKee and Gutschick. Geol. Soc. America Mem. 114, p. 221, pl. 17, figs. 22–24; pl. 24, fig. 16; pl. 27, figs. 6–9, 12, 13, 15, 16.

Diagnosis.—The group is recognized by (1) a great number of chambers (usually 11 to 13, exceptionally 14) in the last volution; (2) a form ratio around 1/0.5; (3) a primitive diaphanotheca; and (4) poorly developed secondary deposits.

Stratigraphic range and distribution.—Eurasia and North America.

Occurs for the first time in the Early Viséan and extinct in Middle Viséan. A good marker for the Salem Limestone in the midcontinent and its time equivalents in the Cordillera (Zones 10 to 12).

Rather common in Alaska and the Yukon Territory.

Eoendothyranopsis spiroides (Zeller 1957)

Plate 30, figures 8, 9

Synonymy.—See above, exemplifying the group.

Diagnosis.—Test free, discoidal, laterally compressed. Form ratio around 1/0.5. Umbilici marked. Proloculus round, 30μ to 40μ, followed by planispiral, completely involute spirotheca. Diameter 350μ to 700μ, average 500μ. Number of volutions four to five, usually four. Periphery subrounded. Rate of expansion of coil slow. Chambers, 11 to 12 in the last volu-

tion. Septa of medium length, anteriorly directed, 65°–80° from the spirotheca. Wall dark, fine grained, with a poorly defined, discontinuous diaphanotheca; 15μ to 22μ 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, 20μ to 40μ, followed by a planispiral, completely involute spirotheca. Diameter 700μ to 1,000μ (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, 15μ to 28μ. 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 15-16$_{inf}$ 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 (25μ to 35μ) followed by involute planispirally coiled spirotheca. Maximum diameter for adult specimens ranges from 450μ to 700μ 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;" 15μ to 22μ. 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 (50μ to 100μ) followed by involute planispirally coiled spirotheca. Rate of expansion moderate. Periphery round, smooth. Four to five whorls in adult specimens. Diameter 700μ to 1,000μ. 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, 20μ to 25μ 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 40μ to 50μ, followed by involute, tightly coiled spire. Periphery subrounded. Four to five whorls in mature specimens. Diameter 400μ to 600μ. Eleven to 12 chambers in last whorl. Septa cuneiform, pointed, very oblique, 45°–60° from spirotheca. Secondary deposits not known. Wall calcareous secreted 15μ to 20μ, 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, 70μ to 90μ, followed by involute regular, planispirally coiled spirotheca. Outside periphery subrounded with faint subquadratic or keeled outline in first two coils. Diameter 500μ to 750μ 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 (20μ to 30μ). 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.

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 400μ to 600μ. Width 230μ to 300μ. 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

Stratigraphic range and distribution.—Basically endemic to North America, where it is a very common microfossil. If its presence is confirmed in the Tethys (*Millerella uralica* Kireeva 1951 could perhaps be a *Zellerina*? and *Zellerina*-looking taxa have recently been discovered in the Far East), it would still be scarce in a fauna entirely dominated by the *Eostaffella-Mediocris* assemblage.

The genus has a characteristic outburst at the base of the Chester Group and its time equivalents in the midcontinent and in the Cordilleran; this outburst is concomitant with the disappearance of the Meramecian *Eoendothyranopsis* (see Mamet, 1968b; Sando and others, 1969). Known up to the middle Moscovian (Middle Pennsylvanian).

Zellerina is common in the Alapah and the Wahoo Limestones in Alaska and the Yukon Territory (Zones 16_{inf} to 21).

Zellerina discoidea (Girty 1915)

Plate 34, figure 11

1915. *Endothyra discoidea* Girty. U.S. Geol. Survey Bull. 593, p. 27, pl. 10, fig. 11.
1953. *Millerella tortula* Zeller. Jour. Paleontology, v. 27, no. 2, p. 192–194, pl. 26, figs. 7–10, 12–21, 23–26.
1953. ?*Millerella designata* Zeller. Jour. Paleontology, v. 27, no. 2, p. 194, pl. 26, fig. 5 [part].
1957. *Paramillerella tortula* Zeller. Jour. Paleontology, v. 31, no. 4, p. 703, pl. 75, figs. 4–8, 10–12.
1959. [not] *Plectogyra discoidea* Deleau and Marie. Álgérie Serv. Carte Géol., new ser. Bull. 25, p. 104, pl. 15, fig. 2.
1970. *Eostaffella*? *discoidea* Mamet. Canada Geol. Survey Paper 70–21, p. 37, pl. 6, fig. 9.
1970. [not] *Plectogyra discoidea* Hallett. 6ème Cong. Avanc. Strat. Carb. Compte Rendu, p. 896, pl. 6, figs. 4, 5.

Diagnosis.—Test free, small, discoidal. Proloculus followed by involute tight planispirally coiled spirotheca. Some faint axial deviation observed in two first chambers. Last half coil evolute. Periphery subrounded. No keel observed. Diameter 250μ to 360μ for adult specimens of three to four whorls. Umbilical depressions faint. Septa endothyroid, 11 to 12 in last volution, same thickness as spirotheca: 12μ to 18μ. Wall calcareous secreted, a tectum with inconsistent tectoria? Secondary deposits, faint, low, as floor thickenings. Aperture slitlike, at base of apertural face.

Stratigraphic range and distribution.—Basically North American.

Abundant in all carbonate units of the Chester Group in the midcontinent. Present in the Canadian Maritime Provinces (Mamet, 1970) and in the Cordilleran region (Mamet, 1968b; Mamet and Gabrielse, 1969).

Common in the upper part of the Alapah Limestone and scarce in the Wahoo Limestone in Alaska and the Yukon Territory. Apparent teilzone; Zones 16_{inf} to 21.

Figured specimen.—Univ. Montréal 131/7.

Zellerina designata (Zellér 1953)

Plate 34, figures 12, 13

1953. *Millerella designata* Zeller. Jour. Paleontology, v. 27, no. 2, p. 194, pl. 26, figs. 1–4, 6 [not 5].

Diagnosis.—Test free, small, discoidal. Proloculus spherical, followed by involute tight planispirally coiled spirotheca. Faint evolution in ultimate whorl. Periphery subrounded. Diameter 400μ to 460μ for adult specimens of 3½ to 4 whorls. Septa endothyroid, 11 to 12 in last whorl, same thickness as spirotheca, 12μ to 15μ. Wall calcareous secreted, a dense tectum with poorly defined tectoria(?). Secondary deposits absent or faintly developed. Aperture slitlike, at base of apertural face.

Remarks.—*Millerella uralica* Kireeva, as illustrated by Brazhnikova and others (1967) from Zones 20 and 21 of the Donbass, could be related to *Zellerina* and its axial section is rather similar to that of *Zellerina designata;* however, no good equatorial section is given and this attribution remains doubtful. Kireeva's original holotype is certainly not a *Zellerina,* and it is uncertain if the taxon figured on Kireeva's plate 2, figure 4, ought to be considered a true *Millerella.*

Stratigraphic range and distribution.—Essentially North American, where it is abundant.

Present in the Upper Mississippian and Lower Pennsylvanian of the midcontinent. Present in the upper part of the Alapah Limestone and in Wahoo Limestone of Alaska and the Yukon Territory.

Figured specimens.—USNM 179471; Univ. Montréal 219/25.

Family OZAWAINELLIDAE Thompson and Foster 1937
Genus MILLERELLA Thompson 1942

1942. *Millerella* Thompson. Am. Jour. Sci., v. 240, no. 6, p. 404–407 [part].
1944. *Millerella* Thompson. Kansas Geol. Survey Bull. 52, pt. 7, p. 420–430 [part].
1945. *Millerella* Thompson. Kansas Geol. Survey Bull. 60, p. 44–49 [part].
1947. *Millerella* Cooper. Jour. Paleontology, v. 21, no. 1, p. 82–87 [part].
1948. *Staffella* (*Eostaffella*) Rauzer-Chernoussova. Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 17, 18
1948. *Millerella* Thompson. Kansas Univ. Paleont. Contr., art. 1, p. 76 [part].
1950. [not] *Millerella* Zeller. Kansas Univ. Paleont. Contr., Protozoa, art. 4, pl. 5, figs. 10, 11, 14–17 [no text].
1950. *Eostaffella* (*Millerella*) Grozdilova and Lebedeva. VNIGRI Trudy 50, p. 18–20 [part].

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 30μ to 50μ, followed by involute, planispiral whorls, which become evolute in ultimate volution. Diameter 300μ to 340μ for 3½ to 4 whorls. Periphery slightly subangular. Septa arcuate, regular, 16 to 20 in mature forms. Wall calcareous secreted, 6μ to 8μ, 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 270μ to 340μ for three whorls. Wall calcareous secreted, dark thin, 6μ to 8μ. 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.

Type 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 *möller*i 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 700μ to 800μ for eight chambers. Septa long, largely overlapping. Tip of septa slightly enlarged. Sutures well marked. Wall calcareous secreted, two layered; a thick (30μ 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 250μ to 280μ, and maximal length 450μ to 550μ for eight coils. Wall calcareous secreted, fine grained, 12μ to 18μ. 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 Géol. 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 1,200μ; maximum height for same number of coils 1,300μ. Wall calcareous secreted, two layered with very slow thickness increase; 40μ to 60μ 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, 600μ to 900μ for seven to nine coils. Height, for same number of volutions, 450μ to 650μ. Wall bilayered, regular, with well-developed inner dark layer. Fibrous layer present; total thickness 40μ to 70μ. 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 400μ to 500μ. Height 300μ to 400μ for six spiral whorls. Wall bilayered, 25μ to 30μ; 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 350μ to 500μ. Valvular projections heavy, strongly overlapping. Wall calcareous secreted with clearly defined diaphanotheca; thickness 22μ to 30μ, 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. *Coeloceratioides* 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.

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 180μ to 250μ. Wall bilayered; an inner, thin, 2μ- to 6μ-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 130μ to 180μ; thickness of the wall 300μ to 380μ.

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

(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].

1879. [not] *Stacheia* von Möller. St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 27, no. 5, p. 78.
1880. [not?] *Stacheia* von Möller. Jahrb. Ost. Geol. Reich., v. 30, pt. 4, p. 580.
1888. [not] *Stacheia* Howchin. Royal Micros. Soc. London Jour., pt. 2, p. 543.
1901. [not] *Stacheia* Chapman. Ann. Mag. Nat. History, London, ser. 7, v. 7, p. 143.
1905. [not] *Stacheia* Chapman *in* Chapman and Howchin. New South Wales Geol. Survey Mem., Palaeontology, no. 14, p. 11.
1927. [not] *Stacheia* Harlton. Jour. Paleontology, v. 1, no. 1, p. 21, 22.
1927. [not] *Stacheia* Waters. Jour. Paleontology, v. 1, no. 1, p. 133.
1928. ?*Stacheia* Galloway and Harlton. Jour. Paleontology, v. 2, no. 3, p. 356.
1930. [not] *Stacheia* Cushman and Waters. Texas Univ. Bull. 3019, p. 73.
1932. [not] *Stacheia* Liebus. Preuss. Geol. Landesanstalt. Abh., new series, no. 141, p. 170.
1955. *Stacheia* Cummings. Washington Acad. Sci. Jour., v. 45, no. 11, p. 342, 343.
1956. [not] *Stacheia* Brazhnikova. Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 10, p. 49.
1958. [not] *Stacheia* Crespin. Royal Soc. New South Wales Jour. and Proc., v. 92, pt. 4, p. 133, 134.
1961. *Stacheia* Cummings. Great Britain Geol. Survey Bull. 18, pt. 8, p. 19.
1961. [not] *Stacheia* Conkin. Am. Paleontology Bull., v. 43, no. 196, p. 340–342.
1962. *Stacheia* Ferguson. Jour. Paleontology, v. 36, no. 5, p. 1098.
1964. *Stacheia* Loeblich and Tappan. Treatise Invert. Paleont., Protista, p. C330 [part].
1972. ?*Stacheia* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 784.
1972. ?*Stacheia* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 88, 89.

Diagnosis.—Thallus attached, cylindrical or tapering, fusiform, or lemon shaped, composed of numerous regular rectangular cells. Walls and floors regularly calcified. Mamillate protuberances faint or absent. Wall calcareous secreted, of faint yellowish color, and almost hyaline.

Remarks.—We are temporarily including in the genus, thalli which are lemon shaped and whose cell rows are not overlapping. It is probable that a new genus ought to be erected for these forms, Brady's genus being restricted to tapering fusiform thalli.

The systematic position of *Stacheia* remained unclear for a century. The type kept in London (British Museum) is certainly calcareous secreted, hence all siliceous agglutinated *Stacheia* of the literature have to be discarded. Cummings (1955) in his revision of the genus thought that it was a plurilocular forminifer, but could not detect any proloculum or aperture. *Stacheia* has a wall structure unknown among bona fide Paleozoic Foraminifera and cannot be placed among the Fusulinina as suggested by Loeblich and Tappan.

Uneven calcification often obscures the cell morphology. However, exceptionally well preserved, chertified *Stacheia* disclose that the cell arrangement is similar to that observed among red algae (pl. 37, fig. 9), and the Stacheiinae are transferred to the Rhodophycophyta.

Type of species.—1876 *Stacheia marginuloides* Brady. Palaeont. Soc. London Pub., v. 30, p. 107, 112, pl. 7, figs. 16–21.

Taxa included in the genus *Stacheia*:

1876 *acervalis* Brady
1876 *congesta* Brady
1876 *pupoides* Brady
1972 ?*skimoensis* Mamet and Rudloff

Stratigraphic range and distribution.—Widespread in Eurasia, Australia, and North America.

Appears in the Tournaisian and is quite abundant in the Late Viséan of the Tethyan realm. Present in Namurian. Presence in higher horizons still debatable. Observed in all Viséan and Namurian formations in Alaska and the Yukon Territory.

Stacheia? skimoensis Mamet and Rudloff 1972

Plate 37, figures 1–13; plate 38, figure 1

1972. *Stacheia? skimoensis* Mamet and Rudloff. Rev. Micropaléontologie, v. 15, no. 2, p. 89, pl. 6, figs. 3–6.

Diagnosis.—Thallus encrusting, lemon shaped. Diameter 1,000μ to 1,800μ. Floor arrangement concentric. Cells quadratic, regularly calcified, 30μ to 50μ in height. Thickness of the walls difficult to assess because of epitaxial calcite overgrowth; in silicified specimens, walls range from 12μ to 15μ. Protuberances restricted to poles. Wall calcareous secreted, hyaline, clear, yellowish.

Stratigraphic range and distribution.—Apparently abundant in Alaska and the Yukon Territory.

Originally described from the Alapah Limestone at the Skimo Creek section. Known from the Viséan and Namurian carbonate units of the Wachsmuth, Alapah, and Wahoo Limestones and the Kogruk and Nasorak Formations.

Figured specimens. — USNM 179488–179500; Univ. Montréal 206/8.

Genus STACHEOIDES Cummings 1955

1876. *Stacheia* Brady. Palaeont. Soc. London Pub., v. 30, p. 118 [only].
1955. *Stacheoides* Cummings. Washington Acad. Sci. Jour., v. 45, no. 11, p. 343.
1964. *Stacheoides* Loeblich and Tappan. Treatise Invert. Paleont., Protista, p. C332.
1972. *Stacheoides* Petryk and Mamet. Canadian Jour. Earth Sci., v. 9, no. 7, p. 785–787.

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 (30μ to 40μ). Horizontal partitions poorly developed; when present, discontinuous from one cell to another. Wall microcrystalline, secreted, 7μ to 10μ.

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, 15μ to 20μ, constant throughout the thread. Wall calcareous secreted, microcrystalline, dense, "dark," 3μ to 5μ.

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, 700μ to 1,000μ in diameter, composed of poorly defined concentric layers. Layers are composed of cystose cells that range from 150μ to 250μ 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 500μ to 1,500μ in length and exceptionally as much as 0.5 cm; thallus composed of intertwined cylindrical chambers, closely packed, 150μ to 300μ in diameter. Wall calcareous secreted, two layered; outer dark layer thin, 2μ to 4μ; inner layer clear, pseudofibrous, as much as 50μ.

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 110μ to 180μ; inner cavity spherical. Wall calcareous secreted, one layered, microcrystalline, 15μ to 30μ. Pores scarcely noticeable, 1μ to 2μ, 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.

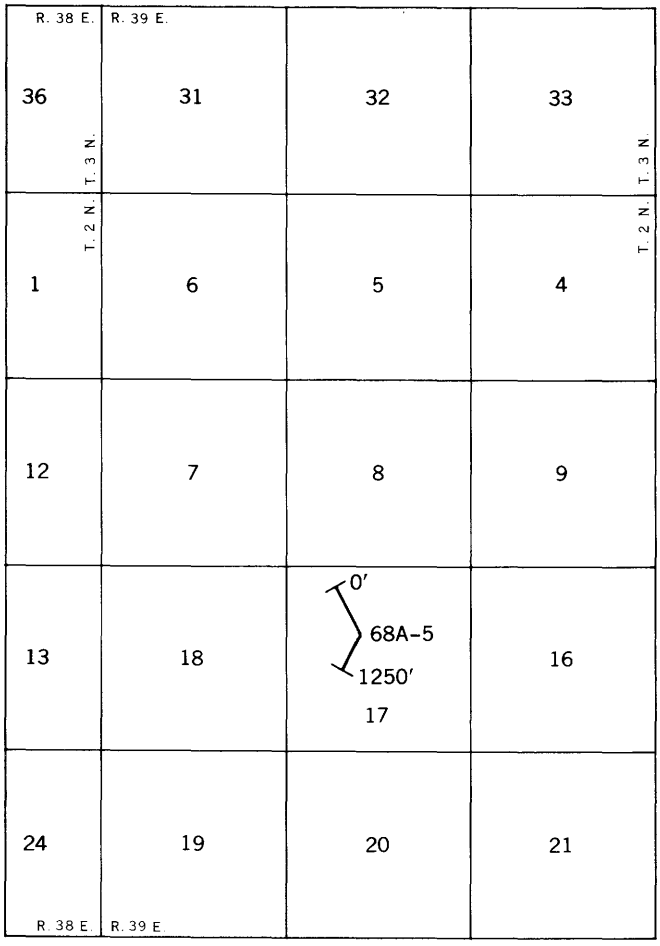


FIGURE 8.—Location map, Egaksrak River section 68A–5, Romanzof Mountains.

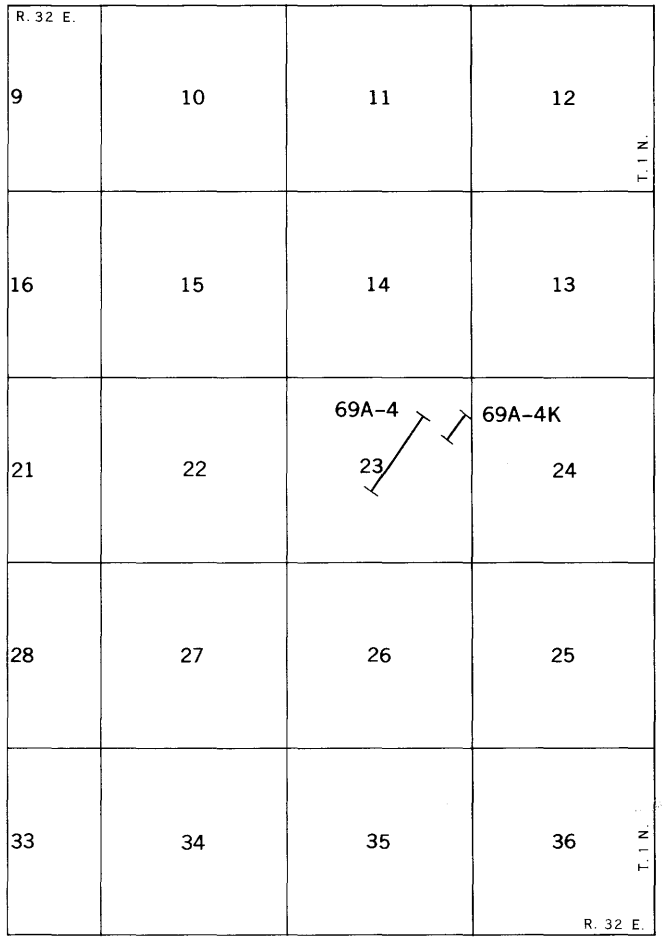


FIGURE 9.—Location of Old Man Creek, sections 69A–4 and 69A–4K, Romanzof Mountains.

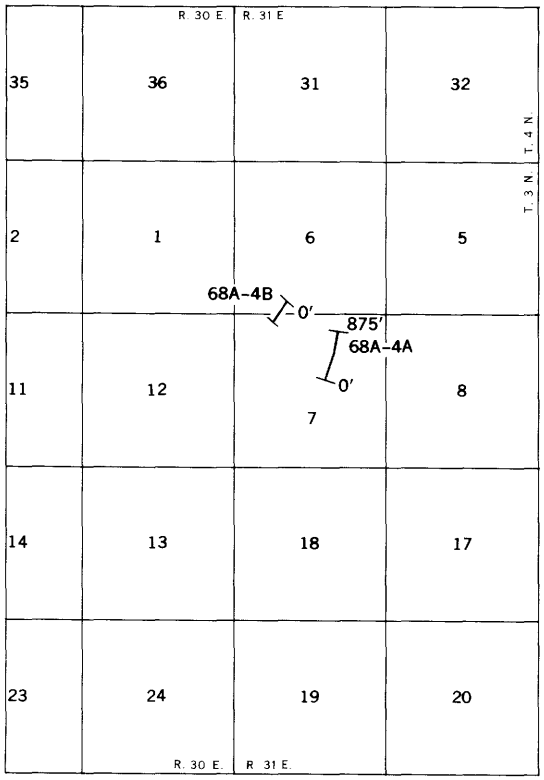


FIGURE 10.—Location of sections 68A–4A, 4B, Sunset Pass, Sadlerochit Mountains.

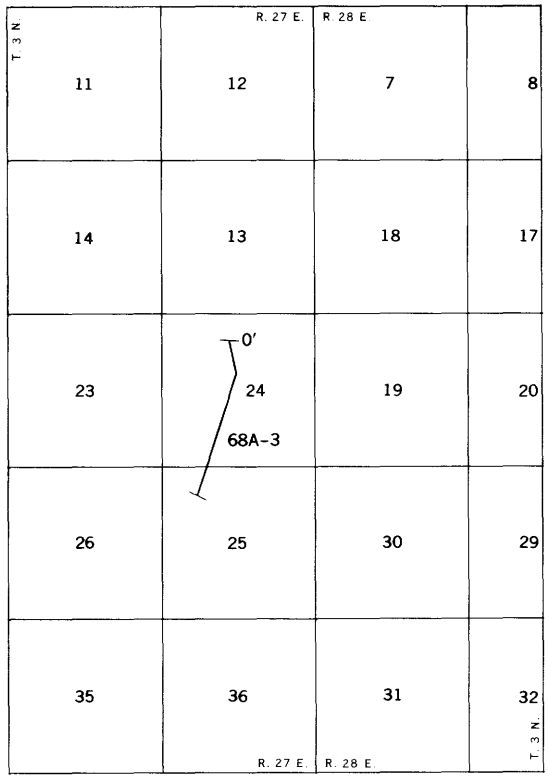


FIGURE 11.—Location of Sadlerochit Mountains section 6A–3.

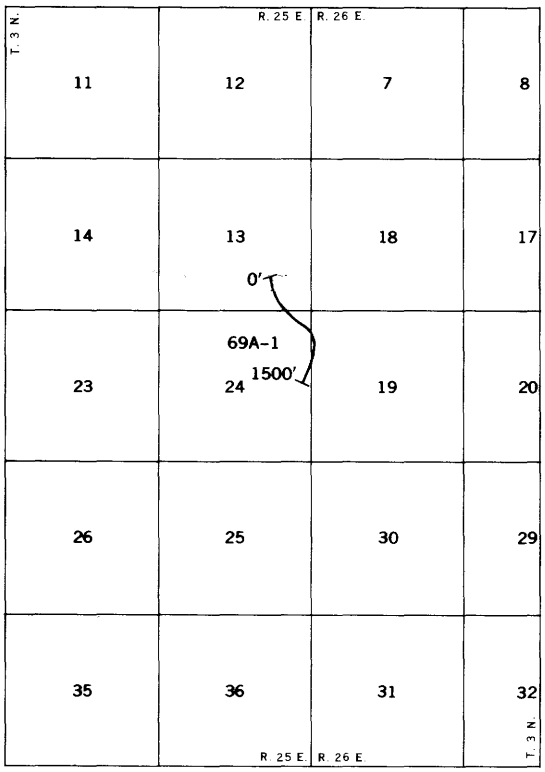


FIGURE 12.—Location of West Sadlerochit Mountains section 69A–1.

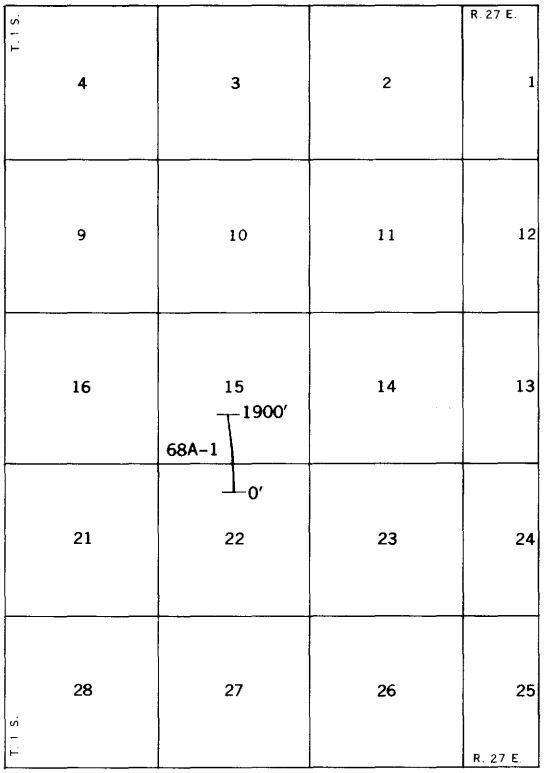


FIGURE 13.—Location of Ikiakpuk River section 68A–1, Franklin Mountains.

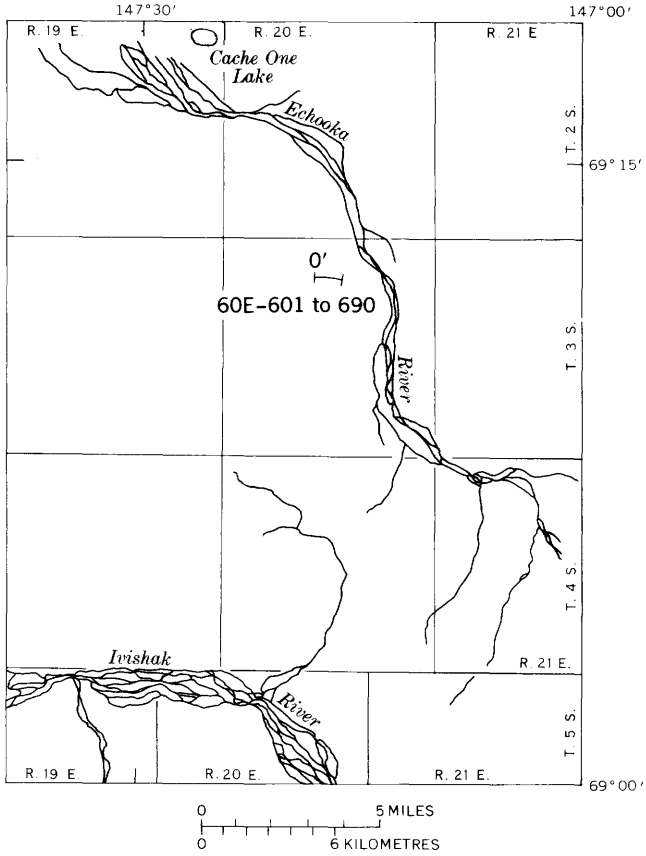


FIGURE 14.—Location of Echooka River section 60E–601 to 690, Philip Smith Mountains.

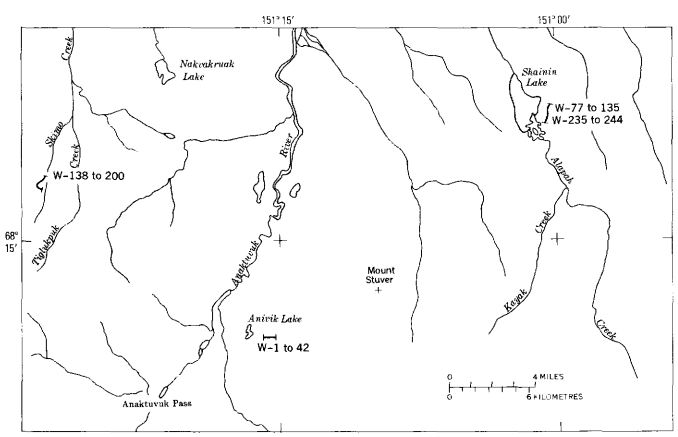


FIGURE 16.—Location of sections, Shainin Lake W–77 to 135 and W–235 to 244; Anivak Lake W–1 to 42; and Skimo Creek W–138 to 200, Endicott Mountains.

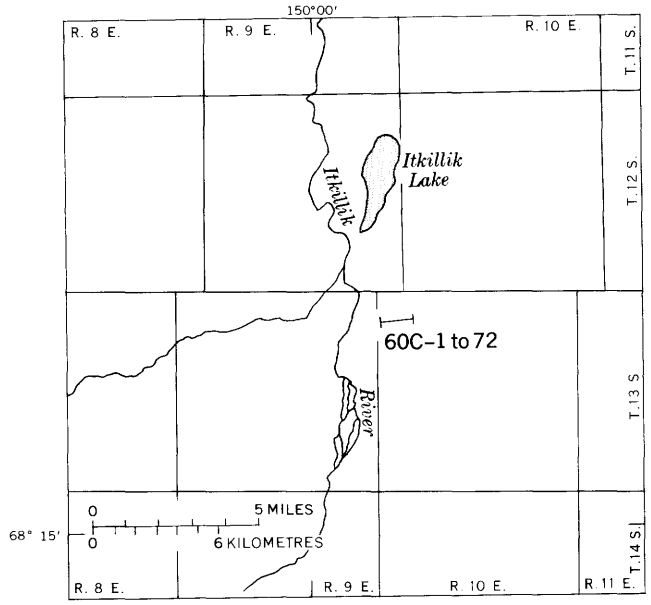


FIGURE 15.—Location of Itkillik Lake section 60C–1 to 72, Endicott Mountains.

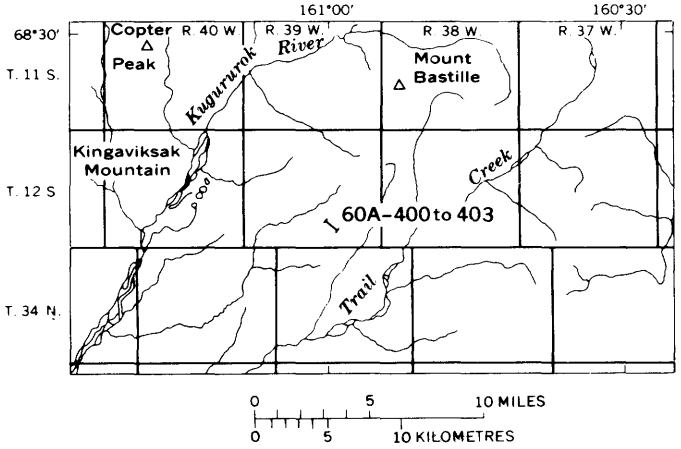


FIGURE 17.—Location of Trail Creek, sections 60A–400 to 403, De Long Mountains.

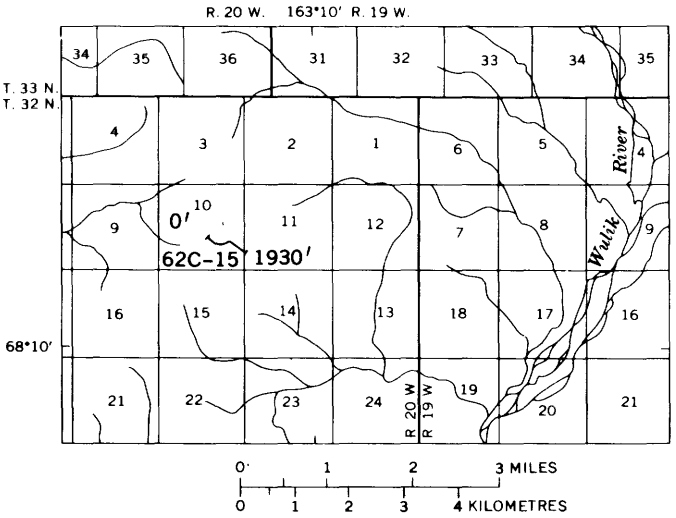


FIGURE 18.—Location of Cirque section 62C–15, De Long Mountains.

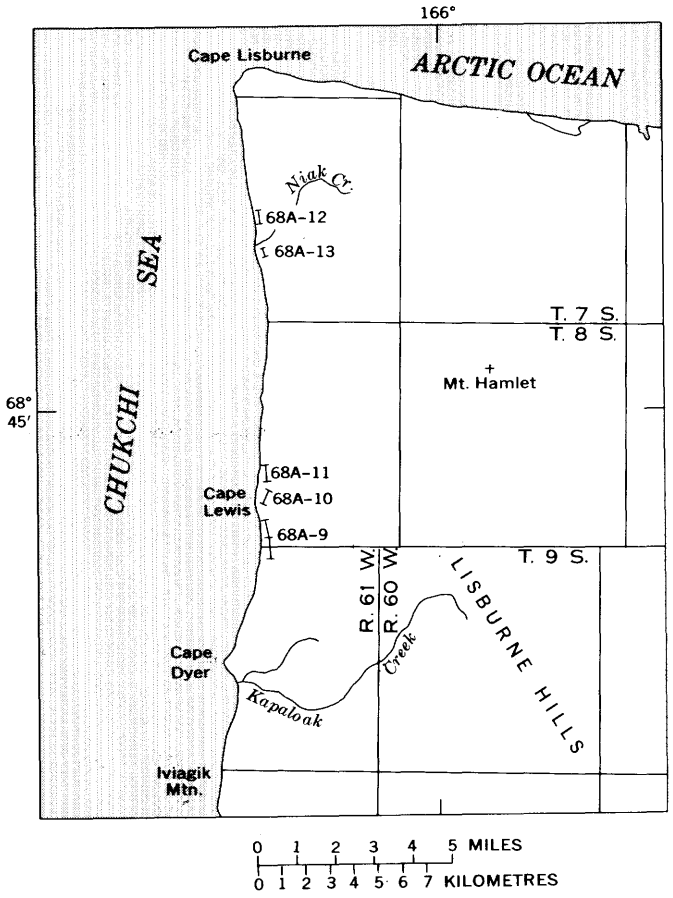


FIGURE 19.—Location of Cape Lewis sections 68A–9 to 11; North Niak Creek section 68A–12; and South Niak Creek section 68A–13, Lisburne Peninsula.

REFERENCES CITED

Aizenberg, D. E., and Brazhnikova, N. E., 1964, Donetz basin analogues of Etroeungt strata: Cong. Avanc. Strat. Géol. Carbonifère, 5th, Paris 1963, Compte Rendu, p. 263–270, 3 pls .

Aizenberg, D. E., and Brazhnikova, E. V., 1966, On the $C_1^t a$ Zone of the Donetz Basin, *in* Fauna nizov Turnye (zony $C_1^t a$) Donetskogo Basseyna [The fauna of the lowest part of the Tournaisian (Zone $C_1^t a$) in the Donetz Basin]: Akad. Nauk Ukrain. SSR Inst. Geol. Nauk, p. 3–42, 116–124, 18 pls., 1 text fig.

Andrews, H. N., Jr., 1955, Index of generic names of fossil plants, 1820–1950: U.S. Geol. Survey Bull. 1013, 262 p.

Anisgard, H., and Campau, D. E., 1963, *Paramillerella thompsoni* n. sp. from Michigan and a redefinition of *Paramillerella*: Cushman Found. Foram. Research Contr., v. 14, pt. 3, p. 99–108, pls. 9–11, 3 text figs.

Akademiya Nauk SSSR, Geologicheskiy Institut, Koordinatsionnoy Komissiey po micropaleontologii, 1963, Results of the second colloquium on systematics of the endothyroid foraminifers organized by the Commission of micropaleontological coordination: Akad. Nauk SSSR Geol. Inst., Otdeleniye Geologo-Geograficheskikh Nauk, Voprosy Paleontologii, v. 7, p. 223–227.

Antropov, I. A., 1950, New species of Foraminifera in the Upper Devonian of certain areas in the eastern part of the Russian Platform: Akad. Nauk SSSR, Kazakh. Fil., Geol. Ser., no. 1, p. 21–23, 3 pls.

——— 1959, Devonian Foraminifera of Tatary: Akad. Nauk SSSR, Kazakh. Fil., Geol. Ser., no. 7, p. 11–33, 1 pl., 7 text figs.

Armstrong, A. K., 1958, Meramecian (Mississippian) endothyrid fauna from the Arroyo Penasco formation, northern and central New Mexico: Jour. Paleontology, v. 32, no. 5, p. 973–975.

——— 1967, Biostratigraphy and carbonate facies of the Mississippian Arroyo Penasco Formation, north-central New Mexico: New Mexico Bur. Mines and Mineral Resources Mem. 20, 80 p., 12 pls., 45 text figs., 4 tables.

——— 1970a, Mississippian rugose corals, Peratrovich Formation, west coast of Prince of Wales Island, southern Alaska: U.S. Geol. Survey Prof. Paper 534, 43 p., 13 pls., 30 figs.

——— 1970b, Carbonate facies and the lithostrotionoid corals of the Mississippian Kogruk Formation, DeLong Mountains, northwestern Alaska: U.S. Geol. Survey Paper 664, 38 p., 14 pls., 37 figs.

——— 1970c, Mississippian dolomites from Lisburne Group, Killik River, Mount Bupto Region, Brooks Range, Alaska: Am. Assoc. Petroleum Geologists Bull., v. 54, no. 2, p. 251–264, 10 figs.

——— 1972a, Biotratigraphy of Mississippian lithostrotionoid corals, Lisburne Group, Arctic Alaska: U.S. Geol. Survey Prof. Paper 743–A, p. A1–A28, 25 figs. 9 pls.

——— 1972b, Pennsylvanian carbonates, paleoecology, and colonial corals, north flank, eastern Brooks Range, Arctic Alaska: U.S. Geol. Survey Prof. Paper 747, 21 p., 8 pls., 16 figs.

——— 1975, Stratigraphy and paleoecology of Carboniferous corals, Lisburne Group, Brooks Range, Alaska: Am. Paleontology Bull., v. 67, no. 287, p. 17–35, 5 figs.

Armstrong, A. K., and Mamet, B. L., 1970, Biostratigraphy and dolomite porosity trends of the Lisburne Group, *in* Adkison, W. L., and Brosgé, M. M. eds., Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Pacific Sec. Am. Assoc. Petroleum Geologists, p. N1–N16, 12 figs.

——— 1974, Carboniferous biostratigraphy, Prudhoe Bay State I, Arctic Alaska: Am. Assoc. Petroleum Geologists Bull., v. 58, no. 4, p. 646–660.

——— 1975, Carboniferous biostratigraphy, Northeastern Brooks Range, Arctic Alaska: U.S. Geol. Survey Prof. Paper 884, 29 p.

Armstrong, A. K., Mamet, B. L., and Dutro, J. T., Jr., 1971, Lisburne Group, Cape Lewis-Niak Creek, northwestern Alaska, *in* Geological Survey research, 1971: U.S. Geol. Survey Prof. Paper 750–B, p. B23–B34, 9 figs.

Austin, R. L., Conil, R., and Husri, S., 1970, Correlation and age of the Dinantian rocks north and south of Shannon, Ireland: Liège Univ. Coll. Mém., v. 55, p. 179–196.

Bamber, E. W., and Waterhouse, J. B., 1971, Carboniferous and Permian stratigraphy and paleontology, northern Yukon Territory, Canada: Canadian Petroleum Geology Bull., v. 19, no. 1, p. 29–250.

Baxter, J. W., 1960, Calcispheres from the Salem Limestone in southwestern Illinois: Jour. Paleontology, v. 34, no. 6, p. 1153–1157, 1 pl.

Birina, L. M., 1948, A detailed scheme of the stratigraphy of the passage beds between the Devonian and the Carboniferous (Etroeungt) in the southern part of the Podmoscovian region [in Russian]: Sovetskaya Geologia, Sbornik 28, p. 146–153, 1 text fig.

——— 1948, New species of calcareous algae and foraminifers from the transitional Devonian-Carboniferous beds of the Moscow basin [in Russian]: Sovetskaya Geologia, Sbornik 28, p. 154–159.

Blumenstengel, H., 1961, Foraminiferen aus dem Thüringen Oberdevon: Geologie, v. 10, no. 3, p. 316–335, 3 pls., 1 text fig.

Bogush, O. I., 1963, Foraminifery i stratigrafiya srednego i verkhnego Karbona vostochnoy chasti Alayskogo Khebta [Foraminifera and stratigraphy of the Middle and Upper Carboniferous of the oriental part of the Alaisk Range]: Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy, p. 1–132, 11 pls., 1 text fig.

Bogush, O. I., Bushmina, L. S., and Domnikova, E. I., 1970, On the microfauna of the Devonian-Carboniferous transition beds of the Eltsov synclinorium [in Russian]: Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki Trudy 71, p. 49–59,, 3 pls.

Bogush, O. I., and Yuferev, O. V., 1960, Some new species of Tournaisian Foraminifera from Kara-Tau and the western spurs of Ala-Tau [in Russian]: Paleont. Zhur., no. 4, p. 16–27, 1 pl.

——— 1962, Foraminifery i stratigrafiya Kamennougol'nykh Otlozheniy Karatay i Talasskogo Alatay [Foraminifers and stratigraphy of the Carboniferous deposits in Kara-Tau and Talasskiy Ala-Tau]: Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki, p. 1–234, 9 pls.

——— 1966, Foraminifery Karbona i Permi Verkhoyan'ya [Carboniferous and Permian Foraminifera of the Verkhoyansk Range]: Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki, p. 1–208, 14 pls., 18 text figs.

——— 1970, Foraminiferida, *in* The Carboniferous of the Omolon and southwestern Kolyma Massif [in Russian]: Akad. Nauk SSSR Sibirsk. Otdeleniye Inst. Geologii i Geofiziki, Byull. 60, p. 68–74, and 97–105, 9 pls.

Bowsher, A. L., and Dutro, J. T., Jr., 1957, The Paleozoic section in the Shainin Lake area, central Brooks Range, Alaska: U.S. Geol. Survey Prof. Paper 303–A, 39 p., 6 pls. 4 figs.

Brady, H. B., 1870, Notes on the Foraminifera of mineral veins and the adjacent strata, *in* Moore, C., Report on mineral veins in Carboniferous limestones and their organic contents: British Assoc. Adv. Sci., London, 39th Mtg. Rept., Exeter 1869, p. 381–382.

——— 1873a, On *Archaediscus karreri*, a new type of Carboniferous Foraminifera: Ann. Mag. Nat. History, ser. 4, v. 12, p. 286–290, pl. 11.

——— 1873b, *in* Etheridge, R., Jr., Notes on certain genera and species mentioned in the foregoing list *in* Explanation of Sheet 23: Lanarkshire, Scotland Geol. Survey Mem., p. 1–107.

——— 1876, A monograph of Carboniferous and Permian Foraminifera (the genus *Fusulina* excepted): Palaeont. Soc. Pub., v. 30, 166 p., 12 pls.

——— 1884, Report on the Foraminifera dredged by H. M. S. *Challenger* during the years 1873–1876: *Challenger* Expedition 1873–1876, Rept. Zoology, v. 9, p. 1–814, 115 pls.

Brazhnikova, N. E., 1951, New data on the foraminiferal faunas of the western part of the Donbass Basin [in Russian]: Akad. Nauk Ukrain. SSR Inst. Geol. Trudy, Ser. Strat. Paleont., no. 5, p. 73–107, 4 pls.

——— 1956, Fauna and flora of the Carboniferous beds of the Galitzi-Volyn Basin [in Russian]: Akad. Nauk Ukrain. SSR, Ser. Strat. Paleont., no. 10, p. 16–103, 17 pls.

——— 1962, *Quasiendothyra* and closely related forms in the Lower Carboniferous of the Donetz Basin and other areas of the Ukraine [in Russian]: Akad. Nauk Ukrain. SSR, Ser. Strat. Paleont., no. 44, p. 3–48, 14 pls.

——— 1964, Studying *Eosigmoilina* from the Lower Carboniferous of the greater Donetz Basin [in Russian]: Akad. Nauk Ukrain. SSR, Ser. Strat. Paleont., no. 48, p. 3–15, 3 pls.

Brazhnikova, N. E., and Potievskaya, P. D., 1948, Results of studying Foraminifera in material from wells at the western boundary of the Donetz Basin [in Russian]: Akad. Nauk Ukrain. SSR, Ser. Strat. Paleont., no. 1, Byull. 2, p. 76–103, 5 pls.

Brazhnikova, N. E., and Rostovceva, L. P., 1966, Foraminifera, *in* Aizenberg, D. E., Brazhnikova, N. E., and Rostovceva, L. P., On the zone $C_1^t a$ of the Donetz Basin [in Russian]: Akad. Nauk Ukrain. SSR, Inst. Geol. Nauk, p. 9–42, 18 pls.

——— 1967, On the study of Early Viséan Endothyranopsinae of the Donetz Basin and other areas [in Russian]: Akad. Nauk Ukrain. SSR, Inst. Geol. Nauk, p. 10–18.

Brazhnikova, N. E., and Vdovenko, M.V., 1971, Foraminifera *in* Aizenberg D.E., ed., Atlas of the tournaisian fauna in the Donetz Basin: Naukova Dumka, Kiev, p. 21–64, 124–212, 45 pls.

——— 1973, Lower Viséan Foraminifera of Ukraine [in Ukrainian]: Naukova Dumka, 296 p., 45 pls.

Brazhnikova, N. E., Vakartchuk, G. I., Vdovenko, M. V., Viniitchenko, L. V., Karpova, M. A., Kolomietz, La. I., Potievskaia, P. D., Rostovceva, L. P., and Chevtchenko, G. D., 1967, Mikrofaunisticheskiye markiruyshchiye gorizonty Kamennougol'nykh i Permiskikh otlozheniy Dneprovsko-Donetskoy vpadiny [Marker microfaunistic horizons of the Carboniferous and the Permian of the Dniepr-Donetz Basin]: Akad. Nauk Ukrain. SSR, Inst. Geol. Nauk Trudy, p. 1–224, 59 pls.

Brazhnikova, N. E., and Yartseva, M. V., 1956, The evolution of the genus *Monotaxis* [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 1, p. 62–72, 1 pl., 1 text fig.

Brenckle, P. L., 1970, Smaller Mississippian and Lower Pennsylvanian calcareous foraminifers from Nevada [Abs.]: Dissert. Abs. Internat., B, v. 31, no. 9 p. 5525.

——— 1973, Smaller Mississippian and Lower Pennsylvanian foraminifers from Nevada: Cushman Found. Foram. Research Spec. Pub. no. 11, 82 p., 10 pls.

Brosgé, W. P., Dutro, J. T., Jr., Mangus, M. D., and Reiser, H. N., 1960, Geologic map of the eastern Brooks Range, Alaska: U.S. Geol. Survey open-file map.

——— 1962, Paleozoic sequence in eastern Brooks Range, Alaska: Am. Assoc. Petroleum Geologists Bull., v. 46, no. 12, p. 2174–2198.

Brosgé, W. P., and Tailleur, I. L., 1971, Northern Alaska Petroleum Province: Am. Assoc. Petroleum Geologists Mem. 15, p. 68–99.

Brown, P. R., 1963, Some algae from the Swan Hills reef: Canadian Assoc. Petroleum Geologists Bull., v. 11, no. 2, p. 178–182.

Brown, T., 1843, The elements of fossil conchology: London, Houlston and Stoneman, 133 p., 12 pls.

Bütschli, O., 1880, Protozoa, Band 1 *of* Bronns, Klassen und Ordnungen des Thier-Reiches: Leipzig, C. F. Winter.

Bykova, E. V., 1952, Devonian Foraminifera of the Russian Platform and Cis-Urals [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 60, Mikrofauna SSSR, no. 5, p. 5–64, 14 pls.

Bykova, E. V., and Polenova, E. I., 1955, On the Foraminifera, Radiolaria and Ostracoda in the Devonian period of the Volga-Ural region [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 87, Mikrofauna SSSR, no. 6 p. 1–141, 24 pls.

Cayeux, L., 1929, Les Calcisphères sont del Algues siphonées: Acad. Sci. Comptes Rendus, v. 188, p. 594–597.

Chang, L.-H., 1962, Fusulinids from the Hochow Limestone, Hohsien, Anhui [in Chinese with English abstract]: Acta. Palaeont. Sinica, v. 10, no. 4, p. 433–441, 1 pl.

Chanton, N., 1964, Sur la présence d'Algues calcaires dans le Carbonifère de différents bassins sahariens (Colomb-Béchar, Reggane, Polignac): Soc. Géol. France Bull., sér. 7, no. 6, p. 564–572, 1 pl.

——— 1966, Nouvelle contribution à l'étude des Algues calcaires du Carbonifère saharien: Soc. Géol. France Bull., sér. 7, no. 7, p. 402–409.

——— 1967a, Etude micropaléontologique du Viséen Supérieur de Djerada (Maroc): Soc. Géol. France Bull. sér. 7, v. 8, p. 36–39, 1 pl.

——— 1967b, A propos de la présence de Lasiodiscidae (Foraminifères) dans le Viséen terminal du bassin houiller de Djerada: Soc Géol. France Compte Rendu, sér 7, v. 8, no. 4, p. 165–166.

Chapman, F., 1901, On some fossils of Wenlock age from Mulde, near Klinteberg, Gothland: Ann. Mag. Nat. History, ser. 7, v. 7, p. 141–160, pl. 3.

——— 1908, On the relationship of the genus *Girvanella* and its occurrence in the Silurian limestones of Victoria: Australasian Assoc. Adv. Sci. Report, v. 2, p. 377–386, 3 pls.

Chapman, F., and Howchin, W., 1905, A monograph of the Foraminifera of the Permo-Carboniferous limestones of New South Wales: New South Wales Geol. Survey Mem., Palaeontology, no. 14, 22 p., 3 pls.

Chapman, R. M., Detterman, R. L., and Mangus, M. D., 1964, Geology of the Killik-Etivluk River region, Alaska: U.S. Geol. Survey Prof. Paper 303–F, p. 325–407.

Chernysheva, N. E., 1940, On the stratigraphy of the Lower Carboniferous Foraminifera in the Makarovsky district of the South Urals [in Russian, with English summary]: Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 48, ser. geol. 18, no. 5–6, p. 113–135, 2 pls.

——— 1948, In reference to *Archaediscus* and similar forms from the Lower Carboniferous of the U.S.S.R. [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 150–158, 2 pls.

——— 1948b, Some new species of Foraminifera from the Viséan of the Makarov district [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 246–250, 1 pl.

——— 1952, New foraminiferal species from the Devonian and Etroeungt of the Urals [in Russian]: Vses. Nauchno-Issled. Geol. Inst. Trudy, Paleont. Strat. Ser., no. 16, p. 16.

China, W. E., 1965, Opinion 724. *Endothyra bowmani* Phillips (1846) (Foraminifera)—validated under the plenary powers: Zool. Nomenclature Bull., v. 22, pt. 1, p. 37–39.

Chuvashov, B. I., 1965, Foraminifera and algae from the Upper Devonian sediments in the western slope of the central and southern Urals [in Russian]: Akad. Nauk SSSR Ural. Fil., Inst. Geol. Trudy 74, p. 3–153, 29 pls.

Colani, M., 1924, Nouvelle contributions à l'étude des Fusulinidés de l'Extrême-Orient: Géol. Indochine Serv. Mém., v. 11, pt. 1, 191 p., 29 pls.

Conil, R., 1959, Recherches stratigraphiques sur les terrains dinantiens dans le bord Nord du bassin de Namur: Acad. Royale Belgique Mém., Cl. Sci., v. 14, no. 5, p. 1–159, 17 pls.

——— 1964, Interprétation micropaléontologique de quelques sondages de Campine: Soc. Géol. Belgique Bull., v. 72, no. 2, p. 123–135, 1 pl., 2 text figs.

——— 1970, Notice infrapaginale *in* Le Calcaire Carbonifère du synclinorium de Dinant et le sommet du Famennien: Liège Univ. Cong. et Coll., v. 55, p. 52, 53.

Conil, R., and Lys, M., 1964, Matériaux pour l'étude micropalèontologique du Dinantien de la Belgique et de la France (Avesnois). Pt. 1, Algues et Foraminfères, and Pt. 2, Foraminifères (suite): Louvain Univ. Inst. Géol. Mém., v. 23, 335 p., 42 pls., 33 text figs.

——— 1965, Précisions complémentaires sur la Micropaléontologie du Dinantien: Soc. Géol. Belgique Annales, v. 88, Bull. 3, p. 23-44, 3 pls.

Conil, R., and Lys, M., 1966, Foraminifères et Algues du Tournaisien supérieur et du Viséen de la Belgique. Soc. Géol. Belgique Annales, v. 89, Bull. 6, p. 207–221, 3 pls.

——— 1967, Aperçu sur les associations de Foraminifères Endothyroides du Dinantien de la Belgique: Soc. Géol. Belgique Annales, v. 90, 1966–67, Bull. 4, p. 395–412, 4 pls.

——— 1968, [Foraminifères] *in* Conil, R., La limite des étages Tournaisien et Viséen au stratotype de l'assise de Dinant: Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, no. 1, Paléontologie, p. 57–74, 1 pl.

——— 1968, Utilisation stratigraphique des Foraminifères du Dinantien: Soc. Géol. Belgique Annales, v. 91, 1967–1968, Bull. 4, p. 491–557, 11 pls.

——— 1970, Données nouvelles sur les Foraminifères du Tournaisien Inférieur et des couches de passage du Famennien au Tournaisien de l'Avesnois: Liège Univ. Coll. Mém., v. 55, p. 241–265, 7 pls.

Conil, R., Paproth, E., and Lys, M., 1968, Mit Foraminiferen gegliederte Profile aus dem nordwestdeutschen Kohlenkalk und Kulm; Decheniana, v. 119, no. 1–2, p. 51–94, 4 pls.

Conil, R., and Pirlet, H., 1964, Sur quelques Foraminifères caractéristiques du Viséen supérieur de la Belgique (Bassins de Namur et de Dinant): Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 72, pt. 2, p. 183–197, 3 pls., 1 text fig.

Conkin, J. E., 1961, Mississippian Foraminifera of Kentucky, southern Indiana, northern Tennessee, and southcentral Ohio: Am. Paleontology Bull., v. 43, no. 196, p. 129–368, pls. 17–27, 43 text figs., 22 charts.

Cooper, C. L., 1947, Upper Kinkaid (Mississippian) microfauna from Johnson County, Illinois: Jour. Paleontology, v. 21, p. 81–94, pls. 19–23.

Coryell, H. N., and Rozanski, G., 1942, Microfauna of the Glen Dean limestone: Jour. Paleontology, v. 16, p. 137–151, pls. 23–24.

Crespin, I., 1958, Permian Foraminifera of Australia: Australia Bur. Mineral Resources, Geology and Geophysics Bull. 48, 207 p., 33 pls.

Cummings, R. H., 1955a, New genera of Foraminifera from the British Lower Carboniferous: Washington Acad. Sci. Jour., v. 45, p. 1–8, text figs. 1–5.

——— 1955b, *Stacheoides*, a new foraminiferal genus from the British Upper Paleozoic: Washington Acad. Sci. Jour., v. 45, no. 11, p. 342–346, 8 text figs.

——— 1955c, *Nodosinella* Brady, 1876, and associated Upper Paleozoic genera: Micropaleontology, v. 1, p. 221–238, 1 pl., 10 text figs.

——— 1956, A revision of the Upper Paleozoic textulariid Foraminifera: Micropaleontology, v. 2, p. 201–242, pl. 1, 24 text figs.

——— 1961, The foraminiferal zones of the Carboniferous sequence of the Archerbeck borehole, Canonbie, Dumfriesshire: Great Britain Geol. Survey Bull., no. 18, pt. 8, p. 107–128, pl. 4, 2 text figs. (faunal lists, p. 47–66, App. B).

Cushman, J. A. 1928, Foraminifera, their classification and economic use: Cushman Lab. Foram. Research Spec. Pub. 1, p. 1–401, 59 pls.

——— 1930, A résumé of new genera of the Foraminifera erected since early 1928: Cushman Lab. Foram. Research Contr., v. 6, pt. 4, p. 73–94, pls. 10–12.

Cushman, J. A. and Stainbrook, M. A., 1943, Some Foraminifera from the Devonian of Iowa: Cushman Lab. Foram. Research Contr., v. 19, p. 77.

Cushman, J. A., and Waters, J. A., 1927, Pennsylvanian Foraminifera from Michigan: Cushman Lab. Foram. Research Contr., v. 3, pt. 2, p. 107–110, pl. 2.

——— 1927, Arenaceous Paleozoic Foraminifera from Texas: Cushman Lab. Foram. Research Contr., v. 3, pt. 3, p. 146–153.

——— 1928a, Some Foraminifera from the Pennsylvanian and Permian of Texas: Cushman Lab. Foram. Research Contr., v. 4, pt. 2, p. 31–55, pls. 4–7.

——— 1928b, *Hyperamminoides*, a new name for *Hyperamminella* Cushman and Waters: Cushman Lab. Foram. Research Contr., v. 4, pt. 4, p. 112.

——— 1928c, Upper Paleozoic Foraminifera from Sutton County, Texas: Jour. Paleontology, v. 2, no. 3, p. 358–371, pls. 47–49.

——— 1928d, Additional Cisco foraminifers from Texas: Cushman Lab. Foram. Research Contr., v. 4, pt. 3, p. 62–67, 1 pl.

——— 1930, Foraminifera of the Cisco group of Texas: Texas Univ. Bull. 3019, p. 22–81, pls. 2–12.

Dain, L. G., 1953, [Tournayellidae] *in* Dain, L. G. and Grozdilova, L. P., Iskopayemyye Foraminifery SSSR-Turneynellidy i Arkhedistsidy [Fossil Foraminifera of the U.S.S.R., Tournayellidae and Archaediscidae]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 74, p. 1–66, 11 pls.

——— 1958, [Description of new taxa] *in* Bykova, N. K., Balakmatova, V. T., Vassilenko, V. P., Voloshina, N. A., Dain, L. G., Ivanova, L. V., Kusina, V. I., Kuznetsova, S. V., Koryseva, V. F., Morozova, V. G., Maitliuk, E. V., and Subbotina, N. N., New species and genera of Foraminifera [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 115, Mikrofauna SSR no. 9, p. 5–81, 12 pls.

Dain, L. G., and Potievskaia, P. D., 1962, Foraminiferal horizons of the western part of the Donetz [in Russian]: Akad. Nauk Ukrain. SSR, p. 234–235.

Dangeard, L., 1948, Contribution à l'étude des genres *Girvanella* et *Sphaerocodiums* Mus. Royale Hist. Nat. Belgique Bull., v. 24, no. 2, p. 1–3.

Deleau, P., and Marie, P., 1959, Les Fusulinidés du Westphalien C du Bassin d'Abadla et quelques autres Foraminifères du Carbonifère algérien (Région de Colomb-Béchar): Pub. Serv. Carte Géol. Algérie, n.s., Bull. 25, Travaux des Collaborateurs, p. 45–160, pls. 1–12.

Delépine, G., 1932, Description de *Solenopora* sp. de la Zone d'Etroeungt: Soc. Géol. Nord Annales, v. 57, p. 237–239.

Derville, H., 1931, Les Marbres du Calcaire Carbonifère en Bas-Boulonnais: Strasbourg, Boehm editeur, 322 p.

——— 1942, De quelques manières d'être des Calcisphères: Soc. Géol. France Bull., sér. 5, no. 11, p. 357–365, pl. 7.

——— 1953, Les calcaires stratifiés à *Daviesiella llangollensis* de la bande d'Avesnes: Soc. Géol. France Bull., sér. 6, v. 2, p. 425–435, pl. 16, fig. 11.

——— 1954, Les calcaires stratifiés à *Daviesiella llangollensis* de la bande d'Avesnes (2d note): Soc. Géol. France Bull., sér. 6, v. 3, p. 981–986.

Dobroljubova, T. A. 1958, Nizhnekamennougol'nys kolonial'nye chetyrokhluchevye korally Russkoi platformy [Lower Carboniferous colonial tetracorals of the Russian Platform]: Akad. Nauk SSSR Paleont. Inst. Trudy, v. 70, 216 p., 38 pls., 34 figs.

Durkina, A. V., 1959, Foraminifera of the Lower Carboniferous deposits of the Timan-Pechora Province [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 136, Mikrofauna SSSR no. 10, p. 132–389, 27 p.

Dutkevitch, G. A., 1934, New fusulinid species of the Middle and Upper Carboniferous of the High Tchussov Region (western slope of the Middle Urals) [in Russian]: Neft. Geol.-Razved. Inst. Trudy, ser. A, no. 36, p. 1–98.

Dutro, J. T., Jr., Brosgé, W. P., and Reiser, H. N., 1972, Significance of recently discovered Cambrian fossils and reinterpretation of Neruokpuk Formation, northeastern Alaska: Am. Assoc. Petroleum Geologists Bull., v. 56, no. 4, p. 808–815, 4 figs.

Dvorak, J., and Conil, R., 1969, Foraminifères du Dinantien de Moravie: Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 77, pt. 1, 1968, p. 75–95, 3 pls. 1 table.

Dybowski, W. N., 1878, Die Chaetetiden der Ostbaltischen Silur-Formation: Dorpat, 134 p., 4 pls.

Easton, W. H., 1962, Carboniferous formations and faunas of central Montana: U.S. Geol. Survey Prof. Paper 348, 126 p., 14 pls., 1 text fig., 5 tables.

Ehrenberg, C., 1854, Zur Mikrogeologie: Leipzig, Germany, L. Vogt, p. 1–374, 40 pls.

Eichwald, E. d', 1860, Lethaea Rossica ou Paléontologie de la Russie: Première section de l'Ancienne Période, E. Schweizerbart, ed., Stuttgart, Germany, v. 1, 681 p., 59 pls.

Eickhoff, G., 1968a, Moravamminidae (Foraminifera) aus dem Unterkarbon vom Hermannsholz bei Frankenberg an der Eder: Neues Jahrb. Geologie u. Paläontologie Monatsh., no. 3, p. 129–142.

——— 1968b, Neue Textularien (Foraminifera) aus dem Waldecker Unterkarbon: Paläont. Zeitschr., v. 42, no. 3/4, p. 162–178, 2 pls.

Ferguson, L., 1962, The paleoecology of a Lower Carboniferous marine transgression: Jour. Paleontology, v. 36, no. 5, p. 1090–1107, 6 text figs., 2 tables.

Flügel, E., and Hötzl, H., 1971, Foraminiferen, Calcisphaeren und Kalkalgen aus dem Schwelmer Kalk (Givet) von Lethmate in Sauerland: Neues Jahrb. Geologie u. Paläontologie Abh., v. 137, no. 3, p. 358–395.

Fomichev, V. D., 1953, Coral Rugosa and stratigraphy of the Middle and Upper Carboniferous and Permian deposits of the Donetz basin [in Russian]: Vses. Nauchno-Issled. Geol. Inst. Trudy, 622 p., 44 pls.

Fomina, E. V., 1958, The problem of the structure of the text wall of some Viséan Foraminifera of the Moscow Basin [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 121–123, 2 text figs.

——— 1960, Nekotorye novye vidy foraminifer iz vizeyskikh otlozheniy podmoskovnogo basseyna [On some Viséan foraminifers from the Podmoscovian Basin]: Materialii geol. polezn. iskopanii Central Rayon Europ. Chasti SSSR, p. 114–119, 1 pl.

Galloway, J. J., and Harlton, B. H., 1928, Some Pennsylvanian Foraminifera of Oklahoma, with special reference to the genus *Orobias*: Jour. Paleontology, v. 2, p. 338–357, pls. 45, 46.

——— 1930, *Endothyranella*, a genus of Carboniferous Foraminifera: Jour. Paleontology, v. 4, p. 24–28.

Galloway, J. J., and Ryniker, C., 1930, Foraminifera from the Atoka Formation of Oklahoma: Oklahoma Geol. Survey Circ. 21, 27 p., 5 pls.

Galloway, J. J., and Spock, L. E., 1933, Pennsylvanian Foraminifera from Mongolia: Am. Museum Novitates, no. 658, p. 1–7, 2 figs.

Ganelina, R. A., 1951 Viséan and Namurian *Eostaffella* and *Millerella* of the western slope of the Moscow syncline [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 56, Mikrofauna SSSR no. 6, p. 179–209, 4 pls.

——— 1956, Foraminifera of the Viséan sediments of the northwest region of the Moscow syncline [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 98, Mikrofauna SSSR no. 8, p. 31–159, 12 pls.

——— 1966, Tournaisian and Viséan foraminifers of some regions of the Kama-Kinel depression [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 250, Mikrofauna SSSR no. 14, p. 64–175,12 pls.

Garwood, E. J., 1912, The Lower Carboniferous succession in the North-West of England: Geol. Soc. London Quart. Jour., v. 68, p. 449–586, 13 pls.

——— 1913, On the important part played by calcareous algae at certain geological horizons, with special reference to the Palaeozoic rocks: Geol. Mag., Dec. 5, v. 10, p. 440–446, 490–498, 545–553.

——— 1914, Some new rock building organisms from the Lower Carboniferous Beds of Westmoreland: Geol. Mag., Dec. 6, v. 1, p. 265–271, 2 pls.

——— 1916, The faunal succession in the Lower Carboniferous rocks of Westmoreland and North Lancashire: Geol. Assoc. London, Proc., v. 27, pt. 1, p. 1–23.

——— 1931, The Tuedian Beds of Northern Cumberland and Roxburgshire east of Liddel water: Geol. Soc. London Quart. Jour., v. 87, p. 97–157.

Garwood, E. J., and Goodyear, E. 1924, The Lower Carboniferous succession in the Settle District and along the line of the Craven fault: Geol. Soc. London Quart. Jour., v. 80, p. 184–272, 11 pls.

Gerke, A. A., 1961, Permian, Triassic and Lower Jurassic Foraminifera from the petroleum regions of northcentral Siberia [in Russian]: Nauchno-Issled. Inst. Geol. Arktiki Trudy, v. 120, p. 1–270, 122 pls.

Ginkel, A. C., van, 1965, Carboniferous fusulinids from the Cantabrian Mountains (Spain): Leidse Geol. Meded., v. 34, 225, p. 53 pls.

Girty, G. H., 1915, The fauna of the Batesville sandstone of northern Arkansas: U.S. Geol. Survey Bull. 593, p. 26–27, pl. 10, figs. 11–18.

Golubsov, V. K., 1957, Stratigraphy and Foraminifera of the Viséan Series of the Pripyat Arch. [in Russian]: Akad.

Nauk Beloruss SSR, Inst. Geol. Nauk, Sbornik 2, p. 41–191, 9 pls.

Gordon, Mackenzie, Jr., 1957, Mississippian cephalopods of northen and eastern Alaska: U.S. Geol. Survey Prof. Paper 283, 61 p.

Gorecka, T., and Mamet, B., 1970, Sur quelques microfaciès carbonatés paléozoïques des Sudètes polonaises (Monts de Bardo): Rev. Micropaléontologie, v. 13, no. 3, p. 155–164, 3 pls.

Griffith, J. W., and Henfrey, A., 1883, The micrographic dictionary, 4th ed.: London, van Voorst, v. 1.

Groot, G. E., de, 1963, Rugose corals from the Carboniferous of northern Palencia (Spain) Leidse Geol. Meded., pt. 29, 123 p., 26 pls., 39 figs.

Grozdilova, L. P., 1953, [Archaediscidae] *in* Dain, L. G., and Grozdilova, L. P., Fossil Foraminifera in the U.S.S.R.-Archaediscidae [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 74, p. 67–115, 4 pls.

Grozdilova, L. P., and Glebovskaia, E. M., 1948, Materials pertinent to the studies of the genus *Glomospira* and other representatives of the family Ammodiscidae in Viséan sediments of Makarov, Krasnokamsk, Kizelovsk and Moscow districts [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 145–149, 1 pl.

Grozdilova, L. P., and Lebedeva, N. S., 1950, Data on the middle Carboniferous Staffelliods of the western slope of the Urals [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 50, Mikrofauna SSSR no. 5, p. 5–46, 5 pls.

——— 1954, Foraminifera of the Lower Carboniferous and Bashkirian Stage of the Middle Carboniferous of the Kolvo-Vishera area [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 81, Mikrofauna SSSR no. 7, p. 4–236, 15 pls.

——— 1960, Foraminifera from the Carboniferous deposits of the western slope of the Urals and Timan [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 150, p. 1–264, 33 pls.

Gümbel, C. W., 1878 Kurze Anleitung zu geologischen Beobachtungen in den Alpen *in* Anleitung zu Wissenschaftlichen Beobachtungen auf Alpenreisen: Deutsch. Oster. Alpenverein Zeit., Beil. Wien, pt. 1, p. 105.

Gürich, G., 1914, *Solenopora* im oberdevonischen Kontaktkalk von Ebersdorf bei Neurode in Schlesien: Deutsch. Geol. Gesell. Zeitschr., v. 66, p. 383.

Güvenç, T., 1966, Description de quelques espèces d'Algues calcaires (Gymnocodiacées et Dasycladacées) du Carbonifère et du Permien des Taurus Occidentaux (Turquie): Rev. Micropaléontologie, v. 9, no. 2, p. 94–103, 3 pls.

Hall, J., 1864, Description of new species of fossils from the Carboniferous limestones of Indiana and Illinois: Albany Inst. Trans., v. 4, p. 24, 34–35.

Hallett, D., 1970, Foraminifera and algae from the Yoredale "Series" (Viséan-Namurian) of northern England: 6ème Cong. Avanc. Strat. Carbonifère, Sheffield 1967, Compte Rendu, p. 873–900, 8 pls.

Harlton, B. H., 1927, Pennsylvanian Foraminifera of the Glenn formation of southern Oklahoma: Jour. Paleontology, v. 1, no. 1, p. 15–26, pls. 1–5.

——— 1928, Pennsylvanian Foraminifera of Oklahoma and Texas: Jour. Paleontology, v. 1, no. 4, p. 305–310, pls. 52–53.

——— 1933, Micropaleontology of the Pennsylvanian Johns Valley shale of the Ouachita Mountains, Oklahoma, and its relationship to the Mississippian Caney shale: Jour. Paleontology, v. 7, no. 1, p. 3–29, pls. 1–7.

Henbest, L. G., 1931, The species *Endothyra baileyi* (Hall): Cushman Found. Foram. Research Contr., v. 7, pt. 4, p. 90–93, pls. 11–12.

——— 1953, The name and dimorphism of *Endothyra bowmani* Phillips 1846: Cushman Found. Foram. Research Contr., v. 4, no. 2, p. 63–65, 2 text figs.

——— 1962, *Endothyra bowmani* Phillips (1846) v. *Endothyra bowmani* Brown (1843) (Foraminifera): Zool. Nomenclature Bull., v. 19, pt. 4, p. 199–201.

Hewitt, P. C., and Conil, R., 1969, Foraminiferes du Meramecien et du Chesterien des Etats-Unis (Tennessee): Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 78, p. 175–185, 2 pls.

Hinde, G. J., 1913, On *Solenopora garwoodi* sp. nov., from the Lower Carboniferous in the North-West of England: Geol. Mag., n.s., Dec. 5, v. 10, p. 289–292.

Horn af Rantzien, H., 1956, An annotated check-list of genera of fossil Charophyta: Micropaleontology, v. 2, no. 3, p. 243–256.

Howchin, W., 1888, Additions to the knowledge of the Carboniferous Foraminifera: Royal Micros. Soc. Jour., pt. 2, p. 533–545, pls. 8–9.

Huh, O. K., 1967, The Mississippian System across the Wasatch Line, east central Idaho, extreme south western Montana: Montana Geol. Soc. 16th Ann. Field Conf. Guidebook, p. 31–62.

Igo, H., 1957, Fusulinids of Fukuji, southern part of the Hida Massif, Central Japan: Tokyo Kyoiku Daigaku Sci. Rept., ser. C, v. 5, no. 47, p. 153–246, 15 pls.

Jodot, P., 1930, Sur l'existence du Dinantien au col de San Colombano (Corse): Soc. Géol. France Bull., ser. 4, v. 30, p. 515–562.

Johnson, J. H., 1945, Calcareous algae of the Upper Leadville Limestone near Glenwood Spring, Colorado: Geol. Soc. America Bull., v. 56, no. 9, p. 829–848.

——— 1946a, Mississippian algal limestones from the vicinity of St. Louis, Missouri: Jour. Paleontology, v. 20, no. 2, p. 166–171, 1 pl.

———1946b, Lime secreting algae from the Pennsylvanian and Permian of Kansas. Geol. Soc. America Bull., v. 57, p. 1087–1120.

——— 1964, Lower Devonian algae and encrusting foraminifera from New South Wales: Jour. Paleontology, v. 38, no. 1, p. 98–108, 5 pls.

Johnson, J. H., and Konishi, K., 1956, Mississippian algae from the western Canada Basin and Montana: Colorado School Mines Quart., v. 51, no. 4, p. 85–107, 8 pls.

——— 1956, A review of Mississippian algae: Colorado School Mines Quart., v. 51, no. 4, p. 1–85, 24 pls.

Jones, T. R., 1854, [Reference to *Endothyra*] *in* Morris, J., 1854, A catalogue of British Fossils: London, p. 1–372.

——— 1876, Remarks on the Foraminifera, with special reference to their variability of forms, as illustrated by the cristellarians: Monthly Micros. Jour., v. 15, p. 61–92.

Judd, T., 1877, [Reference to the nature of calcispheres] *in* Sollas, W. J., On the structure and affinities of the genus *Siphonia*: Geol. Soc. London Quart. Trans., v. 33, p. 790–835.

Juferev, O. V., 1961, Systematics of Parathurammina [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 5, p. 121–127, 2 tables.

Kaisin, F., 1926, Les Roches du Dinantien de la Belgique: 13ème Cong. Gèol. Intl. Compte Rendu, v. 3, p. 1237–1269.

Kanmera, K., 1952, The Lower Carboniferous Kakisako Formation of southern Kyushu, with a description of some Corals and Fusulinids: Kyushu Univ. Fac. Sci. Mem., ser. D, v. 3, no. 4, p. 157–177, 5 pls.

Karpinsky, A., 1906, Die Trochilisken [in German]: Mémoires Comité géol., n. sér., v. 27, p. 1–166, 3 pls.

Kireeva, G. D., 1949, Some new Fusulinidae species from the Carboniferous limestones of the Donbass region [in Russian]: Biuro Glavnouprovlenie Radzvedkam. Uglya, Geol. Inst. Trudy, Bull. 6, p. 27–52.

Koninck, L. G. de, 1842, Description des animaux fossiles qui se trouvent dans le terrain carbonifère de Belgique, v. III: Liège, Dessain, 650 p.

——— 1872, Nouvelles recherches sur les animaux fossiles du terrain carbonifère de Belgique: Acad. Royale Sci. Belgique Mém., v. 39, fasc. 4, 178 p., 15 pls.

Konishi, K., 1956, *Anatolipora*, a new dasycladacean genus and its algal associates from the Lower Carboniferous of Japan: Colorado School Mines Quart., v. 51, no. 4, p. 111–127.

Konoplina, O. R., 1956, The microfauna of the Upper Devonian deposits of the Oleska Area (western Ukraine) [in Russian]: Akad. Nauk Ukrain. SSR, Inst. Geol. Trudy, Ser. Strat. Paleont., no. 26, p. 454–456, 1 pl.

——— 1959, Upper Devonian Foraminifera of the Oleska-Lvov section of the Ukraine [in Russian]: Akad. Nauk Ukrain. SSR, Inst. Geol. Trudy, Ser. Strat. Paleont., no. 26, p. 1–48, 7 pls.

Konovalova, M. V., 1962, New Sakmarian species of small foraminifers from the Timan-Petchora region [in Russian]: Paleont. Zhur., no. 3, p. 16–23, 2 pls.

Krestovnikov, V. N., and Teodorovitch, G. I., 1935, Zur Geologie des Mittle- und Oberkarbons des westlichen Abhanges des Süd-Urals [in Russian, with German summary]: Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 43, Geol. ser. no. 13 (1), p. 81–100.

——— 1936, Une nouvelle espèce de foraminifères de genre *Archaediscus* du Carbonifère de l'Oural méridional [in Russian]: Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 44, Geol. ser. no. 14 (1), p. 86–90, 3 figs.

Lange, E., 1925, Eine Mittelpermische Fauna von Guguk Bulat (Padanger Oberland, Sumatra): Geol.-Mijnb. Genootsch. Nederland Geol. Ser., v. 7, no. 3, p. 213–295, 5 pls.

Lapparent, J. de, 1926, De quelques manières d'être des calcaires oolithiques: Internat. Geol. Cong., 13th sess., Belgium, v. 3, p. 1303–1307, 1 pl.

Leavitt, E. M., 1968, Petrology, Paleontology, Carson Creek north reef complex, Alberta: Canadian Petroleum Geology Bull., v. 16, no. 3, p. 298–413.

Lebedeva, N. S., 1954, Lower Carboniferous Foraminifera of the Kuznetsk Basin [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 81, Mikrofauna SSSR no. 7, p. 237–295, 12 pls.

——— 1956, Foraminifera of the Etroeungtian sediments of the Tenghiz territory [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 98, Mikrofauna SSSR no. 8, p. 39–53, 3 pls.

——— 1962, [Taxonomy of lower Carboniferous Foraminifera] *in* Kalfina, L. L., Biostratigraphy of the Paleozoic of the Altai Mountain Region. Pt. 3, Upper Paleozoic [in Russian]: Sibirsk. Nauchno-Issled. Inst. Geologii, Geofizikii Mineral'nogo Syr'ya Trudy, Byull. 21, p. 100–115, 3 pls.

Lee, G. W., 1912, The British Carboniferous *Trepostomata*: Great Britain Geol. Survey Mem., v. 1, pt. 3, p. 135–195.

Lee, J. S., 1937, Foraminifera of the Donetz Basin and their stratigraphical significance: Geol. Soc. China Bull., v. 16 (1936–37), p. 48–102, pls. 1, 2.

Lee, J. S., Chen, S., and Chu, S., 1930, Huanglung limestone and its fauna: Acad. Sinica, Nat. Res. Inst. Geol., Mem. 9, p. 85–143, pls. 2–15.

Lehmann, E. P., 1953, Foraminifera of the Glen Eyrie shale of central Colorado: Cushman Found. Foram. Research Contr., v. 4, no. 2, p. 67–76, pls. 11, 12.

Le Maitre, D., 1930, Observations sur les Algues et les Foraminifères des calcaires dévoniens: Soc. Géologique du Nord Annales, v. 55, p. 42–50, 1 pl .

Liebus, A., 1932, Die Foraminiferen, *in* Die Fauna des deutschen Unterkarbons, Pt. 3, Preuss. Geol. Landesanstalt Abh., new ser., no. 141, p. 133–175, pls. 9–10.

Lipina, O. A., 1948a, Foraminifera of the Chernyshinsk Suite, Tournaisian Series, Lower Carboniferous, Moscow Basin [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 251–259, 2 pls.

——— 1948b, Textulariids of the upper part of the Lower Carboniferous of the southern part of the Moscow Basin [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 196–215, 4 pls.

——— 1950, Foraminifera from the Upper Devonian of the Russian Platform [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 119, no. 143 p. 110–132, 3 pls.

——— 1955, Foraminifera of the Tournaisian stage and uppermost Devonian of the Volga-Ural region and western slope of the central Urals [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 163, no. 70, p. 1–96, 13 pls.

——— 1959, On the Devonian-Carboniferous boundary in the oriental part of the Russian Platform and the western slope of the southern Urals, *in* Stratigraphy of the lower part of the Lower Carboniferous of the Volga-Ural district of the Russian Platform [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 14, p. 31–50, 2 pls.

——— 1960, Stratigraphy of the Tournaisian Stage and the Devonian and boundary beds of the eastern part of the Russian Platform and western slopes of the Urals [in Russian] Akad. Nauk SSSR Geol. Inst. Trudy 14, p. 1–128, 2 pls.

——— 1963, On the evolution of the Tournaisian Foraminifera [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 13–21, 1 table.

——— 1965, Taxonomy of the Tournayellidae [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 130, p. 1–115, 24 pls.

——— 1970, Evolution of biserial rectilinear Early Carboniferous foraminifers [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 13, p. 3–29, 2 pls.

Liszka, S., 1958, Culm-Foraminifera from Gluchowki near Cracow [in Polish with English translation]: Polskie. Towarz. Geol. Rocznik, v. 28, no. 2, p. 153–167.

Loeblich, A. R., Jr., and Tappan, H., 1964, Protista, Pt. C, *in* Moore, R. C., ed., Treatise on Invertebrate Paleontology: Geol. Soc. America and Kansas Univ. Press, p. 1–900.

Macqueen, R. W., and Bamber, E. W., 1967, Stratigraphy of Banff Formation and lower Rundle Group (Mississippian), southwestern Alberta: Canada Geol. Survey Paper 67–47, 37 p., 3 pls., 9 figs.

——— 1968, Stratigraphy and facies relationships of the Upper Mississippian Mount Head Formation, Rocky Mountains and foothills, southwestern Alberta: Canadian Petroleum Geology Bull., v. 16, no. 3, p. 225–287, 11 figs.

McCoy, F., 1849, On some new genera and species of Paleozoic corals and foraminifera: Ann. Mag. Nat. History, ser. 2, v. 3, p. 134.

——— 1855, Systematic description of the British Paleozoic fossils in the Geological Museum of the University of Cambridge: London, J. W. Parker and Son, 661 p., 25 pls.

McKay, W., and Green, R., 1963, Mississippian Foraminifera of the southern Canadian Rocky Mountains, Alberta: Research Council Alberta Bull. 10, 77 p., 12 pls., 4 text figs.

Malakhova, N. P., 1954, Lower Carboniferous Foraminifera of the siliceous limestones of the western slope of the Urals [in Russian]: Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., v. 29, no. 1, p. 49–60, 2 pls.

——— 1956a, Foraminifera from the Carboniferous rocks of the western slope of the northern and central Urals: Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 72–155, 15 pls.

——— 1956b, Foraminifera of the Zhartimke River Limestone of the southern Ural [in Russian]: Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 24, no. 3, p. 26–71, 8 pls.

——— 1957, New Lower Carboniferous foraminiferal species of the Urals [in Russian]: Akad. Nauk SSSR Ural Fil., Gorno-Geol. Inst. Trudy 27, p. 3–8, 2 pls.

——— 1959, The Tournaisian Stage of the northern and central Urals [in Russian]: Akad. Nauk SSSR Ural. Fil., Gorno-Geol. Inst. Trudy 38, p. 1–104, 14 pls.

——— 1963, A new foramineral genus from the Lower Viséan of the Urals [in Russian]: Paleont. Zhur., no. 3, p. 111–112, 1 text fig.

Mamet, B. L., 1962, Remarques sur la microfaune de Foraminifères du Dinantien: Soc. Belge Géologie, Paléontologie et Hydrologie Bull., v. 70, no. 2, p. 166–173.

——— 1965, Remarques sur la Microfaune du Marbre Noir de Dinant (V I a): Soc. Géol. Belgique Annales, v. 88, no. 5, p. 187–219.

——— 1967, The Devonian-Carboniferous boundary in Eurasia, *in* International Symposium on the Devonian System, v. 2: Alberta, Alberta Soc. Petroleum Geologists, p. 995–1007.

——— 1968a, Sur les microfaciès calcaires du Viséen de la Montagne-Noire (France): Rev. Micropaléontologie, v. 11, no. 3, p. 121–136, 5 pls., 6 text figs.

——— 1968b, Foraminifera, Etherington Formation (Carboniferous), Alberta, Canada: Canadian Petroleum Geology Bull., v. 16, no. 2, p. 167–179.

——— 1968c, Sur une microfaune du Viséen Supérieur de Terre-Neuve: Naturaliste Canadien, v. 95, no. 6, p. 1375–1382.

——— 1970, Carbonate microfacies of the Windsor Group (Carboniferous), Nova Scotia and New Brunswick: Canada Geol. Survey Paper 70–21, p. 1–121, 19 pls.

——— 1973, Microfaciès viséens du Boulonnais (Nord, France): Rev. Micropaléontologie, v. 16, no. 2, p. 101–124, 9 pls.

——— 1974, Taxonomic note on Carboniferous Endothyracea: Jour. Foraminiferal Research, v. 4, no. 4, p. 200–204.

Mamet, B. L., and Armstrong, A. K., 1972, Lisburne Group, Franklin and Romanzof Mountains, northeastern Alaska, *in* Geological Survey research 1972: U.S. Geol. Survey Prof. Paper 800–C, p. C127–C144, 10 figs.

Mamet, B. L., and Belford, D., 1968, Carboniferous Foraminifera, Bonaparte Gulf Basin, northwestern Australia: Micropaleontology, v. 14, no. 3, p. 339-347.

Mamet, B. L., Choubert, G., and Hottinger, L., 1966, Notes sur le Carbonifère du Djebel Ouarkziz; Etude du passage du Viséen au Namurien d'après les Foraminifères: Maroc Service Géol. Notes et Mém., v. 27 (Notes et Mém. no. 198), p. 6–21, 4 pls., 4 text figs.

Mamet, B. L., and Gabrielse, H. 1969, Foraminiferal zonation and stratigraphy of the type-section of the Nizi Formation, British Columbia: Canada Geol. Survey Paper 69–16, p. 1–21.

Mamet, B. L., and Mason, D., 1968, Foramineral zonation of the Lower Carboniferous Connor Lake section, British Columbia: Canadian Petroleum Geology Bull., v. 16, no. 2, p. 147–166.

Mamet, B. L., Mikhailov, N., and Mortelmans, G., 1970, La stratigraphie du Tournaisien et du Viséen Inférieur de Landelies. Comparaison avec les coupes du Tournaisis et du bord Nord du Synclinal de Namur: Soc. Belge Géologie, Paléontologie et Hydrologie Mém. 9, p. 1–81.

Mamet, B. L., and Ross, C. A., 1971, Foraminiferal microfacies of the Upper Paleozoic, northern Yukon Territory, *in* Bamber, E. W., and Waterhouse, J. B., Carboniferous and Permian stratigraphy and paleontology, northern Yukon Territory, Canada: Canadian Petroleum Geology Bull., v. 19, no. 1, p. 29–250.

Mamet, B. L., and Rudloff, B., 1972, Algues carbonifères de la partie septentrionale de l'Amérique du Nord: Rev. Micropaléontologie, v. 15, no. 2, p. 75–114, 10 pls.

Mamet, B. L., and Skipp, Betty, 1970a, Preliminary foraminiferal correlations of Early Carboniferous strata in the North American Cordillera: Liège Univ. Cong. et. Coll., v. 55, p. 327–348.

——— 1970b, Lower Carboniferous Foraminifera; preliminary zonation and stratigraphic implication for the Mississippian of North America: Sixth Internat. Cong. Carboniferous Stratigraphy, v. 3, p. 1129–1146.

Mamet, B. L., Skipp, Betty, Sando, W. J., and Mapel, W. J., 1971, Biostratigraphy of Upper Mississippian and associated Carboniferous rocks in south-central Idaho: Am. Assoc. Petroleum Geologists Bull., v. 55, no. 1, p. 20–33.

Marple, M. F., 1955, Small Foraminifera of the Pottsville formation in Ohio: Ohio Jour. Sci., v. 55 (2), p. 81–89, 42 figs.

Martin, A. J., 1970, Structure and tectonic history of the western Brooks Range, DeLong Mountains and Lisburne Hills, northern Alaska: Geol. Soc. America Bull., v. 81, p. 3605–3622, 7 figs.

Maslov, V. P., 1935, On some Paleozoic algae of the southern Urals [in Russian]: All-Union Inst. Trans., Econ. Mineralogy, v. 72 p. 1–28.

——— 1956, Fossil algae of the U.S.S.R. [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy, v. 160, p. 1–301, 86 pls.

Meunier, S., 1888, Examen paléontologique du Calcaire à *Saccammina* de Cussy-en-Morvan: Soc. Hist. Nat. Autun, no. 1, p. 231–236.

Meyer, H. L., 1914, [Carbonenfaunen aus Bolivia und Peru] *in* Steinmann, G., Beitrage zur Geologie und Paläontologie von Süd-Amerika: Neues Jahrb. Mineralogie, Geologie u. Paläontologie, Stuttgart, v. 37, p. 590–652, pls. 13–14, 5 text figs.

Mikhailov, A. V., 1935, Foraminifera from the Oka series of the Borovichi District, Leningrad Region [in Russian]: Lenin. Geol. Trust, Bull. no. 2–3, (7–8), p. 33–36.

——— 1939a, To the characteristics of the genera of Lower Carboniferous Foraminifera, *in* Maljavkin, S. F., ed., The Lower Carboniferous deposits of the northwestern limb of the Moscow Basin [in Russian]: Lenin. Geol. Trust Symp., no. 3, p. 47–62, 4 pls.

——— 1939b, On the Paleozoic Ammodiscidae: Same as 1939a, p. 63–69, 5 figs.

Miklukho-Maklai, A. D., 1953, Systematic classification of the family Archaediscidae [in Russian]: Ezh. Vses. Paleont. Otdel. Trudy 14, p. 127–131, 1 pl.

——— 1956, *in* Kiparisova, L. D., Markovsky, B. P., and Radchenko, G. P., New families and genera of invertebrates [in Russian]: Vses. Nauchno-Issled. Geol. Inst. Trudy, Ser. Geol., Bull. 12, p. 9–15.

——— 1957, New information concerning the systematics of phylogeny of the Archaediscidae [in Russian]: Leningrad Univ. Bull., Ser. Geol. Geography, no. 24 (4), p. 37.

——— 1958, A new family of Foraminifera—Tuberitinidae M.-Maklai, Fam. Nov. [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 130–135, 1 text fig.

——— 1960, New early Carboniferous Archaediscidae, *in* Novye vidy drevnikh rasteniy i bespozvonochnykh SSR [New species of ancient plants and invertebrates of the U.S.S.R.]: Vses. Nauchno-Issled. Geol. Inst. Trudy, Min. Geol. Okhran Nedr. SSSR, pt. 1, p. 149–151, 1 pl.

——— 1963, Stratigraphy of the Upper Paleozoic and the systematics and phylogeny of Foraminifera, *in* Upper Paleozoic of central Asia [in Russian]: Izd. Leningrad Universitat, p. 1–328, 14 tables, 18 text figs.

Miller, S. A. 1889, North American Geology and Paleontology for the use of amateurs, students and scientists: Cincinnati, Ohio Western Methodist Book Concern, 664 p.

Milne-Edwards, H., and Haime, Jules, 1852, A Monograph of British fossil corals, Pt. III, Permian and Mountain Limestone: Paleont. Soc., v. 6, p. 147–210.

Milon, Y., 1928, Recherches sur les Calcaires Paléozoïques et le Briovérien de Bretagne: Paris Univ. Fac. Sci., Doctorat, 151 p., 8 pls., 77 text figs.

Möller, V. von, 1877, Ueber Fusulinen und ähnliche Foraminiferen Formen des Russischen Kohlenkalks: Neues Jahrb. Mineralogie, Geologie u. Paläontologie, p. 139–146.

——— 1878, Die Spiral-Gewundenen Foraminiferen des Russischen Kohlenkalks: St. Petersbourg Acad. Imp. Sci. Mém., sér. 7, v. 25, no. 9, 147 p., 15 pls.

——— 1879, Die Foraminiferen des Russischen Kohlenkalks: St. Petersbourg Acad. Imp. Sci. Mém., ser. 7, v. 27, no. 5, 131 p., 7 pls.

——— 1880, Ueber einige Foraminiferenführende Gesteine Persiens: Jahrb. Ost. Geol. Reichanstalt., Wein, v. 30, pt. 4, p. 573–586, pls. 9, 10.

——— 1880, Materialy dlia geologii Rossii (Materialen zur Geologie Russlands): St. Petersbourg Acad. Imp. Sci. section minéralogique, v. 9, 182 p., 7 pls.

Moore, W. L., 1964, Note on the Morphology and Taxonomic Position of the Fusulinid *Millerella marblensis* Thompson: Jour. Paleontology, v. 38, no. 2, p. 294–305, 2 pls.

Morozova, V. G., 1949, Representatives of the families Lituolidae and Textulariidae from the Upper Carboniferous and Artinskian deposits of the Bashkirian pre-Ural [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 105, no. 35, p. 244–275, 5 pls.

Mull, C. G., and Mangus, M. D., 1972, Itkilyariak Formation: New Mississippian Formation of Endicott Group, Arctic Slope of Alaska: Am. Assoc. Petroleum Geologists Bull., v. 56, no. 8, p. 1364–1369, 6 figs.

Nicholson, H. A., and Etheridge, R., J., 1878, A Monograph of the Silurian fossils of the Girvan district, Ayrshire, with special reference to those contained in the "Gray Collection": Edinburgh and London, v. 1, pt. 1.

Okimura, Y., 1958, Biostratigraphical and paleontological studies on the endothyroid Foraminifera from the Atetsu Limestone Plateau, Okayama Prefecture, Japan: Hiroshima Univ. Jour. Sci., ser. C, v. 2, no. 3, p. 235–264, pls. 32–36.

——— 1965, Endothyroid Foraminifera, *Endothyranopsis* from Japan: Hiroshima Univ. Geol. Rept., no. 14, Prof. Imamura Mem. Vol., p. 253–264, pl. 21, 2 text figs.

——— 1967, Carboniferous palaeotextulariid foraminifers from the Akiyoshi Limestone Group, Southwest Japan: Hiroshima Univ. Geol. Rept., ser. C, v. 5, no. 3, p. 255–266, 1 pl.

Omara, S., and Conil, F., 1965, Lower Carboniberous Foraminiefra from southwestern Sinai, Egypt: Soc. Géol. Belgique Annales, v. 88, no. 5, p. 221–242, 3 pls.

Orlova, I. N. 1955, New genus of the familv Archaediscidae [in Russian]: Akad. Nauk SSSR Doklady, v. 102, no. 3, p. 621–622, 1 text fig.

——— 1958, Foraminifera of the Carboniferous horizons of the region of the Saratogan disturbances [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 124–129, 1 pl.

Ozawa, Y., 1925, Paleontological and stratigraphical studies on the Permo-Carboniferous limestone of Nagata—Pt. 2, Paleontology: Tokyo Imp. Univ. Jour., Coll. Sci., v. 45 (1923–25), art. 6, p. 1–90, pls. 1–14.

Parker, W. K., and Jones, R., 1872, On the nomenclature of the Foraminifera: Ann. Mag. Nat. History, ser. 4, v. 10, p. 10, p. 253–271.

Patton, W. W., Jr., and Tailleur, I. L., 1964, Geology of the Upper Killik-Itkillik region, Alaska: U.S. Geol. Survey Prof. Paper 303–G, p. 409–499.

Paul, H., 1937, Unterkarbonische Kalkalgen und Calcisphaeren Deutschlands: Jahrb. Preuss. Geol. Landesanstalt, v. 58, pt. A, p. 276–281.

——— 1938, *Girvanella liebusi* Paul in der innern Dibunophyllum-Zone des Velberter Sattels: Paläont. Zeitschr., v. 20, no. 3–4, p. 317–318.

——— 1940, *Solenopora hillae*, eine neue Art aus dem Unterkarbon von Australien: Zentralblatt Mineralogie, Abt. B., no. 1, p. 15–21.

Pelhate, A., 1964, Présence de *Koninckopora inflata* (de Koninck) (Algue) dans les calcaires viséens du bassin de

Laval (Mayenne): Soc. Gèol. France Compte Rendu, 7ème sér, v. 6 p. 263–264.

——— 1967, Algues et Foraminifères viséens du bassin de Laval (Massif armoricain): Soc. Géol. France Bull., 7ème sér., v. 9, no. 6, p. 897–902, pl. 32.

——— 1969, Micropaléontologie des calcaires dinantiens du Bassin de Laval: Soc. Géol. Minéral. Bretagne Bull., p. 27–76, 6 pls.

Petryk, A. A., 1971, A new Lower Carboniferous *Archaediscus* (Foraminifera) from southwestern Alberta: Micropaleontology, v. 17, no. 2, p. 249–252.

Petryk, A. A., and Mamet, B. L., 1972, Lower Carboniferous algal flora, southwestern Alberta: Canadian Jour. Earth Sci., v. 9, no. 7, p. 767–802.

Petryk, A. A., Mamet, B. L., and MacQueen, R. W., 1970, Preliminary foraminiferal zonation, Rundle Group and uppermost Banff Formation (Lower Carboniferous), southwestern Alberta: Canadian Petroleum Geology Bull., v. 18, no. 1, p. 84–103.

Phillips, J., 1846, On the remains of microscopic animals in the rocks of Yorkshire: Geol. Polytech. Soc. West Riding, Yorkshire, v. 2, p. 274–285, pl. 7.

Pia, J., 1932, Algenkalkknollen aus dem Russischen Devon: Acad. Sci. URSS Bull., p. 1345–1360, 2 pls.

——— 1937, Die wichtigsten Kalkalgen des Jungpaläozoikums und ihre geologische Bedeutung: 2ème Cong. Av. et Strat. Carbonifère, Heerlen 1935, Compte Rendu, v. 2, p. 765–856, 13 pls.

——— 1939, Sammelbericht über fossile Algen—Solenoporaceae 1930 bis 1938, mit Nachtragen aus früheren Jahren: Neues Jahrb. Geologie, v. 3, p. 731–760.

Platonov, V. A., 1969, Givetian and Late Devonian Foraminifers of the Norilsk Region [in Russian]: Nauchno-Issled. Inst. Geologii Arktiki, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 47–60, 1 pl.

Plummer, H. J., 1930, Calcareous Foraminifera in the Brownwood shale near Bridgeport, Texas: Texas Univ. Bull., no. 3019, p. 5–21, pl. 1.

——— 1945, Smaller Foraminifera in the Marble Falls, Smithwick, and Lower Strawn strata around the Llano Uplift in Texas: Texas Univ. Pub. 4401, p. 211–271, pls. 15–17.

——— 1948, Morphology of *Globivalvulina*: Am. Midland Naturalist, v. 39, p. 167–173, 5 text figs.

Pogrebniak, V. A., 1964, The foraminiferal genera *Monotaxinoids* and *Eolasiodiscus* [in Russian]: Paleont. Zhur., no. 1, p. 3–9, 1 pl.

Pokorny, V., Grundzüge der Zoologischen Mikropaläontologie: Berlin, VEB Deutscher Verlag der Wissenschaften, v. 1, p. 1–582.

Porchniakova, J. F., 1958, The Namurian of the Peshkant Mountain Range (south Ferghana) [in Russian]: Leningrad Univ., Ser. Geology Geography, no. 24, (4), p. 32–38, 2 text figs.

Porter, S. C., 1966, Stratigraphy and deformation of Paleozoic section at Anaktuvuk Pass, central Brooks Range, Alaska: Am. Assoc. Petroleum Geologists Bull., v. 50, no. 5, p. 952–980.

Potievskaia, P. D., Foraminifera of the Upper Bashkir deposits of the western part of the Donetz Basin [in Russian]: Akad. Nauk Ukrain. SSR, Ser. Strat. Paleont., Geol. Inst. Trudy 31, p. 1–73, 7 pls.

——— 1962, Representatives of certain families of small Foraminifera from the Lower Permian of the northwestern border of the Donetz Basin [in Russian]: Akad. Nauk Ukrain, SSR, Ser. Strat. Paleont., Trudy 44, p. 49–94, 8 pls.

——— 1964, Some fusulinids and small Foraminifera in the Bashkir sediments of the greater Donetz Basin [in Russian]: Akad. Nauk Ukrain, SSR, Ser. Strat. Paleont., Trudy 48, p. 31–59, 5 pls.

Pozner, V. M., and Shlykova, I. I., 1961, Paleontological characteristics of the Lower Carboniferous Raskov Beds of the central Volga Basin [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 179, Mikrofaune S.S.S.R. no. 13, p. 5–26, 2 pls.

Poyarkov, B. V., 1969, Stratigraphy and foraminifers of the Devonian System in the Tian–Shian [in Russian]: Akad. Nauk Kirgiz. SSR Inst. Geol., Izdatel. Ilim, Frunze, p. 1–185, 11 pls.

Pronina, T. V., 1960, New Ordovician and Silurian Parathuramminidae of the Urals, *in* New species of ancient plants and invertebrates of the U.S.S.R. [in Russian]: Vses. Nauchno-Issled. Geol. Inst. Trudy, Mineral. Geol. Okran Nedr. SSSR, no. 1, p. 138–140, 1 pl.

——— 1963a, Carboniferous foraminifers of the Berezovo Series in the eastern slope of the southern Ural Mountains, *in* Papers on the problems of stratigraphy, no. 7—Stratigraphy and fauna of the Paleozoic of the Ural Mountains [in Russian]: Akad. Nauk SSSR Ural. Fil., Geol. Inst. Trudy 65, pl. 119–176, 7 pls.

——— 1963b, Foraminifera and some associated microorganisms from the Silurian of the Ufa Amphitheatre [in Russian]: Paleont. Zhur., no. 4, p. 3–13, 2 pls.

——— 1965, On the development of the systematics, paleoecology and stratigrapic significance of the Parathuramminidae: Akad. Nauk SSSR Voprosy Mikropaleontologii, v. 9, p. 71–82.

Purkin, M. M., Poyarkov, B. V., and Rozanetz, V. M., 1961, The stratigraphy and new species of Foraminifera from the Tournaisian of the Borkoldoi Ridge (Tian-chan) [in Russian]: Akad. Nauk Kirgiz. SSR, Ser. Set. Tekh. Nauk, Byull. 3, no. 4, p. 15–36, 2 pls.

Putria, F. S., 1956, Stratigraphy and Foraminifera of the Middle Carboniferous sediments of the eastern Don Basin [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 98, Mikrofauna SSSR no. 8, p. 333–485, 17 pls.

Racz. L., 1966, Late Paleozoic calcareous algae in the Pisuerga Basin (North Palencia, Spain): Leidse Geol. Meded., v. 31, p. 241–260.

Rauzer-Chernoussova, D. M., [Description of new taxa] *in* Rauzer-Chernoussova, D. M., and Fursenko, A. V., 1937, Guide to the Foraminifera of the oil-bearing region of the U.S.S.R., part 1 [in Russian]: Leningrad and Moscow, United Sci. Tech. Press (ONTI), p. 1–315, 241 text figs.

——— 1938, The upper Paleozoic Foraminifera of the Samara Bend and the Trans-Volga region [in Russian]: Acad. Sci. URSS, Trav. Inst. Geol., v. 7, p. 69–167, 9 pls.

——— 1948a, Some new Lower Carboniferous Foraminifera from Syzran district [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 239–243, 1 pl.

——— 1948b, Foraminifera from the Carboniferous deposits of central Kazakhstan, U.S.S.R. [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 66, no. 21, p. 1–25, 3 pls.

——— 1948c, Stratigraphy of the Viséan Series of the southern part of the Moscow Basin, by means of foraminiferal fauna: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 3–40, 9 text figs.

——— 1948d, Foraminifers and stratigraphy of the Viséan and the Namurian Series of the central part of the Russian Platform and areas adjoining the Urals: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 102–142, 2 text figs.

——— 1948e, The Lower Carboniferous Endothyras of the group *Endothyra crassa* Brady and similar forms: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 166–175, 1 pl.

——— 1948f, The genus *Haplophragmella* and similar forms [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 159–165, 1 pl.

——— 1948g, About some Endothyras of the group *Endothyra bradyi* Mikhailov [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 176–181, 1 pl.

——— 1948h, The genus *Cribrospira* Möller [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 186–189, 1 pl.

——— 1948i, Some new species of Foraminifera from the Lower Carboniferous sediments of the Moscow Basin [in Russian]: Akad. Nauk SSR Geol. Inst. Trudy 62, no. 19, p. 227–238, 2 pls.

——— 1949, A discussion of the ontogeny of certain Paleozoic Foraminifera [in Russian]: Akad. Nauk SSSR Paleont. Inst. Trudy 20, p. 339–353, 1 pl.

Rauzer-Chernoussova, D. M., Beljaev, G. M., and Reitlinger, E. A., 1936, Die Oberpaläozoischen Foraminiferen aus dem Petschora-Lande (der Westabhang des Nord Urals) [in Russian, with German summary]: Akad. Nauk SSSR, Poliarnia Komissia, Trudy 28, p. 159–232, 6 pls.

——— 1940, On Carboniferous Foraminifera of the Samara Bend [in Russian, with English summary]: Neft Geol. Razved. Inst. Trudy 7, p. 1–79, 9 pls.

Rauzer-Chernoussova, D. M., and Fursenko, A. V., 1959, Principles of Paleontology, Part 1, Protozoa, edited by Yu. Orlov: Akad. Nauk SSSR, p. 1–368, 13 pls.

Rauzer-Chernoussova, D. M., Kireeva, G. D., Leontovich, C. E., Gryzlova, N. D., Safonova, T. P., and Chernova, E. I., 1951, Srednekamennougol'nye fuzulinidy russkoy platformy i copredel'nykh oblastey [Middle Carboniferous fusulinids of the Russian Platform and adjacent regions]: Akad. Nauk SSSR Geol. Inst. Ministerstvo Neftyanoy promyshlennosti SSSR, p. 1–380, 58 pls.

Reed, B. L., 1968, Geology of the Lake Peters area, northeastern Brooks Range: U.S. Geol. Survey Bull. 1236, 132 p.

Reichel, M., 1945, Sur quelques foraminifères nouveaux du Permien méditerranéen: Eclogae Geol. Helvetiae, v. 38, p. 524–560, pl. 19, 44 text figs.

Reiser, H. N., 1970, Northeastern Brooks Range—a surface expression of the Prudhoe Bay section, *in* Adkison, W. L., and Brosgé, M. M., eds., Proceedings of the geological seminar on the North Slope of Alaska: Los Angeles, Pacific Sec. Am. Assoc. Petroleum Geologists, p. K1–K14.

Reiser, H. N., Brosgé, W. P. Dutro, J. T., Jr., and Detterman, R. L., 1971, Preliminary geologic map, Mount Michelson quadrangle, Alaska: U.S. Geol. Survey open-file map, scale 1:250,000.

Reiser, H. N., Dutro, J. T., Jr., Brosgé, W. P., Armstrong, A. K., and Detterman, R. L., 1970, Progress map, geology of the Sadlerochit and Shublik Mountains: U.S. Geol. Survey open-file map, scale 1:63,360.

Reitlinger, E. A., 1949, An account of the smaller Foraminifera in the lower part of the Middle Carboniferous in the central Ural and Kama Regions, U.S.S.R. [in Russian]: Akad. Nauk SSSR Izv. Ser. Geol., no. 6, p. 149–164, 1 pl.

——— 1950, Foraminifera of the Middle Carboniferous formations of the central part of the Russian Platform (exclusive of the family Fusulinidae) [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 126, no. 47, p. 1–127, 22 pls.

——— 1954a, Results of the study of the Donbass Series for the stratigraphy of the Namurian and Bashkirian on the Russian Platform [in Russian]: Akad. Nauk SSSR Izv. Ser. Geol., no. 3, p. 72–82, 1 pl.

——— 1954b, Devonian Foraminifera from some sections of the eastern part of the Russian Platform [in Russian]: Vses. Nauchno-Issled. Geologorazved. Neft. Inst. Trudy, Paleont. sbornik no. 1, p. 52–81, 8 pls.

——— 1956, New family Lasiodiscidae [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 1, p. 69–80, 2 pls.

——— 1958, The problem of the systematization and phylogeny of the superfamily Endothyridea [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 2, p. 53–74, 4 text figs.

——— 1959a, Atlas of microscopic organic remains and problematics in the ancient deposits of Siberia [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 25, p. 1–62, 22 pls.

——— 1959b, [Order Endothyrida] *in* Rauzer-Chernoussova, D. M., and Fursenko, A. V., *in* Osnovy paleontologii, v. 1, Protozoa [in Russian]: Akad. Nauk SSSR, p. 190–201, 2 pls.

——— 1960, On the characteristics of the Ozerko-Kovansk formation and its organic remains [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy, Byull. 14, p. 135–179, 3 pls.

——— 1961, On some questions of the systematics of the Quasiendothyridae [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 5, p. 31–68, 6 pls.

——— 1962, [Taxonomic description] *in* Brazhnikova, N. E., and Reitlinger, E. A., On the characterization of the Upper Devonian and Tournaisian layers of the Pechora [in Russian]: Moskov. Obshch. Ispytateley Prirody Byull., Otdel Geol., no. 5, p. 36–60.

——— 1963, On the micropaleontological criteria for determination of the limits of the Lower Carboniferous according to the Foraminifera [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 7, p. 22–56, 3 pls.

——— 1964, Present status of the studies of the order Endothyrida [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 8, p. 30–52, 1 pl.

——— 1966, Some problems of classification and evolution of endothyrids and primitive fusulinids [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 10, p. 39–67, 3 pls.

——— 1971, Some problems of systematics in the light of evolutionary stages of Upper Paleozoic foraminifers [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 14, p. 3–16, 1 pl.

Rich, Mark, 1961, Stratigraphic section and fusulinids of the Bird Spring Formation near Lee Canyon, Clark County, Nevada: Jour. Paleontology, v. 35, no. 6, p. 1159–1180.

Ronchesnes, P., 1930, Présence de poudingue et Algues calcaires à Bois-Borsu, dans l'oolithe moyenne du Viséen: Soc. Géol. Belgique Annales, v. 54, p. 84–85.

Ross, C. A., 1967, Late Paleozoic Fusulinacea from Northern Yukon Territory: Jour. Paleontology, v. 41, no. 3, 709–729, pls. 79–86, 2 text figs.

Ross, C. A., and Sabbins, F. F., 1965, Early and Middle Pennsylvanian fusulinids from southeastern Arizona: Jour. Paleontology, v. 39, no. 2, p. 173–209, 8 pls.

Roth, R., and Skinner, J., 1930, The fauna of the McCoy Formation, Pennsylvanian, of Colorado: Jour. Paleontology, v. 4, no. 4, p. 332–352, 2 pls.

Rozovskaia, S. E., 1961, On the systematics of the Endothyridae and Ozawainellidae [in Russian]: Paleont. Zhur., no. 3, p. 19–21.

——— 1962, *Endothyra bowmani* Phillips (1846), v. *Endothyra bowmani* Brown, 1843 (Foraminifera); an alternative proposal: Zool. Nomenclature Bull., v. 19, pt. 4, p. 202–204.

——— 1963, The earliest fusulinids and their ancestors [in Russian]: Akad. Nauk SSSR Paleont. Inst. Trudy 97, p. 1–127, 22 pls.

Rupp, A. W., 1966, Origin, structure and environmental significance of recent and fossil Calcispheres: Geol. Soc. America Program 1966, Ann. Mtgs., San Francisco, 1966, p. 186.

Sable, E. G., and Dutro, J. T., Jr., 1961, New Devonian and Mississippian Formations in DeLong Mountains, northern Alaska: Am. Assoc. Petroleum Geologists Bull., v. 45, no. 5, p. 585–593, 4 figs.

Sada, K., 1964, Carboniferous and Lower Permian fusulines of the Atetsu Limestone in west Japan: Hiroshima Univ. Jour. Sci., ser. C, v. 4, no. 3, p. 225–269, pls. 21–28, 23 tables.

——— 1967, Fusulinids of the *Millerella* Zone of the Taishaku Limestone (Studies of the stratigraphy and the microfossil faunas of the Carboniferous and Permian Taishaku Limestone in west Japan, no. 1): Palaeont. Soc. Japan Trans. and Proc., n.s., no. 67, p. 139–147, pls. 13–14, 4 tables.

——— 1969, Microfossils of the lowest part of the Taishaku Limestone (Studies of the stratigraphy and the microfossil faunas of the Carboniferous and Permian Taishaku Limestone in west Japan): Palaeont. Soc. Japan Trans. and Proc., n.s., no. 75, art. 555, p. 119–129, pls. 12–13.

Sage, N. M., Jr., 1954, The stratigraphy of the Windsor Group in the Antigonish quadrangles and the Mahone Bay-St. Margaret Bay area, Nova Scotia: Nova Scotia Dept. Mines Mem. 3, 168 p., 21 pls., 14 text figs., 2 maps.

St.-Jean, Joseph, 1957, A Middle Pennsylvanian foraminiferal fauna from Duboic County, Indiana: Indiana Geol. Survey Bull., 10, 66 p., 5 pls. 3 text figs.

Sando, W. J., Mamet, B. L., and Dutro, J. T., Jr., 1969, Carboniferous megafaunal and microfaunal zonation in the northern Cordillera of the United States: U.S. Geol. Survey Prof. Paper 613–E, p. E1–E29.

Saurin, E., 1960, Foraminifères viséens de Ban Phit (Laos): Ann. Fac. Sci. Saigon, p. 345–376, pls. 1–4 [in French, with English abstract].

——— 1961, Foraminifères dinatiens du Laos: Ann. Fac. Sci. Saigon, p. 199–230, pls. 1–7 [in French, with English abstract].

——— 1964, Foraminifères namuriens de Tan-Lam (Province de Quang-Tri, centre Viêtnam): Arch. Géol. Viêtnam, v. 6, p. 37–74, 7 pls.

——— 197, Enrothyridae et Fusulindae du Moscovien Inférieur (Bashkirien) de la Grande Norway: Arch Géol. Viêtnam, v. 10, p. 111–149, 4 pls.

Schellwien, E., 1898, Die Fauna des Karnischen Fusulinenkalks: Paleontolographica, v. 44 (1897–1898), pt. 5–6, p. 237–282, pls. 17–24 [in German].

Schrader, F. C., 1902, Geologic section of the Rocky Mountains in northern Alaska: Geol. Soc. America Bull., v. 13, p. 233–252.

Schubert, R. J., 1921, Paläontologische Daten zur Stammesgeschichte der Protozoen: Paläont. Zeitschr., v. 3, pt. 2, p. 129–188 [in German].

Schwager, C., 1877, Quadro del proposto sistema de classificazione dei foraminiferi con guscio: Uff. Geol. (Roy. Commitato Geol. Ital.), Boll., v. 8, p. 18–27.

——— 1883, [Reference to *Endothyra*] *in* von Richthofen, F. von, Karbonische Foraminiferen aus China and Japan, *in* Richthefer, F. von, China: Berlin, D. Reimer, v. 4, Pal., abh. 7, p. 106–159, pls. 15–18 [in German].

Scott, H. W., Zeller, E., and Zeller D. N., 1947, The genus *Endothyra*: Jour. Paleontology, v. 21. p. 557–562, pls. 83–84, 2 text figs.

Sheng, J. C., 1958, Fusulinids from the Penchi Series of the Taitzeho Valley, Liaoning: Paleont. Sinica, no. 143, new ser. 8, fasc. 7, p. 56–119, 16 pls.

Shlykova, T. I., 1951, Foraminifera of the Viséan and Namurian stages of the Lower Carboniferous of the western slope of the Moscow Basin [in Russian]: Vses. Neft. Nauchno-Issled. Geol.-Razved. Inst. Trudy 56, Mikrofauna SSSR, no. 4, p. 109–178, 6 pls.

Skinner, J. W., and Wilde, G. L., 1954, Fusulinid wall structure Jour. Paleontology, v. 28, no. 4, p. 445–451, 4 pls.

Skipp, Betty, 1961, Stratigraphic distribution of endothyrid Foraminifera in Carboniferous rocks of the Mackay quadrangle, Idaho, *in* Short papers in the geologic sciences: U.S. Geol. Survey Prof. Paper 424–C, art. 236, p. C239–C244, 3 text figs.

——— 1969, Foraminifera, Chap. 5, *in* McKee, E. D., and Gutschick, R. C., History of the Redwall Limestone of northern Arizona: Geol. Soc. America Mem. 114, p. 173–255, pls. 16–28, text figs. 45–49.

Skipp, Betty, Holcomb, L. D., and Gutschick, R. C., 1966, Tournayellinae, calcareous Foraminifera, in Mississippian rocks of North America: Cushman Found. Foram. Research Spec. Pub. 9, 38 p., 7 pls., 7 text figs.

Skipp, Betty, and Mamet, B. L., 1971, Stratigraphic micropaleontology of the type-locality of the White Knob Limestone (Mississippian), Custer County, Idaho, *in* Geological Survey research 1970: U.S. Geol. Survey Prof. Paper 700–B, p. B118–B123.

Skvorzov, V. P., 1965, New Viséan Foraminifera from northern Fergana [in Russian]: Paleont. Zhur. no. 3, p. 23–32, 3 pls.

Sohn, I. G., 1971, New late Mississippian ostracode genera and species from northern Alaska: U.S. Geol. Survey Prof. Paper 711–A, p. A1–A24, 9 pls.

Solovieva, M. F., 1967, New data on the foraminiferal genus *Endothyranopsis* of the Lower Carboniferous of the eastern Taimyr [in Russian]: Nauchno-Issled. Inst. Geologii Arktiki, Uchennye Zapiski, Paleont. Biostrat., Bull. 18, p. 24–37, 3 pls.

——— 1969, On the Lower-Middle Carboniferous limit in Nova Zemlyia [in Russian]: Nauchno-Issled. Inst. Geologii Arktiki, Uchennye Zapiski, Paleont. Biostrat., Bull. 28, p. 5–15, 3 pls.

Solosvieva, M. F., and Krashenikov, V. A., 1965, Some general comparisons of foraminiferal complexes and stratigraphy of the Middle Carboniferous of Africa and the Russian Platform [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 9, p. 3–44, 3 pls.

Sossipatrova, G. P., 1962, Foraminifera of the Upper Paleozoic of the Taimyr [in Russian]: VNIGA 30, sbornik Stat. Paleob. Biostrat., p. 35–72, 5 pls.

——— 1966, Foraminifera of the Tiksin suite of the northern Kharaulah (Lena River) [in Russian]: Nauchno-Issled. Inst. Geologii Arktiki, Uchennye Zapiski, Paleont. Biostrat., Byull. 11, p. 5–32, 3 pls.

Spandel, E., 1901, Die Foraminiferen des Permo-Karbon von Hooser Kansas, Nord-Amerika: Abandl. der Natur-Hist. Gesellsch., Nürnberg, p. 3–20, 10 text figs.

Steinmann, G., 1880, Mikroskopische Thierreste aus dem deutschen Kohlenkalk (Foraminiferen und Spongien): Deutsch. Geol. Gesell. Zeitschr., v. 32, p. 394–400, pl. 19.

Suliemanov, I. S., 1945, Some new species of small Foraminifera from the Tournaisian of the Ishimbayevo oil-bearing region [in Russian]: Akad. Nauk SSSR Doklady, v. 48, no. 2, p. 124–127, 5 figs.

——— 1948, In reference to some Lower Carboniferous sediments in rocks from the Sterlitamak District [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 244–245, 4 text figs.

——— 1949, Certain Foraminifera from Upper Paleozoic sediments of Bashkiria [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 105, no. 35, p. 236–243, 1 pl.

Tailleur, I. L., Kent, B. H., and Reiser, H. N., 1966, Outcrop geologic map of the Nuka-Etivluk region, northern Alaska: U.S. Geol. Survey open-file report, 5 sheets.

Termier, G., and Termier, H., 1950, Paléontologie marocaine—II, Invertébrés de l'Ere Primaire. Pt. I, Foraminifères, Spongiaires et Coelentérés: Maroc Service Géol. Notes et Mém., no. 73, p. 30–40, 112–115, pls. 1, 2.

Thomas, A. O., 1931, Late Devonian Foraminifera from Iowa: Jour. Paleontology, v. 5, no. 1, p. 40–41, pl. 7.

Thompson, M. L., 1937, Fusulinids of the subfamily Schubertellinae: Jour. Paleontology, v. 11, no. 2, p. 118–125, 1 pl.

——— 1942, New Genera of Pennsylvanian Fusulinids: Am. Jour. Sci., v. 240, p. 403–420, 3 pls.

——— 1944, Pennsylvanian Morrowan rocks and fusulinids of Kansas: Kansas Geol. Survey Bull. 52, pt. 7, p. 409–431, 2 pls.

——— 1945, Pennsylvanian rocks and fusulinids o east Texas and northwest Colorado correlated with Kansas section: Kansas Geol. Survey Bull. 60, p. 17–84.

——— 1947, Stratigraphy and Fusulinids of Pre-Desmoinesian Pennsylvanian rocks, Llano Uplift, Texas: Jour. Paleontology, v. 21, no. 2, p. 147–164.

——— 1948, Studies of American Fusulinids: Kansas Univ. Paleont. Contr., Protozoa, art. 1, p. 1–184.

——— 1951, New genera of fusulinid Foraminifera: Cushman Found. Foram. Research Contr., v. 2, pt. 4, p. 115–119.

Toomey, D. F., 1961, *Endothyra scitula*, new name for *E. symmetrica* Zeller, preoccupied: Cushman Found. Foram. Research Contr., v. 12, pt. 1, p. 26.

——— 1965, Upper Devonian (Frasnian) Foraminifera from Redwater and South Sturgeon Lake Reefs, Alberta, Canada: Canadian Petroleum Geology Bull., v. 13, no. 2, p. 252–270, 4 pls., 3 text figs.

Toomey, D. F., Mountjoy, E. W., and Mackenzie, W. S., 1970, Upper Devonian (Frasnian) algae and Foraminifera from the Ancient Wall carbonate complex, Jasper National Park, Alberta, Canada: Canadian Jour. Earth Sci., v. 7, no. 3, p. 946–981, 7 pls.

Trautschold, H. A., 1879, Ueber den muthmasslichen Geschlechtsapparat von *Poteriocrinus multiplex*, Trd. [1882]: Moscou, Nouveneaux Mém. 14, 1879–83, p. 139–156.

Vdovenko, M. V., 1954, New species of Foraminifers from the Lower Viséan of the Donetz Basin [in Ukrainian]: Kiev Univer. Schevshenko Nauk Zapiski, v. 13, no. 4, p. 63–76, 3 pls.

——— 1960, New foraminiferal species of the Upper Tournaisian and Early Viséan of the Donetz Basin [in Russian]: Kiev. Univ., Visnik, Bull. 3, no. 2, p. 30–37.

——— 1961, Lower Namurian Foraminifera of the Sarysuisk Dome of Kot–Tjube [in Russian]: Kiev. Univ., Visnik, Ser. Geol. Geograph., no. 4, p. 26–29.

——— 1962, Some new Upper Viséan and Lower Namurian species of Foraminifera from the southwestern part of central Kazakhstan [in Russian]: Paleont. Zhur., no. 1, p. 41–46, 2 pls.

——— 1967, Fauna Nizhneviszeyskikh otlozheniy Bol'shogo Donbass [Some representatives of Endothyridae, Tournayellidae and Lituolidae from the Lower Viséan deposits of the Greater Donbass]: Akad. Nauk Ukrain. SSR Inst. Geol. Nauk, p. 18–29.

——— 1969, Characteristics of the development of the Viséan foraminifers in the Dniepr-Donetz Basin [in Russian]: Akad. Nauk SSSR Voprosy Mikropaleontologii, no. 11, p. 35–40, 2 pls.

——— 1972, New subgenera of *Endothyra* and *Globoendothyra* [in Ukrainian]: Akad. Nauk Uk SSR Dopodivi, ser. B, p. 105–107.

Venukov, P. M., 1889, Unterkarbonifere Ablagerungen des Flusses Bardun in Süd Mongolien [in Russian]: Zapiski Mineral. Obshchestva, ser. 2, no. 25, p. 210–228.

Vissarionova, A. Ya., 1948a, The group of *Endothyra globulus* Eichwald from the Viséan Series of the Lower Carboniferous of the European part of the Union [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 182–185, 1 pl.

——— 1948b, Primitive fusulinids of the Lower Carboniferous in the European part of the USSR [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 216–226, 2 pls.

——— 1948c, Some species of the Tetrataxinae Galloway from the Viséan Series of the European part of the USSR [in Russian]: Akad. Nauk SSSR Geol. Inst. Trudy 62, no. 19, p. 190–195, 1 pl.

——— 1950, Foraminiferal fauna from the deposits of Bashkiria [in Russian]: Bashkiria Neft, no. 1, p. 33–36, 1 pl.

Voizekhovskaia, A. A., 1961, On some species of the family Endothyridae in the Lower Carboniferous of the uppermost northern region [in Russian]: NIIGA, Bull. 24, Sbornik Stat. Paleob. Biostrat., p. 16–45, 7 pls.

Voloshinova, N. A., Dain, L. G., and Reitlinger, E. A. 1959, [Order Ammodiscida], *in* Rauser-Chernoussova, R. M., and Fursenko, A. V., Principles of Paleontology, Part 1, Protozoa [in Russian]: Akad. Nauk SSSR, p. 177–190, 2 pls.

Wahrhaftig, C. A., 1960, Physiographic divisions of Alaska: U.S. Geol. Survey Prof. Paper 482, 52 p.

Warthin, A. S., 1930, Micropaleontology of the Wetumka, Wewoka and Holdenville formations: Oklahoma Geol. Survey Bull. 53, 95 p., 7 pls.

Waters, J. A., 1927, A group of Foraminifera from the Dornick Hills formation of the Ardmore Basin: Jour. Paleontology, v. 1, p. 129–133, pl. 22.

——— 1928, A group of Foraminifera from the Canyon division of the Pennsylvanian formation in Texas: Jour. Paleontology, v. 1, p. 271–275, pl. 42.

Wethered, E., 1890, On the occurrence of the genus *Girvanella* in oolitic rocks and remarks on oolitic structure: Geol. Soc. London Quart. Jour., v. 46, p. 270–281.

Weyant, H., 1967, Algues calcaires du Viséen de Montmartin-sur-mer (Manche): Soc. Linnéene Normandie Bull., v. 8, no. 1, p. 63–68.

Weyer, D., 1968, *Koninckopora* Lee, 1912 (Dasycladaceae) aus dem Unterkarbon der Insel Rügen: Geologie, v. 17, no. 2, p. 176–190, 3 pls.

Whitfield, R. P., 1882, On the fauna of the Lower Carboniferous limestones of Spergen Hill, Indiana, with a revision of the description of its fossils hitherto published and illustrations of the species from the original type series: Am. Mus. Nat. History Bull., v. 1, no. 3, art. 5, p. 39–97, pls. 6–9.

Williamson, W. C., 1881, On the organization of the fossil plants of the Coal Measures (Part X). Including an examination of the supposed Radiolarians of the Carboniferous Rocks: Royal Soc. London Philos. Trans., v. 171, p. 493–539, 8 pls.

Wilson, J. L., 1970, Depositional facies across carbonate shelf margins: Gulf Coast Assoc. Geol. Socs. Trans., v. 20, p. 229–233.

Wood, Alan, 1941, The Lower Carboniferous algae *Mitheldeania* Wethered and *Garwoodia* gen. nov.: Geologists' Assoc. Proc., v. 52, pt. 3, p. 216–226, 3 pls.

——— 1942, The algal nature of the genus *Koninckopora* Lee; its occurrence in Canada and western Europe: Geol. Soc. London Quart. Jour., v. 98, no. 3–4, p. 205–222.

——— 1957, The type-species of the genus *Girvanella* (Calcareous algae): Palaeontology, v. 1, pt. 1, p. 22–28, 2 pls.

——— 1963, The British Carboniferous species of *Girvanella* (Calcareous algae): Palaeontology, v. 6, pt. 2, p. 264–273, 3 pls.

Wood, G. V., and Armstrong, A. K., 1975, Diagenesis and stratigraphy of the Lisburne Group limestones of the Sadlerochit Mountains and adjacent areas of northeastern Alaska: U.S. Geol. Survey Prof. Paper 857, 47 p., 25 figs., 2 pls.

Woodland, R. B., 1958, Stratigraphic significance of Mississippian endothyroid Foraminifera in central Utah: Jour. Paleontology, v. 32, p. 791–814, pls. 99–103, 5 text figs.

Wray, J. L., 1952, Endothyroid Foraminifera from the Greenbrier Series (Mississippian) of northern West Virginia: Jour. Paleontology, v. 26, p. 946–952, 20 text figs.

——— 1967, Upper Devonian calcareous algae from the Canning Basin, Western Australia: Colorado School Mines Prof. Contr. 3, p. 1–76, 11 pls.

Yochelson, E. L., and Dutro, J. T., Jr., 1960, Late Paleozoic Gastropoda from northern Alaska: U.S. Geol. Survey Prof. Paper 334–D, p. 111–147.

Zavjalova, E. A., 1959, Tournaisian Foraminifera of the Lvov Depression [in Russian]: Ukrain. Nauchno-Issled. Geologorazved. Inst. Trudy, Byull. 1, p. 174–179, 3 pls.

Zeller, D. E., 1953, Endothyroid Foraminifera and ancestral fusulinids from the type Chesteran (Upper Mississippian): Jour. Paleontology, v. 27, p. 183–199, pls. 26–28, 9 text figs.

——— 1963, *Endothyra bowmani* Brown, 1843, designation of neotype: Jour. Paleontology, v. 37, p. 502–503.

Zeller, D. E. N., 1963, *Endothyra Bowmani*: proposed rejection of applications of Henbest and Rozovskaia: Zool. Nomenclature Bull., v. 20, pt. 4, p. 285–286.

Zeller, E. J., 1950, Stratigraphy significance of Mississippian endothyroid Foraminifera: Kansas Univ., Paleont. Contr., Protozoa, art. 4, p. 1–23, pls. 1–6.

——— 1957, Mississippian endothyroid Foraminifera from the Cordilleran Geosyncline: Jour. Paleontology, v. 31, p. 679–704, pls. 75–82.

INDEX

[Italic page numbers indicate major references and descriptions]

Page

A

abramjanae, Paracaligelloides 112
abramovi, Endothyra 62
absimilis, Planoarchaediscus 32
acantha, Endothyra 62
accepta, Eostaffella 85
Tournayella 47
accuratus, Neoarchaediscus 39
acervalis, Stacheia 105
achomata, Endothyra 62
acuta, Endothyra 62
Eostaffella 85
mosquensis 86, 87
Millerella mosquensis 87
Tetrataxis 97
acutiformis, Eostaffella 85
Tetrataxis 96
acutissima, Eostaffella 85
acutus, Archaediscus 34
Tetrataxis 96
advena, Eostaffella 85, 90
Latiendothyra 51, 64
Millerella 86
aegyptiacus, Planoarchaediscus 32
affecta, Endothyra 62
affixa, Pseudoendothyra 82
afflientia, Pseudoendothyra 82
Agathamina 43
agathis, Plectogyra 56
Priscella 56, 65
agilis, Endothyra 52
Latiendothyra 51, 64
akchimensis, Neoarchaediscus 39
alaskaensis, Sciophyllum 9, 12, 14
Algae spore cases *109*
Algal and foraminiferal microbiota *14*
aljutovica, Earlandia 25
Endothyra 57
alta, *Endothyra* 62
Latiendothyra 51, 64
Plectogyra bradyi 68
altilis, Endothyra 62
alviterna, Endothyra 62
amabilis, Eostaffella 85
amenta, Dainella 71
ameradaensis, Zellerina 66, 87
Ammobaculites 45, 53, 112
attenuatus 46
nalivkini 46
powersi 53
Ammodiscus 27, 28, 99
bellus 28
borealis 28
buskensis 28
medius 28
multivolutus 28, 99
priscus 28
volgensis 28
ammonoides, Endothyra 62
ampla, Eostaffella 85, 90
Amplexizaphrentis sp 9
amplis, Endothyra 62
Endothyra similis 69
Plectogyra similis 69
angularis, Eostaffella 85

Page

angulata, Pseudoendothyra 82
Vicinesphaera 20
angusta, Eostaffella 85
Septaglomospiranella 46
Tetrataxis 96
Tournayella discoidea 47
anivikensis, Dainella 16, *71*; pl. 33
annulata, Glomospiranella 44
anteflexa, Septaglomospiranella 45
antiqua, Latiendothyra 51, 64
antoninae, Globoendothyra 73
aperta, Millerella 90
aperta, *Tetrataxis* 96
aperturata, Parathurammina 21
apposita, Endothyra 62
approximatus,
Archaediscus 17, 34, 37, *33*; pl. 27
Archaediscidae 15, 17, 31, 34, 40
archaediscoidea, Globoendothyra 73
Archaediscus 16, 31, 32, *33*, 38, 40, 41, 42
approximatus 17, 34, 37, *38*; pl. 27
acuta 34
acutus 34
baschkiricus 42
celsus 34
chernoussovensis 34, 37
commutabilis 34
componens 34
convexus 34, 37
convexus 36
cornua 34
crassus 34
cyrtus 34
decussatus 34
demaneti 34, 36
densospira 34
depressus 34
discoidea 34
donetzianus 34
dubius 34, 36
electus 34
elongatus 34
embolicus 34
enodatus 34
enormis 34, 37
foliaceus 34
geniculatus 34
globosus 34
globulus 34
glomus 34
gracilis 34
grandiculus 34, 37
granum 34
(*Group unknown*) 38
incertus 39
infantis 34
inflatus 34
inflexus 34
itinerarius 34, 37
karreri 34, 35, 37, 38
compressa 34
fragilis 34
nana 34
koktjubensis 34, *36*; pl. 27

Page

Archaediscus—Continued
krestovnikovi 16, 34, *35*, 36; pl. 27
discoidea 35
koktjubensis 36
pusillus 35
longus 35
macer 35, 37
magnus 35
matutinus 35
maximus 35
mellitus 35
minimus 41
moelleri 35, 37
gigas 35
ventrosa 35
mohae 35, 37
mutans 35
nanus 37
ninae 35
of the group *A.*
chernoussovensis *37*; pl. 27
A. krestovnikovi 16, *35*; pl. 27
A. moelleri *37*; pl. 27
operosus 35
pachytheca *38*; pl. 27
paraspirillinoides 35
parvus 39
regularis 39
pauxillus 35, 37
perlucidus 35
piesis 35
praecursos 35
probatus 35
pseudoapproximatus 35
pseudomoelleri 35
pseudovisherensis 35
pulvinus 35
reliquus 35
rhombiformis 35
rhombus 35
rugosus 42
saleei 35, 37
spectabilis 35
spirillinoides 32, 33
faceta 32
grandis 32
stilus 35, 36
subcylindricus 35
teres 35
tiksinensis 35, 36
triangulus 35
valens 35
varsanofievae 35
velgurensis 35
vertens 35
visherensis 35, 36
sp 37
Archaesphaera 20, 23, 109, 110
grandis 110
pachisphaerica 111
arctata, Skippella 66, 57
arctica, Endothyra 62
Globoendothyra 73
arcuata, Globoendothyra 73
Pseudoendothyra 82

Page

arguta, Globivalvulina 101
Globoendothyra 73
Parathurammina 21
arizelum, Lithostrotion (Siphonodendron) 14
armstrongi, Endothyranella 53
sobrina, Endothyranella 53
arrecta, Endothyra 80
Endothyranopsis 80
arta, Planoendothyra 57
asalina, Eostaffella 85
asiatica, Eovolutina 111
Glomospiranella 44
Septaglomospiranella (Rectoseptaglomospiranella) 46
Asphaltina 109
cordillerensis *109*; pl. 39
Asteroarchaediscus 34, 38, *41*, 43
baschkiricus 17, 42
longulus 42
of the group *A. baschkiricus* *42*; pl. 27
ovoides 42
pressulus 42
pustulus 42
rugosus 42
subbaschkiricus 40
astraeiforme, Thysanophyllum 9, 12, 14
attenta, Eostaffella mosquensis 86, 87
attenuata, Cribrostomum 93
Septaglomospiranella 46
attenuatus, Ammobaculites 46
aucta, Archaediscus 34

B

bacteriformis, Neoarchaediscus 39
baileyi, Endothyra 73
bridgensis, Endothyra 73
poloumera, Endothyra 73
Globoendothyra 15, 16, 62, 64, 73
Rotalia 73
Baituganella 112
bamberi, Yukonella *104*; pl. 36
Banffella 16, 78
banffensis, Lithostrotionella 9, 12, 14
barkatovae, Tetrataxis 96
bashkirica, Tetrataxis 96
baschkiricus, Archaediscus 42
Asteroarchaediscus 17, 42
bastakkensis, Planoendothyra 57
bella, Parathurammina 21
Pseudoendothyra 82
bellus, Ammodiscus 28
beshevensis, Tetratais 96
biconvexa, Pseudoendothyra 82
Tetrataxis 96
bigemmicula, Millerella 90
birdi, Lithostrotionella 9, 12, 14
biserialis, Globivalvulina 101
Biseriammina 100
Biseriamminidae 100
Biseriella 17, *100*
kamensis 100
minima 100
moderata 100
of the group *B. parva* *100*; pl. 35
parva 17, 100
pulchra 100
scaphoidea 100
blatoni, Endothyra 62
bona, Pseudoendothyra 82
borealis, Ammodiscus 28
bowmani, Endothyra 16, 61, 62, 67, *68*, 73; pl. 31
sensu, Endothyra 62

Page

bradyi parva, Cribrostomum 93
Endothyra 62, 67, 68
bradyi 68
bradyi, Endothyra 68
compressa, Endothyra 67, 80
maxima, Endothyra 67
pulchra, Endothyra 68
Plectogyra 68
bradyi 68
alta, *Plectogyra* 68
bradyi, Plectogyra 68
Pseudoendothyra 82
brazhnikovae, Earlandia elegans 24
Parathurammina 21
breve, Cribrostomum 93
breviradiosa, Parathurammina 21
bridgensis, Endothyra baileyi 73
Globoendothyra 73
britishensis, Pseudoendothyra 82, *83*; pl. 34
Brunsia 16, *28*, 32, 38, 44, 78
crassa 29
duplex 29
ezhwadorica 29
facies 16, 19, 31, 50, 103
fluctata 29
irregularis 30
lata 29
lenensis 16, 29, 30
novita 29
obtusa 29
of the group *B. irregularis* *30*; pl. 26
B. lenensis *30*; pl. 26
B. pulchra *29*; pl. 26
parva 29
pulchra 29
sairamica 29
sibirica 29, 30
spirillinoides 29, 30, 31
sygmoidalis 29
tiksinensis 29
umbilicata 29
brunsieformis, Planoarchaediscus 32
Brunsiella 28, 29
irregularis 30
spirillinoides 30
volgensis 28
Brunsiina 43
bulbisepta, Latiendothyra 51, 64
bulbosa, Earlandia 25
bulloides, Globivalvulina 18, 102
Valvulina 101, 102
burgaliensis, Latiendothyra 51, 64
buskensis, Ammodiscus 28
bykovensis, Neoarchaediscus 39

C

Calamopora 102
inflata 103
calcar, Endothyra 62
Calcisphaera 20, *109*
cancellata 110
fimbriata 110
hexagonata 110
laevis *110*; pl. 39
pachysphaerica *111*; pl. 39
robusta 110
sol 110
spinosa 22, 110
Calcispheres 23, *109*
Caligella 112
Caligellidae 112
callosa, Globoendothyra 73
campinei, Plectogyra 81
cancellata, Calcisphaera 110
candida, Pseudoendothyra 82
cantabrica, Pseudoendothyra 82
captiosa, Cornuspira 28

Page

cara, Endothyra 62
Carbonate microfacies *8*
Carbonella 15, *47*
costata 48
spectabilis *48*; pl. 28
carbonica, Eostaffella (Millerella) 90
Millerella 18, *90*; pl. 34
(Seminovella) 91
Pseudoendothyra 82
Seminovella 90, 91
Carboniferous rock outcrops of the Brooks Range *5*
Carboniferous stratigraphy and faunas 9
celsa, Globoendothyra 73
celsus, Archaediscus 34
Chaetetes 102
tumidus 103
chariesa, Endothyra 62
chernoussovensis, Archaediscus 34, 37
Septaglomospiranella 15, 45
Chernyshinella 44
Chlorophycophyta 102, 107
chomatica, Dainella 64, 71
Endothyra 71
chomatifera, Eostaffella 85
chusovensis, Eostaffella 85
circuli, Eostaffella 85, 90
citata, Eostaffella 85
clavaesepta minima, *Endothyra parakosvensis* 52
Latiendothyra 51
Plectogyra parakosvensis 52
clavatula, Earlandia 15, 25
Hyperammina elongata 26
Climacammina 17, 92
clivosa, Parathurammina 21
coarta, Endothyra 62
Codiaceae 104
Coeloceratioides 102
fragilis 103
cognata, Dainella 71
collatatus, Neoarchaediscus 39
commune, Cribrostomum 93
commutabilis, Archaediscus 34
compactus, Tetrataxis 96
complicata, Globivalvulina 101
componens, Archaediscus 34
composita, Pseudoendothyra 82
compressa, Archaediscus karreri 34
Endothyra 62, 64, 80
bradyi 67, 80
crassa 80
Endothyranella 53
Endothyranopsis 16, *80*; pl. 34
compressa 81
compressus 81
crassus 80
compressa, Endothyranopsis 81
Eostaffella 85
Globivalvulina 101
compressa, *Planoarchaediscus* 32
compressa, Septaglomospiranella 45
Tetrataxis 96
compressus, Endothyranopsis 80
compressa, Endothyranopsis 81
plana, Endothyranopsis 80
compta, Planoendothyra 57
concava, Tetrataxis 96
conciliatus, Tetrataxis 96
concinna, Milerella 90
Pseudoendothyra 82
concinnus, Planoarchaediscus 32, 33
condrusiana, *Tetrataxis* 96
congesta, Stacheaia 105
conica, Tetrataxis 96, 97, 98
gibba, Tetrataxis 98
conili, Tetrataxis 96

Page

connorensis, Epistacheoides 106
conspicua, Pseudoendothyra 82
constricta, Eostaffella 85
Pseudoendothyra 82
continens, Pseudoendothyra 82
convexa, Endothyranopsis 80
convexus, Archaediscus 34, 37
Archaediscus convexus 36
convexus, Archaediscus 36
cooperi, Zellerina 87, 90
cora, Globivalvulina 101, 102
cordillerensis, Asphaltina 109; pl. 39
cornua, Archaediscus 34
corona, Tetrataxis 96, 98
corpulenta, Pseudoendothyra 82
cospirillinoides, Planoarchaediscus 32, 33
consternatio, Earlandia 25
contiguus, Planoarchaediscus 32
contractus, Hemidiscus 28
Coral faunas in Lisburne Group, regional relations *14*
Corals, rugose *9*
Cornuspira 27, 28
captiosa 28
prisca 28
pusila 28
cornuta, *Eotuberitina* 23
Corwenia jagoensis 14
symmetrica 14
costata, Carbonella 48
cracoviensis, Endothyranella 53, 54
crassa, Brunsia 29
Endothyra 62, 75
compressa, Endothyra 80
mosquensis, Endothyra 70
rossica, Endothyra 80
Endothyranopsis 17, 81
Eostaffella 85
Eotuberitina 23
Involutina 80
Pseudoendothyra 82
crassiformis, Septaglomospiranella 46
crassiseptata, Septaglomospirannella 45, 66
crassitheca, Parathurammina 21
crassus, Archaediscus 34
compressa, Endothyranopsis 80
Cribrosphaeroides 111
Cribrostomum *92*
attenuata 93
bradyi *93*; pl. 35
parva 93
breve 93
commune 93
curvatum 93
eximiniformis 93
inflatum 93
larvum 93
lecomptei 93
liebusi 93
lipinae 93
macellum 93
maximum 93
oveyi 93
paraeximia 93
parva 93
ponielum 93
recurrens 93
regularis 93
scoticum 93
stalinogorski 93
textulariforme 93
wilkiestoni 93
crustata, *Endothyra* 62
Plectogyra similis 69
cumulosa, Tetrataxis 96
cuneata, Endothyra 62
curvatum, Cribrostomum 93
curviseptata, Tetrataxis 96

Page

cushmani, Parathurammina 21, 22
minima, Parathurammina 21
Thurammina (Salpingothurammina) 22
cussyensis, Dainella 64
cylindrica, Nodosinella 27
Cyclogyra 28
cyprica, Glovivalvulina 101
cyrtus, Archaediscus 34

D

dagmarae, Parathurammina 21
Pseudoendothyra 82
dainae, Dainella 71
Dainella *70*
amenta 71
anivikensis 16, *71*; pl. 33
chomatica 64, 71
cognata 71
cussyensis 64
dainae 71
elegantula 71
exuberans 64, 71
fleronensis 64, 71
florenensis 71
manifesta 71
rectiformis 71
tujmasensis 71
versata 64, 71
Dasycladaceae 102, 104
Deckerella 92
decliva, Latiendothyra 51, 64
decurrens, Tetrataxis 96
decussatus, Archaediscus 34
deflectens, Propermodiscus 31
deformica, Pseudoendothyra 82
delecta, Planoedothyra 57, 65
delepinei, Endothyra 62
delmeri, Globoendothyra 73
demaneti, Archaediscus 34, 36
densa, Girvanella 108
Pseudoendothyra 82
densospira, Archaediscus 34
depressa, Eostaffella 85
Tetrataxis 96
depressus, Archaediscus 34
depressus, *Tetrataxis* 96
dervillei, Pachysphaera 111
designata, Millerella 88
Zellerina 87, *88*, 90; pl. 34
devexa, Endothyra 56
Priscella *56*, 65; pl. 29
devia, *Priscella* 56
devonica, Parathurammina 21
Diachronism *19*
dievi, Tetrataxis 96
digna, Tetrataxis 98
dilatata, Endothyra 62
Globoendothyra 73
dionantina, Solenopora *107*; pl. 39
Diphyphyllum klawockensis 9, 14
nasorakensis 12
Diplosphaerina 23
directa, Pseudoendothyra 82, 84
disca, Septatournayella 49
discoidea, Archaediscus 34
Archaediscus krestovnikovi 35
Endothyra 87, 88
Eostaffella 88
Millerella 90
Plectogyra 88
Tournayella 15, *47*; pl. 28
angusta, Tornayella 47
maxima, Tournayella 47
Zellerina 15, 17, 66, *88*; pl. 34
discoideus, Monotaxinoides 99
diserta, Planoendothyra 57
Disonella 44

Page

distensa, Endothyra 62
dobassica, Eostaffella 85
dobrynini, Pseudoendothyra 83
donbassica, Globivalvulina 101
donbassicus, Eolasiodiscus 99
donetziana, Endothyra 62
donetzianus, Archaediscus 34
donetzica, Tetrataxis 96
donica, Skippella 75
dorogobuzhica, Globoendothyra 73
dubius, Archaediscus 34, 36
ducii, Girvanella 108
duplex, Brunsia 29
dutroi, Lithostrotion (Siphonodendron) 9
duxundaensis, Planoarchaediscus 32

E

Earlandia 15, *24*
aljutovica 25
bulbosa 25
clavatula 15, 25
consternatio 25
elegans 15, 25
brazhnikovae 24
facies 15, 25, 26
longa 25
minima 25
minor 26
minuta 25
moderata 15, 25, 26
of the group *E. clavatula* 15, 25, *26*; pl. 26
E. elegans 15, *25*; pl. 26
E. moderata 15, 25, *26*; pl. 26
E. vulgaris 15, *26*; pls. 1, 14, 20
perparva 25
pulchra 25, 26
vulgaris 15, 25, 26
minor 25, 26
vulgaris 26
Earlandiidae 24, 112
Earlandinella *27*
sp *27*; pl. 26
effetus, Planospirodiscus 40, 41
Ekvasophyllum sp 14
elata, Tetrataxis 96
electus, Archaediscus 34
elegans, Earlandia 15, 25
brazhnikovae, Earlandia 24
Hyperammina 25
Pseudoendothyra 83
Tetrataxis 96
elegantula, Dainella 71
Globoendothyra 73
Septaglomospiranella 46
elegia, Latiendothyra 51
elementata, Eovolutina *111*; pl. 39
elongata clavatula, Hyperammina 26
Tetrataxis 96
elongatus, Archaediscus 34
emaciatus, Tetrataxis 96
embolicus, Archaediscus 34
eminens, Endothyra 62
emphaticus, Planoarchaediscus 32
Endostaffella 54, 62, 89
inflata 55
Endothyra 15, 43, 44, 48, 51, 54, 55, 57, *58*, 70, 71, 72, 74, 75, 76, 79, 81, 84, 85, 87, 99
abramovi 62
acantha 62
achomata 62
acuta 62
affecta 62
agilis 52
aljutovica 57
alta 62
altilis 62
alviterna 62

Page

Endothyra—Continued
ammonoides 62
arctica 62
apposita 62
arrecta 80
amplis 62
baileyi 73
bridgensis 73
poloumera 73
blatoni 62
bowmani 16, 61, 62, 67, *68*, 73; pl. 31
sensu 62
bradyi 62, 67, 68
bradyi 68
compressa 67, 80
maxima 67
pulchra 68
calcar 62
cara 62
chariesa 62
chomatica 71
coarta 62
compressa 62, 64, 80
crassa 62, 75
compressa 80
mosquensis 70
rossica 80
crustata 62
cuneata 62
devexa 56
delepinei 62
dilatata 62
discoidea 87, 88
distensa 62
donetziana 62
eminens 62
eospiroides 55
excelens 62
excentralis 62, 68
explicata 62
expressa 62
fausta 62
fomichaensis 62
geniculata 62
gigantea 62
globulus 62, 72, 86
parva 74
graciosa 62
honesta 62
incrassata 74
inflata 54, 55, 63
minima 54
maxima 55
typica 54
inops 63
inusitata 63
irregularis 63
kaisini 63
kennethi 63
kentuckyensis 63
kirgisana 63
kleina 63
koksarekensis 63
komi 52
kosvensis 52
lanceolata 56
latispiralis 51
latissima 63
lenociniosa 63
longiseptata 63
magna 63
massanae 63
maxima 63
media 63
minuta 63
mosanae 63
mosquensis 63, 64, 70

Page

Endothyra—Continued
mucronata 63
multicamerata 55
munita 63
obsoleta 63
of the group *E. bowmani* 16, *67*; pl. 31
E. *similis* 15, *69*; pl. 32
omraensis 63
ornata 62, 83, 84
ovata 63
pandorae 63
pannusaeformis 63
paracostifera multicamerata 54
parakosvensis 52
clavaesepta minima 52
imminuta 52
nigra 52
paramosquensis *70*; pl. 32
parasamarica 63
parva 63
paucilocula 63
pauciseptata 63
paula 74
pepeljaevi 63
phrissa 63
pietoni 63
plectogyra 74
porrecta 63
posneri 63
primaeva 45
prisca 56
kirgiana 56
prokirgisana 63
pseudobradyi 63
pulchra 63, 68
radiata 62, 86
rauserae 63
reitlingerae 63
rostrata 63
rotayi 58
rotaliformis 63
rothrocki 63
rugosa 63
rzhevica 63
scabra 63
scitula 77
sensu 62
settedabanica 63
similis 15, 63, *69*; pl. 32
amplis 69
magna 69
similis 69
simplex 63
spiroides 76, 77
submissa 63
sulcata 63
superba 63
symmetrica 77
taimyrica 52
tantala 63
teres 63
timanica 63
tomiliensis 74
torta 63
tortilis 63
turgescens 63
vara 63
verkhojanica 63
versabilis 63
zelleri 77
(*Globoendothyra*) 74
redwallensis 75
(*Inflatoendothyra*) 54
sp 55, 62, 73, 74, 77, 78
Endothyranella *53*
armstrongi 53
armstrongi sobrina 53
compressa 53

Page

Endothyranella—Continued
cracoviensis 53, 54
gracilis 53
graciosa 53
inconspicula 53
minuta 53
mordovica 53
nitida 53
protracta 53
pugnoides 53
recta *53*; pl. 29
stormi 53
texturata 53
sp *54*; pl. 29
Endothyranopsidae 75, *79*; pl. 31
Endothyranopsis 16, 62, 72, 78, *79*
arrecta 80
compressa 16, *80*; pl. 34
compressa compressa 81
compressus 80
compressa 81
plana 80
convexa 80
crassa 17, 81
crassus compressa 80
eocompressa 80, 81
foeda 80
hirosei 80, 81
intermedia 80
kuhnei 80
mosquensis 80
nevadaensis 80
pechorica 80
plana 80
rossica 80
sphaerica 80, 81
substricta 80
umbonata 80
Endothyridae 15, *50*, *53*, *70*
Endothyrids 15
endothyroidea, Eostaffella 86
endothyroides, Septaglomospiranella 45
enodatus, Archaediscus 34
enormis, Archaediscus 34, 37
Eostaffella 86
eocompressa, Endothyranopsis 80, 81
eodagmarae, Parathurammina 21
Eoendothyra 57
Eoendothyranopsis 15, 16, 17, 19, 57, 62, 74, *75*, 78, 88
ermakiensis 16, 76, *78*; pl. 31
hinduensis 16, *77*; pl. 30
lebedevae 76
macra 16, 64, 76
mediocriformis 76
of the group
E. ermakiensis 16, 19, *78*; pl. 301
E. rara *77*; pl. 31
E. spiroides 15, *76*, 79; pl.30
originis 64, 76
pressa 76, 77
pressus 77
prodigiosa 64, 76
rara 16, 17, 76, 77, 78
robusta 17, 64, 76
rotayi taimyrica 58
scitula 16, 64, 76, *77*; pl. 31
spiroides 15, 16, 64, *76*, 78; pl. 30
subtilis 76, 77
thompsoni 76
triznae 76
utahensis 16, 64, 76, 78
zelleri 64, 76
sp *78*; pl. 31
Eoforschia 15, 17, 19, *49*
fastosa 50
gigantea 50
minoris 50

Page

Eoforschia—Continued
immodica 50
moelleri 15
uralica 50
nonconstricta 50
of the group *E. moelleri* 15, *50*; pl. 28
primaria 50
rossica 50
subangulata 50
unica 50
verkhojanica 50
eogranulosa, Glovivalvulina 101
Eolasiodiscus 28, 40, 99
donbassicus 99
eomaxima, Tetrataxis 96
Eomillerella 76
hinduensis 77
scitula 77
spiroides 76
Eoparastaffella 82
(*Eoparastaffella*), *Pseudoendothyra* 82
Eoschubertella 18, 91
yukonensis *91*; pl. 35
(*Eoseptatournayella*), *Septatournayella* 48
Eosigmoilina 18, 43
explicata 43
spiroides 76
eosimilis, Priscella 56
eospirillinoides, Planoarchaediscus 32
eospiroides, Endothyra 55
Inflatoendothyra 54, 64
Eostaffella 17, 61, 62, 70, 76, *84*, 87, 89
accepta 85
acuta 85
acutiformis 85
advena 85, 90
amabilis 85
acutissima 85
ampla 85, 90
angularis 85
angusta 85
asalina 85
chomatifera 85
chusovensis 85
circuli 85, 90
citata 85
compressa 85
constricta 85
crassa 85
depressa 85
discoidea 88
donbassica 85
endothyroidea 86
enormis 86
exilis 86
galinae 86
gruenwaldti 86
hohsienica 86
ikensis 86
infirma 86
inflata 86
inflecta 86, 90
intermedia 86
kanmerai 86, 90
kasakhstanica 86, 90
kashirica 86
korobchevi 86
lancetiformis 86
lata 86
lenticula 86
lepida 86
lepidaeformis 86
ljudmilae 86
minima 86
minuta 86
minutissima 86
mixta 86

Page

Eostaffella—Coninued
mosquensis 86, 87
acuta 86, 87
attenta 86, 87
sublata 87
tumida 87
variabilis 87
mstaensis 86
oblonga 86
of the group *E. radiata* *86*; pl. 35
oldae 86
ovoidea 86
paraconvexa 86
paraparva 86
paraprisca 86
parastruvei 86
perspicabilis X986
pinguis 86, 90
postmosquensis 86
puella 86, 90
pressa 86
proikensis 86
pseudostruvei 86
radiata 64, 86
raguchensis 86
recta 90
rhomboides 86
rjasanensis 86
rotunda 86
schwetsovi 86
singularia 86
sublata 86
subtilis 86
subvasta 86
tenebrosa 86
umbonata 86
variabilis 86
varvariensis 86
versabilis 86
(*Millerella*) 87, 89
carbonica 90
(*Seminovella*) 89
(*Eostaffella*), *Staffella* 84, 88
parastruvei, Staffella 85
Eostaffellidae 15, 62, 84, 86, 89, 91
Eostaffellina 17
Eotextularia 93
Eotuberitina *23*
cornuta 23
crassa 23
firmata 23
fornicata 23
grandis 23
reitlingerae *23*; pl. 26
talassica 23
Eovolutina *111*
asiatica 111
elementata *111*; pl. 29
magna 111
tujmasensis 111
Epimastopora 103
Epistacheoides connorensis 106
ermakiensis, Eoendothyranopsis 16, 76, *78*; pl. 31
Parastaffella 78
Eumorphoceras 43
Evlania 112
evoluta, Planoedothyra 57, 65
evoluta, *Skippella* 75
excavata, Millerella 90
excellens, Endothyra 62
excentralis, Endothyra 62, 68
exilis, Eostaffella 86
eximiniformis, Cribrostomum 93
exornatus, Tetrataxis 96, 98
exotica, Globivalvulina 101
expansa, Pseudoendothyra 83

Page

expleta, Pseudoendothyra 83
explicata, Endothyra 62
Eosigmoilina 43
expressa, Endothyra 62
extensus, Volvotextularia 94
fleronensis, *Dainella* 64, 71
ezhwardorica, Brunsia 29

F

Faberophyllum sp 9, 14
faceta, Archaediscus spirillinoides 32
Falsotetrataxis 95
fastosa, Eoforschia 50
fausta, Endothyra 62
Favosites 102
fimbriata, Calcisphaera 110
firmata, Eotuberitina 23
flatile, Skippella 75
fleronensis, Dainella 64, 71
florenesis, Dainella 71
fluctata, Brunsia 29
fluxus, Tetrataxis 96
foeda, Endothyranopsis 80
foliaceus, Archaediscus 34
fomichaensis, Endothyra 62
Foraminiferal and algal microbiota *14*
Foraminiferida 19, 24
Foraminiferal zones *15*
fornicata, Eotuberitina 23
Forschia 50
Forschiidae 49, 112
fragilis, Coeloceratoides 103
Koninckopora 103
Archaediscus karreri 34
fraudulenta, Pseudoendothyra 83
fusca, Globoendothyra 73
Fusulinella 81
struvii 82, 83
Fusulinidae 18, 91
futila, Planoendothyra 57, 65

G

galinae, Eostaffella 86
gaptakensis, Globivalvulina 101
gekkeri, Parathurammina 21
genevievensis, Lithostrotion (*Siphonodendron*) 14
geniculata, Endothyra 62
geniculatus, Archaediscus 34
Geographic setting *4*
Geologic setting *5*
germanica, Hemigordius harltoni 30
gibba, Tetrataxis conica 98
gigantea, Endothyra 62
Eoforschia 50
minoris, Eoforschia 50
Millerella 90
gigantea, *Tetrataxis* 96
gigantea minoris, Tournayella 50
gigas, Archaediscus moelleri 35
Tetrataxis 96
Girvanella *107*
densa 108
ducii 108
incrustans 108
liebusi 108
maplewoodensis 108
moorei 108
ottonosia 108
problematica *108*; pl. 39
staminea 108
wetheredii 108
sp 108

Page

Globivalvulina 18, 100, *101*
arguta 101
biserialis 101
bulloides 18, 102
complicata 101
compressa 101
cora 101, 102
cyprica 101
donbassica 101
eogranulosa 101
exotica 101
gaptakensis 101
graeca 101
granulosa 101
hantkarensis 101
moderata 100
mosquensis 101
multiseptata 101
of the group *G. bulloides* 18, *102*; pl. 35
ovata 101, 102
parva 100
paula 101
pergrata 101
rauserae 101
shikhanensis 101
spiralis 101
syzranica 101
vonderschmitti 101
vulgaris 101
Globoendothyra 15, 16, 17, 61, 62, 70, *71*
antoninae 73
archaediscoidea 73
arctica 73
arcuata 73
arguta 73
baileyi 15, 16, 62, 64, 73
bridgensis 73
callosa 73
celsa 73
delmeri 73
dilatata 73
dorogobuzhica 73
elegantula 73
fusca 73
globulus 17, 64, 72, 73
gutschicki 73
inconstans 73
ishimica 73
korbensis 73
magna 73
mirifica 73
mrassuensis 73
mykutzkyi 73
nevkiensis 73
numerabilis 73
of the group *G. baileyi* 15, 16, *73*; pl. 32
G. tomiliensis 16, *74*; pls. 32, 34
ordinata 73
orelica 73
ovalis 73
parva 73, 74
paula 16, 64, 73, *74*; pls. 32, 34
plectogyra 73
pseudoglobulus 72
tomiliensis 16, 64, 73, 74
torquida 73
tumida 73
ukrainica 73
(*Globoendothyra*) *Endothyra* 74
redwallensis, *Endothyra* 75
Globoendothyridae 51, *70*, *74*
globosa, *Latiendothyra* 51, 64
globosus, *Archaediscus* 34
globula, *Nonionina* 72
globulus, *Archaediscus* 34
Endothyra 62, 72, 86
parva, *Endothyra* 74
Globoendothyra 17, 64, 72, 73

Page

Glomospira 29, 43, 44
Nonionina 72
spirillinoides 30
Glomospiranella 15, *43*, 44, 45
annulata 44
asiatica 44
horioni 44
latispiralis 44
pendula 44
rara 44
subglobosa 44
venusta 44
sp *44*; pl. 28
Glomospirella 29
irregularis 30
irregularis multivoluta 30
pseudopulchra 30, 31
spirillinoides spirillinoides 30, 31
glomus, *Archaediscus* 34
gracilis, *Archaediscus* 34
Endothyranella 53
Monotaxinoides 99
graciosa, *Endothyra* 62
Endothyranella 53
Millerella 90
Parathurammina 21
gradi, *Tetrataxis* 96
graeca, *Globivalvulina* 101
grandiculus, *Archaediscus* 34, 37
grandiosa, *Pseudoendothyra* 83
grandis, *Archaediscus spirillinoides* 32
Archaesphaera 110
Eotuberitina 23
Neoarchaediscus subbaschikiricus *40*; pl. 27
Pseudoendothyra 82
Turritella 94
Vicinesphaera 20
granularis, *Volvotextularia* 94
Granuliferella 44, 45, 51, 55
granuliferoides 46
granulosa 46
pauciseptata 56
tumida 52
Granuliferelloides 46
granulosa, *Globivalvulina* 101
granuliferoides, *Granuliferella* 46
Granuliferella 46
Septaglomospiranella 45
Granulosphaera 109
laevis 110, 111
grata, *Planoendothyra* 57
granum, *Archaediscus* 34
Plectogyra 56
Priscella 56
gregorii, *Planospirodiscus* 40
grozdilovae, *Planoendothyra* 57
Septaglomospiranella 45
gruenwaldti, *Eostaffella* 86
gutschicki, *Globoendothyra* 73

H

hamula, *Skippella* 76
hantkarensis, *Globivalvulina* 101
Haplophragmium 53
harltoni germanica, *Hemigordius* 30
Hemidiscus 27
contractus 28
Hemigordius 28, 31, 94
harltoni germanica 30
ulmeri 31
hemiovoides, *Tetrataxis* 96
hemisphaerica, *Tetrataxis* 96
henbesti, *Septatournayella* 15
heteromorpha, *Pseudoendothyra* 83
hexagonata, *Calcisphaera* 110

Page

hillae, *Solenopora* 107
hinduensis, *Eoendothyranopsis* 16, *77*; pl. 30
Eomillerella 77
hirosei, *Endothyranopsis* 80, 81
hohsienica, *Eostaffella* 86
Homoceras 18
Homoceras Zone 43
honesta, *Endothyra* 62
Planoendothyra 57
horioni, *Glomospiranella* 44
horrida, *Parathurammina* 21
Howchinia 17, 99
Hyperammina 24
elegans 25
elongata clavatula 26
moderata 26
vulgaris 26
minor 26
Hyperamminella 24
Hyperamminidae 112
Hyperamminoides 24

I

ignekensis, *Lithostrotion (Spihonodendron)* 14
ikensis, *Eostaffella* 86
illustria, *Pseudoendothyra* 82
immaturata, *Tetrataxis* 96
imminuta, *Endothyra parakosvensis* 52
Latiendothyra 51, 64
immodica, *Eoforschia* 50
Tournayella 50
Incertae sedis *111*
incertus, *Archaediscus* 39
Neoarchaediscus 17,19, *39*; pl. 27
inconspicula, *Endothyranella* 53
inconstans, *Globoendothyra* 73
incrassata, *Endothyra* 74
incrustans, *Girvanella* 108
infantis, *Archaediscus* 34
infirma, *Eostaffella* 86
inflata, *Calamopora* 103
Endostaffella 55
Endothyra 54, 55, 63
maxima, *Endothyra* 55
minima, *Endothyra* 54
typica, *Endothyra* 54
Eostaffella 86
Inflatoendothyra 54, 64
Koninckopora 16, *103*; pl. 36
Latiendothyra 55, 65
Monticuliopora 103
maxima, *Plectogyra (Spinoendothyra)* 55
Inflatoendothyra *54*
eospiroides 54, 64
inflata *54*, 64
multicamerata 15, 54
nordvikensis 54, 64
obtrita 54, 64
of the group I. *multcamerata* *54*; pl. 29
parainflata 54, 64
recta 54, 64
inflatum, *Cribrostomum* 93
inflatus, *Archaediscus* 34
inflecta, *Eostaffella* 86, 90
inflexus, *Archaediscus* 34
inops, *Endothyra* 63
Plectogyra similis 69
inoptata, *Pseudoendothyra* 82
intermedia, *Endothyranopsis* 80
Eostaffella 86
Pseudoendothyra 83
inusitata, *Endothyra* 63
involuta, *Planoarchaediscus* 32
Involutina 58, 79
crassa 80

Page

irinae, Planoedothyra 57, 65
irregularis, Brunsia 30
Brunsiella 30
Endothyra 63
Glomospirella 30
multivoluta, Glomospirella 30
Parathurammina 21
Spirillina 29, 30
Tetrataxis 96
Vicinesphaera 20
ishimica, Globoendothyra 73
itinerarius, Archaediscus 34, 37
ivanovi, Pseudoendothyra 83
Izhella 112
izhimica, Tetrataxis 96

J

jagoensis, Corwenia 14
japonica, Planoedothyra 57
jasperensis, Septaglomospiranella 46
jazvensis, Pseudoendothyra 83
juliusi, Skippella 75
juventa, Pseudoendothyra 83
juxta, Pseudoendothyra 83

K

kaisini, Endothyra 63
kamensis, Biseriella 100
kanmerai, Eostaffella 86, 90
karreri, Archaediscus 34, 35, 37, 38
compressa, Archaediscus 34
fragilis, Archaediscus 34
nana, Archaediscus 34
kasakhstanica, Eostaffella 86, 90
kashirica, Eostaffella 86
kedrovica, Planoedothyra 57
keltmensis, Millerella 90
Pseudoendothyra 82
Kelyphosphaera 109
kennedyi, Septatournayella 49
kennethi, Endothyra 63
kentuckyensis, Endothyra 63
kerka, Pseudoendothyra 83
kilevatica, Pseudoendothyra 83
kirgiana, Endothyra prisca 56
kirgisana, Endothyra 63
klawockensis, Diphyphyllum 9, 14
kleina, Endothyra 63
koktjubensis, Archaediscus 34, *36*; pl. 27
Archaediscus krestovnikovi 36
koksarekensis, Endothyra 63
kolymensis, Planoarchaediscus 32
komi, Endothyra 52
Latiendothyra 51
konincki, Zaphrentis 9
Koninckopora 16, *102*
fragilis 103
inflata 16, *103*; pl. 36
macropora 103
micropora 103
minuta 103
pruvosti 103
sahariensis 103
tenuiramosa *103* pl. 36
korbensis, Globoendothyra 73
korobchevi, Eostaffella 86
Koskinobigenerina 92
kostobensis, Latinendothyra 51, 65
kosvensis, Endothyra 52
Latiendothyra 15, 51, *52*, 65; pl. 29
kremenskensis, Pseudoendothyra 17, 83
krestovnikovi, Archaediscus 16, 34, *35*, 36; pl. 27
discoidea, Archaediscus 35
koktjubensis, Archaediscus 36
pusillus, Archaediscus 35

Page

kuhnei, Endothyranopsis 80
kynensis, Septaglomospiranella 45, 66
kyrtajolis, Pseudoendothyra 83

L

labiata, Tetrataxis 96
lacera, Septatournayella 49
laevis, Calcisphaera *110*; pl. 39
Granulosphaera 110, 111
lambarti, Sciophyllum 9, 12
lanceolata, Endothyra 56
Priscella 56
lancetiformis, Eostaffella 86
larvum, Cribrostomum 93
lastica, Septaglomospiranella 45
lata, Brunsia 29
Eostaffella 86
lata, *Pseudoendothyra* 83
lata, Pseudoendothyra 83
Schubertella 91
lata, *Skippella* 75
lata, Tetrataxis 96
Latiendothyra *51*, 54, *70*; pl. 32
advena 51, 64
agilis 51, 64
alta 51, 64
antiqua 51, 64
bulbisepta 51, 64
burgaliensis 51, 64
clavaesepta 51
decliva 51, 64
elegia 51
globosa 51, 64
imminuta 51, 64
inflata 55, 65
komi 51
kostobensis 51, 65
kosvensis 15, 51, *52*, 65; pl. 29
lensi 51, 65
lytvensis 51, 65
minima 51
nebulosa 51
neruensis 51, 65
nigra 51, 65
notabilis 51, 65
obesa 51, 65
of the group *L. parakosvensis* 15, *52*; pl. 29
parakosvensis 15, 51, 52, 65
parva 51, 65
rectiformis 51, 65
rjausakensis 51, 65
septima 51, 65
silva 52, 65
singularia 52, 65
skippae 52, 65
struniana 52, 65
taimyrica 52
tortuosa 52, 65
turkestanica 52, 65
sp *52*; pl. 29
latispiralis, Endothyra 51
Glomospiranella 44
Neoarchaediscus 39
Tetrataxis 96
latissima, Endothyra 63
lebedevae, Eoendothyranopsis 76
Septatournayella 49
lecomptei, Cribrostomum 93
leei, Pseudoendothyra 83
lenaensis, Planoarchaediscus 32
lenensis, Brunsia 16, 29, 30
lenitortus, Propermodiscus 31
strictus, Propermodiscus 31
lenociniosa, Endothyra 63
lensi, Latiendothyra 51, 65
Planoedothyra 57, 65

Page

lenticula Eostaffella 86
lenticularis, Pseudoendothyra 83
lepida, Eostaffella 86
lepidaeformis, Eostaffella 86
librans, Plectogyra 55
liebusi, Cribrostomum 93
Girvanella 108
linea, Tetrataxis 96
lipinae, Cribrostomum 93
Parathurammina 21
Planoedothyra 57, 65
Lipinella 18
Lisburne Group, regional relations of coral faunas *14*
lisburnensis, Lithostrotion (Siphonodendron) 12
Sphinctoporella *104*; pl. 36
Lithostrotion niakensis 9, 12
reiseri 9
(Siphonodendron) arizelum 14
dutroi 9
genevievensis 14
ignekensis 14
lisburnensis 12
sinuosum 9, 12, 14
warreni 9, 12, 14
Lithostrotionella 14
banffensis 9, 12, 14
birdi 9, 12, 14
lochmanae 9
mclareni 9, 12, 14
micra 9
microstylum 9
niakensis 12
orboensis 14
pennsylvanica 9, 14
shimeri 14
wahooensis 14
sp 12
Lituolidae 112
ljudmilae, Eostaffella 86
lochmanae, Lithostrotionella 9
Loeblichia 62
longa, Earlandia 25
Planoedothyra 57, 65
longiseptata, Endothyra 63
longulus, Asteroarchaediscus 42
longus, Archaediscus 35
Planoarchaediscus 32
luminosa, Pseudoendothyra 83
lyschnjanskensis, Millerella 90
lytvensis, Latiendothyra 51, 65

M

macellum, Cribrostomum 93
macer, Archaediscus 35, 37
macra, Eoendothyranopsis 16, 64, 76
macropora, Koninckopora 103
magna, Endothyra 63
Endothyra similis 69
Eovolutina 111
Globoendothyra 73
Parathurammina 21
Planoarchaediscus stilus 36
Skippella 66, 75
Tetrataxis 96
magnus, Archaediscus 35
mclareni, Lithostrotionella 9, 12, 14
malakhovae, Septatournayella 49
maljavkini, Tuberitina 23
manifesta, *Dainella* 71
maplewoodensis, Girvanella 108
marblensis, Millerella 90
marginara, Parathurammina 21
marginuloides, Stacheia 105
massanae, Endothyra 63
mathildae, Pseudoendothyra 83

Page

matutinus, Archaediscus 35
maxima, Endothyra 63
Endothyra bradyi 67
inflata 55
Plectogyra (Spinoendothyra) inflata 55
Tetrataxis 96
Tournayella discoidea 47
maximum, Cribrostomum 93
maximus, Archaediscus 35
meandriformis, Stacheoides *106;* pl. 38
media, Endothyra 63
Tetrataxis 96, *98*, pl. 35
mediocriformis, Eoendothyranopsis 76
Mediocris 75, 76, 88, 89
pressa 77
rara 77
medius, Ammodiscus 28
mellitus, Archaediscus 35
menneri, Planoendothyra 57, 65
meridionalis, Tetrataxis 96
Michelinia sp 14
micra, Lithostrotionella 9
Microbiota, foraminiferal and algal *14*
Microfacies, carbonate *8*
micropora, Koninckopora 103
microstylum, Lithostrotionella 9
Millerella 18, 61, 81, 84, 85, 87, *88*
advena 86
aperta 90
bigemmicula 90
carbonica 18, *90*; pl. 34
concinna 90
designata 88
discoidea 90
excavata 90
gigantea 90
graciosa 90
keltmensis 90
lyschnjanskensis 90
marblensis 89, 90
minima 90
mosquensis acuta 87
nautiloides 90
ornata 84
pressa *90;* pl. 35
pressula 90
prilukiensis 90
rossica 90
tortula 88
umbilicata 90
uralica 88
variabilis 90
visherensis 90
(Millerella) 89
(Seminovella) carbonica 91
sp 18, *91;* pl. 34
(Millerella), Eostaffella 87, 89
carbonica, Eostaffella 90
Millerella 89
millsapiensis, Tetrataxis 96
miloni, Propermodiscus 31
minima, Biseriella 100
Earlandia 25
Endothyra inflata 54
minima, *Endothyra parakosvensis* clavaesepta 52
minima, Eostaffella 86
Latiendothyra 51
Millerella 90
Parathurammina cushmani 21
Spiroplectammina 100
Tetrataxis 96
Volvotextularia 84
minimus, Archaediscus 41
Neoarchaediscus 41
Planospirodiscus *41;* pl. 27

Page

minor, Earlandia 26
Earlandia vulgaris 25, 26
Hyperammina vulgaris 26
Planoendothyra 58
minoris, Eoforschia gigantea 50
Tournayella gigantea 50
minuta, Earlandia 25
Endothyra 63
Endothyranella 53
Eostaffella 86
Koninckopora 103
Tetrataxis 96
minutissima, Eostaffella 86
mirifica, Globoendothyra 73
mirus, Tetrataxis 96
mississippiana, Trepeilopsis 94
Volvotextularia *94;* pl. 35
mixta, Eostaffella 86
mixtus, Propermodiscus 31
moderata, Biseriella 100
Earlandia 15, 25, 26
Globivalvulina 100
Hyperammina 26
Pseudoendothyra 83
Tetrataxis 96
modesta, Tournayella 48
moelleri, Archaediscus 35, 37
gigas, Archaediscus 35
ventrosa, Archaediscus 35
Eoforschia 15
uralica, Eoforschia 50
Tournayella 50
mohae, Archaediscus 35, 37
mohikana, Petalaxis 14
mollis, Volvotextularia 95
Monotaxinoides 28, *99*
discoideus 99
gracilis 99
multivolutus *99;* pl. 35
priscus 99
transitorius 99
Monotaxis subconica 99
subplana 99
monstrata, Parathurammina 21
monstratus, Planoarchaediscus 32
Monticuliopora 102
inflata 103
moorei, Girvanella 108
mordovica, Endothyranella 53
mosanae, *Endothyra* 63
mosquensis, Endothyra 63, 64, 70
Endothyra crassa 70
Endothyranopsis 80
Eostaffella 86, 87
acuta, Eostaffella 86, 87
attenta, Eostaffella 86, 87
sublata, Eostaffella 87
tumida, Eostaffella 87
variabilis, Esstaffela 87
Globivalvulina 101
acuta, Millerella 87
Plectogyra 70
Tetrataxis 96
mrassuensis, Globoendothyra 73
mstaensis, Eostaffella 86
mucronata, Endothyra 63
multicamerata, Endothyra 55
Endothyra paracostifera 54
Inflatoendothyra 15, 54
Plectogyra paracostifera 55
multiseptata, Globivalvulina 101
multivoluta, Glomospirella irregularis 30
multivolutus, Ammodiscus 28, 99
Monotaxinoides 99
munita, Endothyra 63
muricatiformis, Paracaligelloides 112
mutans, Archaediscus 35
mykutzkyi, Globoendothyra 73

Page

N

nalivkini, Ammobaculites 46
Rectoseptaglomospiranella 15, *46;* pl. 28
Septaglomospiranella 46
nana, Archaediscus karreri 34
Pseudoendothyra 83
Septaglomospiranella 45
Tetrataxis 96
Nanicella 70
nanus, Archaediscus 37
nasorakensis, Diphyphyllum 12
nautiliformis, Pseudoendothyra 83
nautiloides, Millerella 90
nebulosa, Latiendothyra 51
Priscella 56, 65
Neoarchaediscus 17, 18, 19, *38*, 40, 42, 43
accuratus 39
akchimensis 39
bacteriformis 39
bykovensis 39
collatatus 39
incertus 17, 19, *39;* pl. 27
latispiralis 39
minimus 41
parvus 17, *39;* pl. 27
parvus regularis 17, *39;* pl. 27
postrugosus 39
rugosus 42
subbaschkiricus 39, 40
subbaschkiricus grandis *40;* pl. 27
timanicus 39
Neodiscus 34
(Neoseptaglomospiranella), Septaglomospiranella) 44
neruensis, Latiendothyra 51, 65
nevadaensis, Endothyranopsis 80
nevkiensis, Globoendothyra 73
niakensis, Lithostrotion 9, 12
Lithostrotionella 12
nigra, *Endothyra parakosvensis* 52
Latiendothyra 51, 65
ninae, Archaediscus 35
Planoarchaediscus 36
nitida, Endothyranella 53
njumylga, Septatourneyella 49
noda, Pseudoendothyra 83
Septaglomospiranella primaeva 45
Nodosaria 27
Nodosinella 24, 27
cylindrica 27
nonconstricta, Eoforschia 50
Tournayella 50
Nonionina 71
globula 72
globulus 72
nordvikensis, Inflatoendothyra 54, 64
notabilis, Latiendothyra 51, 65
novita, Brunsia 29
numerabilis, Globoendothyra 73
Tetrataxis 96

O

obesa, Latiendothyra 51, 65
obicus, Paracaligelloides *112;* pl. 39
obliquus, Tetrataxis 96
oblonga, Eostaffella 86
oblongus, Propermodiscus 31
obnata, Vicinesphaera 20
obscura, Planoendothyra 58
obsoleta, Endothyra 63
obtrita, Inflatoendothyra 54, 64
obtusa, Brunsia 29
obtusus, Tetrataxis 96
oldae, Eostaffella 86
Parathurammina 21

Page

Omphalotis 61, 62
omraensis, Endothyra 63
operosus, Archaediscus 35
opinata, Pseudoendothyra 83
opulenta, Septaglomospiranella 45
orboensis, Lithostrotionella 14
ordinata, Globoendothyra 73
orelica, Globoendothyra 73
orientale, Thysanophyllum 9
orientalis, Planoendothyra 58
originis, Eoendothyranopsis 64, 76
ornata, Endothyra 62, 83, 84
Millerella 84
Pseudoendothyra *83;* pl. 34
Orobias 81
radiata 86
Orthriosiphonoides *104*
salterensis *104;* pl. 38
ottonosia, Girvanella 108
ovalis, Globoendothyra 73
ovata, Endothyra 63
Globivalvulina 101, 102
oveyi, Cribrostomum 93
ovoidea, Eostaffella 86
ovoides, Asteroarchaediscus 42
Ozawainellidae 88

P

pachisphaerica, Archaephaera 111
pachisphaeroides, Pachysphaerina 111
Pachysphaera 109, 110
dervillei 111
pachysphaerica, Calcisphaera *111;* pl. 39
Parathurammina 21
Pachysphaerina pachisphaeroides 111
pachythecа, Archaediscus *33;* pl. 27
pagodoformis, Tetrataxis 96
Palaeocancellus 110
Palaeotextularia 16, 17, 92
Palaeotextulariidae 92
pallae, Tetrataxis 96
pamirensis, Quasiarchaediscus 43
pandorae, Endothyra 63
pannusaeformis, Endothyra 63
papillata, Stacheoides 106
Paraarchaediscus 32, 32, 33, 34
Paracaligella 112
Paracaligelloides *112*
abramjanae 112
muricatiformis 112
obicus *112;* pl. 39
parachomatica, Planoedothyra 58
paraconica, Tetrataxis 96
paraconvexa, Eostaffella 86
paracostifera multicamerata, Endothyra 54
multicamerata, Plectogyra 55
paracushmani, Parathurammina 21, 22
paradagmarae, Parathurammina 21
paraeximia, Cribrostomum 93
parainflata, Inflatoendothyra 54, 64
parakosvensis, Endothyra 52
clavaesepta minima, *Endothyra* 52
imminuta, *Endothyra* 52
nigra, *Endothyra* 52
Latiendothyra 15, 51, 52, 65
Plectogyra 52
clavaesepta, *Plectogyra* 52
tortula 88
Paramillerella 75, 81, 84, 87, 89
tortula 88
paraminima, Tetrataxis 96, 98, 99
paramosquensis, Endothyra 70
paraparva, Eostaffella 86
Paraplectogyra 60
paraprisca, Eostaffella 86
parasphaerica, Pseudoendothyra 82
parasamarica, Endothyra 63

Page

paraspirillinoides, Archaediscus 35
Planoarchaediscus 32
Parastaffella 74, 75, 81, 82
ermakiensis 78
pressa 77
rara 77
struvei 84
suppressa 84
(Parastaffelloides) 82
(Parastaffelloides), Parastaffella 82
parastruvei, Eostaffella 86
Staffella (Eostaffella) 85
Parathurammina *20;* 23
aperturata 21
arguta 21
bella 21
branzhnikovae 21
breviradiosa 21
clivosa 21
crassitheca 21
cushmani 21, 22
minima 21
dagmarae 21
devonica 21
eodagmarae 21
gekkeri 21
graciosa 21
horrida 21
irregularis 21
lipinae 21
magna 21
marginara 21
monstrata 21
of the group *P. cushmani* *22;* pl. 26
P. spinosa *22;* pl. 26
P. suleimanovi *22;* pl. 26
oldae 21
pachysphaerica 21
paracushmani 21, 22
paradagmarae 21
paulis 21
polygona 21
praetuberculata 21
radiata 21
radiosphaerica 21
ramosa 21
regularis 21
scitula 21
sergiensis 21
spinosa 21, 22
stellaeformis 21
stellata 21
subvasta 21
suleimanovi 21, 22, 23
stellata 22, 23
tuberculata 21
turgida 21
Parathuramminidae 19, 23, 111
Paratikhinella 27
parva, Biseriella 17, 100
Brunsia 29
Cribrostomum 93
bradyi 93
Endothyra 63
globulus 74
Globivalvulina 100
Globoendothyra 73, 74
Latiendothyra 51, 65
parva, *Plectogyra prisca* 56
Priscella 56, 65
parva, Septaglomospiranella 45
parviconica, Tetrataxis 96
parvus, Archaediscus 39
regularis, Archaediscus 39
Neoarchaediscus 17, *39;* pl. 27
regularis, Neoarchaediscus 17, *39;* pl. 27
paucilocula, Endothyra 63

Page

pauciseptata, Endothyra 63
Granuliferella 56
paula, Endothyra 74
Globivalvulina 101
Globoendothyra 16, 64, 73, *74;* pls. 32, 34
paulis, Parathurammina 21
pauperata, Tetrataxis 97
pauxillus, Archaediscus 35, 37
pechorica, Endothyranopsis 80
pendula, Glomospiranella 44
pennsylvanica, Lithostrotionella 9, 14
pepeljaevi, Endothyra 63
perfidus, Tetrataxis 97
pergrata, Globivalvulina 101
perlucidus, Archaediscus 35
Permodiscus 31
perparva, Earlandia 25
perspicabilis, Eostaffella X986
Petalaxis mohikana 14
petasi, Tetrataxis 97
phrissa, Endothyra 63
piesis, Archaediscus 35
pietoni, Endothyra 63
pigmea, Tournayella 47
pigra, *Tetrataxis* 97
pinguis, Eostaffella 86, 90
plana, Endothyranopsis 80
Endothyranopsis compressus 80
Tetrataxis 97
Tournayella 47
Planoedothyra 58
Tetrataxis 97
Planoarchaediscus 16, *32,* 34
absimilis 32
aegyptiacus 32
brunsieformis 32
compressa 32
concinnus 32, 33
continguus 32
cospirillinoides 32, 33
duxundaensis 32
emphaticus 32
eospirillinoides 32
involuta 32
kolymensis 32
lenaensis 32
longus 32
monstratus 32
ninae 36
paraspirillinoides 32
pseudospirillinoides 32
spirillinoides *32;* pl. 27
stilus magna 36
zyrjanicus 32
Planoendothyra 57
arta 57
bastakkensis 57
compta 57
delecta 57, 65
diserta 57
evoluta 57, 65
futila 57, 65
grata 57
grozdilovae 57
honesta 57
irinae 57, 65
japonica 57
kedrovica 57
lensi 57, 65
lipinae 57, 65
longa 57, 65
menneri 57, 65
minor 58
parachomatica 58
obscura 58
orientalis 58
planispiralis 58

Page

Planoendothyra—Continued
rotayi 58, 65; pl. 30
rotayi 58
rudis 58
spirilliniformis 58, 65
taimyrica 58
tatianae 58, 65
tulensis 58
turlanica 58
umbonata 58
vicina 58, 65
planolocula, Tetrataxis 97
planoseptata, Tetrataxis 97
Planospirodiscus 17, 18, 19, 40, 43
effetus 40, 41
gregorii 40
minimus 41; pl. 27
taimyricus 17, 40, 41; pl. 27
sp 17, 41; pl. 27
planulata, Tetrataxis 97
Plectogyra 44, 51,54, 55, 57, 59, 60, 61, 62, 70, 71, 72, 74, 79, 80
agathis 56
bradyi 68
alta 68
bradyi 68
campinei 81
discoidea 88
grata 56
librans 55
mosquensis 70
paracostifera multicamerata 55
parakosvensis 52
clavaesepta 52
plectogyra 74
prisca 56
parva 56
prisca 56
rotayi rotayi 58
stricta 58
similis 69
amplis 69
crustata 69
inops 69
turgescens 69
symmetrica 77
uva 56
(Latiendothyra) kosvensis 52
(Spinoendothyra) 54
inflata maxima 55
sp 48, 73, 74, 80
plectogyra, Endothyra 74
Globoendothyra 73
Plectogyra 74
Plectogyrina 60, 61
plicata, Tetrataxis 97
poloumera, Endothyra baileyi 73
polygona, Parathurammina 21
polymorpha, Volvotextularia 94
Polymorphocodium 108
polytrematoides, Stacheia 106
plectogyra Endothyra 74
ponielum, Cribrostomum 93
porcupinensis, Zellerina 87, 90
Porostromata 107
porrecta, Endothyra 63
posneri, Endothyra 63
postminima, Tetrataxis 97
postmosquensis, Eostaffella 86
postromanica, Septaglomospiranella 46
postrugosus, Neoarchaediscus 39
poststruvei, Pseudoendothyra 83
posturalica, Septaglomospiroanella 46
potensa, Septatournayella 49
powersi, Ammobaculites 53
praecursos, Archaediscus 35
praesegmentata, Septatournayella 49
praetuberculata, Parathurammina 21

Page

preobrajenskyi, Pseudoendothyra 83
pressa, Eoendothyranopsis 76, 77
Eostaffella 86
Mediocris 77
Millerella 90; pl. 35
Parastaffella 77
pressa, *Priscella* 56, 65
pressula, Millerella 90
pressulus, Asteroarchaediscus 42
Tetrataxis 97
pressus, Eoendothyranopsis 77
prilukiensis, Millerella 90
primaeva, Endothyra 45
Septaglomospiranella 45
primaeva, Septaglomospiranella 45
Septaglomospiranella 45, 66
noda, Septaglomospiranella 45
Septaglomospiranella (Septaglomospiranella) 45
primaria, Eoforschia 50
Tournayella 50
prisca, Cornuspira 28
Endothyra 56
kirgiana, Endothyra 56
Plectogyra 56
prisca 56
parva, *Plectogyra* 56
prisca, Plectogyra 56
Priscella 15, 56, 65; pl. 29
Priscella 15, 55
agathis 56, 65
devexa 56, 65; pl. 29
devia 56
eosimilis 56
grata 56
lanceolata 56
nebulosa 56, 65
parva 56, 65
pressa 56, 65
prisca 15, 56, 65; pl. 29
scansa 56, 65
sulcata 56
waulsorti 56, 65
priscus, Ammodiscus 28
Monotaxinoides 99
Pseudoammodiscus 28; pl. 26
pritonensis, Pseudoendothyra 83
probata, Pseudoendothyra 83
probatus, Archaediscus 35
problematica, Girvanella 108; pl. 39
prodigiosa, Eoendothyranopsis 64, 76
Profusulinella 61
proikensis, Eostaffella 86
prokirgisana, Endothyra 63
Propermodiscus 31, 32, 34
deflectens 31
lenitortus 31
strictus 31
miloni 31
mixtus 31
oblongus 31
rigens 31
sp 31; pl. 27
propinqua, Pseudoendothyra 83
Protozoa 19, 24
protracta, Endothyranella 53
pruvosti, Koninckopora 103
Psammosphaera 111
Psammosphaeridae 111
Pseudoammodiscidae 27
Pseudoammodiscus 27, 28
priscus 28; pl. 26
volgensis 28; pl. 26
pseudoapproximatus, Archaediscus 35
pseudobradyi, Endothyra 63
pseudocamerata, Septatournayella 15, 49; pl. 8

Page

Pseudoendothyra 17, 61, 62, 75, 76, 81, 89
affixa 82
afflientia 82
angulata 82
arcuata 82
bella 82
biconvexa 82
bona 82
bradyi 82
britishensis 82, 83; pl. 34
candida 82
cantabrica 82
carbonica 82
composita 82
concinna 82
conspicua 82
constricta 82
continens 82
corpulenta 82
crassa 82
dagmarae 82
deformica 82
densa 82
directa 82, 84
dobrynini 83
elegans 83
expansa 83
expleta 83
fraudulenta 83
grandiosa 83
grandis 82
heteromorpha 83
illustria 82
inoptata 82
intermedia 83
ivanovi 83
zazvensis 83
juventa 83
juxta 83
keltmensis 82
kerka 83
kilevatica 83
kremenskensis 17, 83
kyrtajolis 83
lata 83
lata 83
leei 83
lenticularis 83
luminosa 83
mathildae 83
moderata 83
nana 83
nautiliformis 83
noda 83
opinata 83
ornata 83; pl. 34
paraspharica 82
poststruvei 83
preobrajenskyi 83
pritonensis 83
probata 83
propinqua 83
raja 82
rara 77
regina 83
rezwoi 83
rhomboidea 83
sagittaria 83
shlykovae 83
spectata 83
stricta 82
struvei 84
suppressa 84
struvii 83, 84
sublimis 83
subrhomboides 83
suppressa 83
tcherjaevae 83

Page

Pseudoendothyra—Continued
timanica 83
triznae 83
tumida 83
umbilicata 83
umbo 82
umbonata 83
variabilis 83
visherensis 83
vlerki 83
vytchegda 83
(Eoparastaffella) 82
(Pseudoendothyra) 82
(Pseudoendothyra), Pseudoendothyra 82
Pseudoendothyridae 15, *81*
pseudoglobulus, Globoendothyra 72
Pseudoglomospira 44
pseudomoelleri, Archaediscus 35
pseudopulchra, Glomospirella 30
pseudospirillinoides, Planoarchaediscus 32
Pseudostaffella 18, 91
yukonensis 91
pseudostruvei, Eostaffella 86
Pseudotetrataxis 95
pseudovisherensis, Archaediscus 35
Pseudotaxis 97
puella, Eostaffela 86, 90
pugnoides, Endothyranella 53
pulchra, Biseriella 100
Brunsia 29
Earlandia 25, 26
Endothyra 63, 68
bradyi 68
pulvinus, Archaediscus 35
pupoides, Stacheai 105
pusila, Cornuspira 28
pusillus, Archaediscus krestovnikovi 35
Tetrataxis 97
pustulus, Asteroarchaediscus 42

Q

Quasiarchaediscus 18, 40, *43*
pamirensis 43
rugosus 18, *43*; pl. 27
quasiconica, Tetrataxis 97, *98*; pl. 35
Quasiendothyra 57, 61
rotayi typica 58
Quasiendothyridae 51
questita, Septatournayella 49

R

radiata, Endothyra 62, 86
Eostaffella 64, 86
Orobias 86
Parathurammina 21
Radiolarians 9
radiosphaerica, Parathurammina 21
Radiosphaerina 110
raguchensis, Eostaffella 86
raja, Pseudoendothyra 82
ramosa, Parathurammina 21
rara, Eoendothyranopsis 16, 17, 76, 77, 78
Glomospiranella 44
Mediocris 77
Parastaffella 77
Pseudoendothyra 77
rauserae, Endothyra 63
Globivalvulina 101
Septatournayella 49
recida, Septatournayella 49
recta, Endothyranella *53*; pl. 29
Eostaffella 86, 90
Inflatoendothyra 54, 64
rectiformis, Dainella 71
Latiendothyra 51, 65
Rectoseptaglomospiranella *45*
nalivkini 15, *46*; pl. 28

Page

(Rectoseptaglomospiranella), Septaglomospiranella 45, 46
asiatica, Septaglomospiranella 46
(Rectoseptatournayella), Septatournayella 48
recurrens, Cribrostomum 93
recurvidens, Trepeilopsis 94
Redwall Limestone 15
redwallensis, Endothyra (Globoendothyra) 75
Skippella 66, *75*; pl. 30
regina, Pseudoendothyra 83
regularis, Archaediscus parvus 39
Cribrostomum 93
Neoarchaediscus parvus 17, *39*; pl. 27
Parathurammina 21
Tetrataxis 97, 98
reiseri, Lithostrotion 9
reitlingerae, Endothyra 63
Eotuberitina *23*; pl. 26
reliquus, Archaediscus 35
Renalcis 112
rezwoi, Pseudoendothyra 83
Rhodophycophyta 104
rhombiformis, Archaediscus 35
rhomboidea, Pseudoendothyra 83
rhomboides, Eostaffella 86
rhombus, Archaediscus 35
rhopaloides, Stylocodium 109
rigens, Propermodiscus 31
rjasanensis, Eostaffella 86
rjausakensis, Latiendothyra 51, 65
robertsoni, Trochammina 43
robusta, Calcisphaera 110
Eoendothyranopsis 17, 64, 76
romanica, Septaglomospiranella 45
rossi, Septaglomospiranella 45
rossica, Endothyra crassa 80
Endothyranopsis 80
Eoforschia 50
Millerella 90
rostrata, Endothyra 63
Rotalia 71
baileyi 73
rotaliformis, Endothyra 63
rotayi, Endothyra 58
taimyrica, Eoendothyranopsis 58
Planoedothyra *53*, 65; pl. 30
rotayi 58
rotayi, Planoendothyra 58
rotayi, *Plectogyra rotayi* 58
rotayi rotayi, *Plectogyra* 58
stricta, *Plectogyra* 58
typica, Quasiendothyra 58
rothrocki, Endothyra 63
rotunda, Eostaffella 86
rudis, Planoedothyra 58
Ruditaxis 94
rugosa, Endothyra 63
Eosigmoilina 43
Rugosarchaediscus 34, 38
Rugose corals *9*
rugosus, Archaediscus 42
Asteroarchaediscus 42
Neoarchaediscus 42
Quasiarchaediscus 18, *43*; pl. 27
Tetrataxis 97
rzhevica, Endothyra 63

S

Saccaminopsis 17
sagittaria, Pseudoendothyra 83
sahariensis, Koninckopora 103
sairamica, Brunsia 29
saleei, Archaediscus 35, 37
(Salpingothurammina), Thurammina 21
cushmani, Thurammina 22

Page

salterensis, Orthriosiphonoides *104*; pl. 38
scabra, Endothyra 63
scansa, *Priscella* 56, 65
scaphoidea, Biseriella 100
Schizophyta 107
Schubertella 91
lata 91
Schubertellinae 91
schwetsovi, Eostaffella 86
Sciophyllum alaskaensis 9, 12, 14
lambarti 9, 12
scitula, Endothyra 77
Eoendothyranopsis 64, 76, *77*; pl. 31
Eomillerella 77
Parathurammina 21
scoticum, Cribrostomum 93
segmentata, Tournayella 49
Seminovella 89
carbonica 90, 91
(Seminovella), Eostaffella 89
carbonica, Millerella 91
Semistaffella 91
sensu, Endothyra 62
Endothyra bowmani 62
Septaglomospiranella 15, *44*
angusta 46
anteflexa 45
attenuata 46
chernoussovensis 15, 45
compressa 45
crassiformis 46
crassiseptata 45, 66
elegantula 46
endothyroides 45
granulosa 45
grozdilovae 45
jasperensis 46
kynensis 45, 66
lastica 45
nalivkini 46
nana 45
of the group *S. chernoussovensis* *45*; pl. 28
opulenta 45
parva 45
postromanica 46
posturalica 46
primaeva 45, 66
noda 45
primaeva 45
romanica 45
rossi 45
(Neoseptaglomospiranella) 44
(Rectoseptaglomospiranella) 45, 46
asiatica 46
(Septaglomospiranella) primaeva 45
(Septaglomospiranella) primaeva, Septaglomospiranella 45
Septatournayella 15, *48*
disca 49
henbesti 15
kennedyi 49
lacera 49
lebedevae 49
malakhovae 49
njumylga 49
potensa 49
praesegmentata 49
pseudocamerata 15, *49*; pl. 28
questita 49
rauserae 49
recida 49
(Eoseptatournayella) 48
(Rectoseptatournayella) 48
septima, Latiendothyra 51, 65
sergiensis, Parathurammina 21
serpukhovensis, Tetrataxis 97
settedabanica, Endothyra 63

Page

shikhanensis, Globivalvulina 101
Tetrataxis 97
shimeri, Lithostrotionella 14
shlykovae, Pseudoendothyra 83
Shuguria 112
sibirica, Brunsia 29, 30
silva, Latiendothyra 52, 65
similis, Endothyra 15, 63, *69*; pl. 32
Endothyra similis 69
amplis, Endothyra 69
magna, Endothyra 69
similis, Endothyra 69
Plectogyra 69
amplis, Plectogyra 69
crustata, *Plectogyra* 69
inops, *Plectogyra* 69
turgescens, *Plectogyra* 69
Solenopora 107
simplex, Endothyra 63
singularia, Eostaffella 86
Latiendothyra 52, 65
sinuosum, Lithostrotion
(*Siphonodendron*) 9, 12, 14
(*Siphonodendron*) *arizelum,*
Lithostrotion 14
dutroi, Lithostrotion 9
genevievensis, Lithostrotion 14
ignekensis, Lithostrotion 14
lisburnensis, Lithostrotion 12
sinuosum, Lithostrotion 9, 12, 14
warreni, Lithostrotion 9, 12, 14
skimoensis, Stacheai *105*; pls. 37, 38
skippae, Latiendothyra 52, 65
Skippella 16, *74*, 79
arctata 66, 75
donica 75
evoluta 75
flatile 75
hamula 75
juliusi 75
lata 75
magna 66, 75
redwallensis 66, *75*; pl. 30
staffeliformis 75
transita 66, 75
sobrina, Endothyranella armstrongi 53
sol, Calcisphaera 110
Solenopora *106*
dionantina *107*; pl. 39
hillae 107
similis 107
spongioides 107
Solenoporaceae 106
solida, Vicinesphaera 20
spectabilis, Archaediscus 35
Carbonella 48
spectata, Pseudoendothyra 83
sphaerica, Endothyranopsis 80, 81
Sphaerocodium sp 108
Sphaeroporella 109
Sphinctoporella 16, *103*
lisburnensis *104*; pl. 36
Spinoendothyra 15, 54
(*Spinoendothyra*) *inflata maxima,*
Plectogyra 55
spinosa, Calcisphaera 22, 110
Parathurammina 21, 22
Thurammina (*Thurammina*) 22
spiralis, Globivalvulina 101
Trepeilopsis 94
spirans, Turritella 94
Spirillina 28, 38, 46, 49
irregularis 29, 30
spirillinoides, Archaediscus 32, 33
spirilliniformis, Planoendothyra 58, 65

Page

spirillinoides faceta, Archaediscus 32
grandis, Archaediscus 32
Brunsia 29, 30, 31
Brunsiella 30
Glomospira 30
Glomospirella spirillinoides 30, 31
spirillinoides, Glomospirella 30, 31
Planoarchaediscus *32*; pl. 27
spiroides, Endothyra 76, 77
Eoendothyranopsis 15, 16, 64, *76*, 78; pl. 30
Eomillerella 76
Spiroplectammina 45, 100, 101
minima 100
spissa, Stacheoides 106
spongioides, Solenopora 107
squalida, Vicinesphaera 20
Stacheia 15, *104*, 105
acervalis 105
congesta 105
marginuloides 105
polytrematoides 106
pupoides 105
skimoensis *105*; pls. 37, 38
Stacheiinae 15, 104, *106*
Stacheiinae, undetermined *106*; pl. 38
Stacheoides 15, *105*
meandriformis *106*; pl. 38
papillata 106
spissa 106
tenuis *106*; pl. 38
Staffella 81, 84
(*Eostaffella*) 84, 88
parastruvei 85
staffeliformis, Skippella 75
stalinogorski, Cribrostomum 93
staminea, Girvanella 108
stellaeformis, Parathurammina 21
stellata, Parathurammina 21
Parathurammina suleimanovi 22, 23
Stenopora 102
stilus, Archaediscus 35, 36
magna, Planoarchaediscus 36
stormi, Endothyranella 53
stricta, *Plectogyra rotayi* 58
Pseudoendothyra 82
strictus, Propermodiscus lenitortus 31
struniana, *Latiendothyra* 52, 65
struvei, Parastaffella 84
suppressa, Parastaffella 84
Pseudoendothyra 84
suppressa, Pseudoendothyra 84
struvii, Fusulinella 82, 83
Pseudoendothyra 83, 84
Stylocodium *108*
rhopaloides 109
sp *109*; pl. 39
subangulata, Eoforschia 50
Tournayella 50
subbaschkiricus, Asteroarchaediscus 40
grandis, Archaediscus 39, 40
Neoarchaediscus 39
grandis, Neoarchaediscus *40*; pl. 27
subconica, Monotaxis 99
Tetrataxis 98
subcylindricus, Archaediscus 35
Tetrataxis 97
subglobosa, Glomospiranella 44
sublata, Eostaffella 86
Eostaffella mosquensis 87
sublimis, Pseudoendothyra 83
submedia, Tetrataxis 97
submissa, *Endothyra* 63
subplana, Monotaxis 99
subrhomboides, Pseudoendothyra 83
substricta, Endothyranopsis 80
subtilis, Eoendothyranopsis 76, 77
Eostaffella 86

Page

subvasta, Eostaffella 86
Parathurammina 21
sulcata, Endothyra 63
Priscella 56
suleimanovi, Parathurammina 21, 22, 23
stellata, Parathurammina 22, 23
Thurammina (*Thurammina*) 23
superba, Endothyra 63
suppressa, Parastaffella struvei 84
Pseudoendothyra 83
struvei 84
sygmoidalis, Brunsia 29
symmetrica, Corwenia 14
Endothyra 77
Plectogyra 77
Syringopora 9
sp 9, 12
Systematic paleontology *19*
syzranica, Globivalvulina 101

T

taimyrica, Endothyra 52
Eoendothyranopsis rotayi 58
Latiendothyra 52
Planoendothyra 58
taimyricus, Planospirodiscus 17, 40, *41*; pl. 27
talassica, Eotuberitina 23
tantala, Endothyra 63
tatianae, Planoendothyra 58, 65
tcherjaevae, Pseudoendothyra 83
tenebrosa, Eostaffella 86
tenuiramosa, Koninckopora *103*; pl. 36
tenuis, Stacheoides *106*; pl. 38
teres, Archaediscus 35
Endothyra 63
Textrataxidae 92, 94
Tetrataxis *94*
acuta 97
acutiformis 96
acutus 96
angusta 96
aperta 96
barkatovae 96
bashkirica 96
beshevensis 96
biconvexa 96
compactus 96
compressa 96
concava 96
conciliatus 96
condrusiana 96
conica 96, 97, 98
gibba 98
conili 96
corona 96, 98
cumulosa 96
curviseptata 96
decurrens 96
depressa 96
depressus 96
dievi 96
digna 98
donetzica 96
elata 96
elegans 96
elongata 96
emaciatus 96
eomaxima 96
exornatus 96, 98
fluxus 96
gigantea 96
gigas 96
gradi 96
hemiovoides 96
hemisphaerica 96
immaturata 96
irregularis 96

Page

Tetrataxis—Continued
izhimica 96
labiata 96
latispiralis 96
lata 96
linea 96
magna 96
maxima 96
media 96, *98*; pl. 35
meridionalis 96
millsapiensis 96
minima 96
minuta 96
mirus 96
moderata 96
mosquensis 96
nana 96
numerabilis 96
obliquus 96
obtusus 96
of the group *T. angusta* *97*; pl. 35
T. conica *97*; pl. 35
pagodoformis 96
pallae 96
paraconica 96
paraminima 96, 98, 99
parviconica 96
pauperata 97
perfidus 97
pauperata 97
petasi 97
pigra 97
plana 97
planispiralis 97
planolocula 97
planoseptata 97
planulata 97
plicata 97
postminima 97
pressulus 97
pusillus 97
quasiconica 97, *98*; pl. 35
regularis 97, 98
rugosus 97
serpukhovensis 97
shikkanensis 97
subconica 97
subcylindricus 97
submedia 97
volongaensis 97
vulgaris 97
sp *97*; pl. 35
Textularia 92
Textulariidae 94
textulariforme, Cribrostomum 93
texturata, Endothyranella 53
thompsoni, Eoendothyranopsis 76
Thurammina (Salpingothurammina) 21
(Salpingothurammina) cushmani 22
(Thurammina) 21
spinosa 22
suleimanovi 23
(Thurammina), Thurammina 21
spinosa, Thurammina 22
suleimanovi, Thurammina 23
Thysanophyllum astraeiforme 9, 12, 14
orientale 9
Tikhinella 46
tiksinensis, Archaediscus 35, 36
Brunsia 29
timanica, Endothyra 63
Pseudoendothyra 83
timanicus, Neoarchaediscus 39
tomiliensis, Endothyra 74
Globoendothyra 16, 64, 73, 74
torquida, Globoendothyra 73
torta, Endothyra 63
tortilis, Endothyra 63

Page

tortula, Millerella 88
Paramillerella 88
Zellerina 87, 90
tortuosa, Latiendothyra 52, 65
Tournaisian (Middle to Upper Osage) age equivalent *15*
Tournayella 15, 27, 28, *46*, 47, 48, 49
accepta 47
discoidea 15, *47*; pl. 28
discoidea angusta 47
discoidea maxima 47
gigantea minoris 50
immodica 50
modesta 48
moelleri 50
nonconstricta 50
pigmea 47
plana 47
primaria 50
segmentata 49
subangulata 50
verkhojanica 50
vespaeformis 47
Tournayellidae 15, 28, 43, 46, 52, 112
transita, Skippella 66, 75
transitorius, Monotaxinoides 99
Trepeilopsis 94
mississippiana 94
recurvidens 94
spiralis 94
triangulus, Archaediscus 35
triznae, Eoendothyranopsis 76
Pseudoendothyra 83
Trochammina robertsoni 43
Trochiliscus 110
tuberculata, Parathurammina 21
Tuberendothyra 15
Tuberitina 23
maljavkini 23
Tuberitinidae 23
tujmasensis, Dainella 71
Eovolutina 111
tulensis, Planoendothyra 58
tumida, Eostaffella mosquensis 87
Globoendothyra 73
Granuliferella 52
Pseudoendothyra 83
tumidus, Chaetetes 103
turgescens, Endothyra 63
turgescens, *Plectogyra similis* 69
turgida, Parathurammina 21
turkestanica, Latiendothyra 52, 65
turlanica, Planoendothyra 58
Turrispira 99
Turrispiroides 99
Turritella grandis 94
spirans 94
typica, Endothyra inflata 54
Quasiendothyra rotayi 58

U

ukrainica, Globoendothyra 73
ulmeri, Hemigordius 31
umbilicata, Brunsia 29
Millerella 90
Pseudoendothyra 83
umbo, Pseudoendothyra 82
umbonata, Endothyranopsis 80
Eostaffella 86
Planoendothyra 58
Pseudoendothyra 83
Undetermined algal phyllum *109*
Undetermined family 94, 104, 109
Ungdarellaceae 104
unica, Eoforschia 50
Uragiella 102
uralica, Eoforschia moelleri 50

uralica—Continued Page
Millerella 88
Zellerina 87
Urbanella 57
utahensis, Eoendothyranopsis 16, 64, 76, 78
uva, Plectogyra 56

V

valens, Archaediscus 35
Valvulina 94, 101
bulloides 101, 102
Valvulinella 17
vara, *Endothyra* 63
variabilis, Eostaffella 86
Eostaffella mosquensis 87
Millerella 90
Pseudoendothyra 83
varsanofievae, Archaediscus 35
varvariensis, Eostaffella 86
vasta, Eostaffella 86
velgurensis, Archaediscus 35
ventrosa, Archaediscus moelleri 35
venusta, Glomospiranella 44
verkhojanica, Endothyra 63
Eoforschia 50
Tournayella 50
versabilis, Endothyra 63
Eostaffella 86
versata, *Dainella* 64, 71
vertens, Archaediscus 35
vespaeformis, Tournayella 47
vicina, Planoendothyra 58, 65
Vicinesphaera 19, 23
angulata 20
grandis 20
irregularis 20
obnata 20
solida 20
squalida 20
sp *20*; pl. 26
Viséan Early (lower and middle Salem age equivalent) *15*
Late, Late Zones 16_{inf} and 16_{sup} (lower Chester age equivalent) *17*
Middle, (upper Salem and lower St. Louis age equivalent) *16*
visherensis, Archaediscus 35, 36
Millerella 90
Pseudoendothyra 83
Vissariotaxis 99
vlerki, Pseudoendothyra *83*
volgensis, Ammodiscus 28
Brunsiella 28
Pseudoammodiscus *28*; pl. 26
volongaensis, Tetrataxis 97
Volvotextularia *94*
extensus 94
granularis 94
minima 94
mississippiana *94*; pl. 35
mollis 94
polymorpha 94
vonderschmitti, Globivalvulina 101
vulgaris, Earlandia 15, 25, 26
Earlandia vulgaris 26
minor, Earlandia 25, 26
vulgaris, Earlandia 26
Globivalvulina 101
Hyperammina 26
minor, Hyperammina 26
Tetrataxis 97
vytchegda, Pseudoendothyra 83

W

wahooensis, Lithostrotionella 14
warreni, Lithostrotion (Siphonodendron) 9, 12, 14

Page

waulsorti, Priscella ---------- 56, 65
Westphalian, Early, Zones 20 and 21-- *18*
wetheredii, Girvanella ---------- 108
wilkiestoni, Cribrostomum ---------- 93

Y

Yukonella ---------- 16, *104*
bamberi ---------- *104*; pl. 36

Page

yukonensis, Eoschubertella --------- *91*; pl. 35
Pseudostaffella ---------- 91

Z

Zaphrentis konincki ---------- 9
zelleri, Endothyra ---------- 77
Eoendothyranopsis ---------- 64, 76
Zellerina ---------- 87, 90
Zellerina ---------- 17, *87*, 89, 91
ameradaensis ---------- 66, 87

Page

Zellerina—Continued
cooperi ---------- 87, 90
designata ---------- 87, *88*, 90; pl. 34
discoidea ---------- 15, 17, 66, *88*; pl. 34
porcupinensis ---------- 87, 90
tortula ---------- 87, 90
uralica ---------- 87
zelleri ---------- 87, 90
Zonal integrity ---------- *18*
zyrjanicus, Planoarchaediscus --------- 32

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.

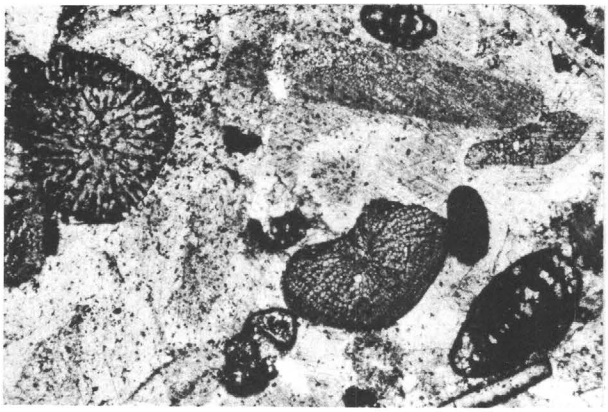
Medium-grained, poorly sorted, pelmatozoan-foraminiferal packstone. Foraminifera include numerous *Earlandinella* sp., *Endothyra* sp., and *Parathurammina* sp. *Calcisphaera pachysphaerica* (Pronina) is also present.

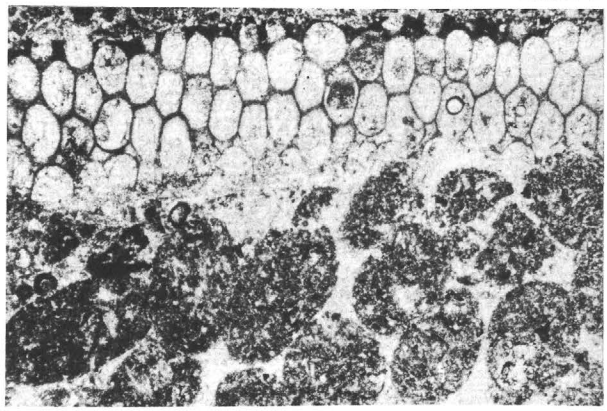
7. Univ. Montréal 204/6, 3,750 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

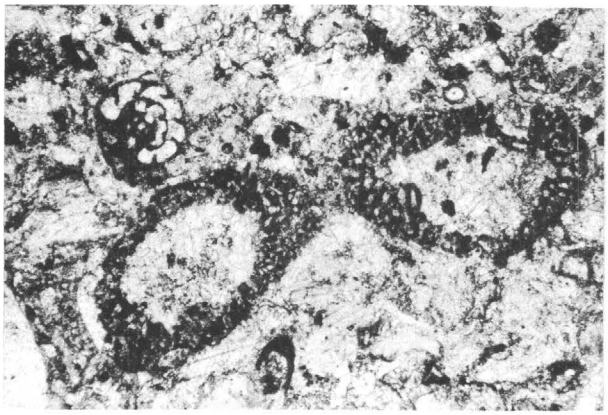
Medium-grained, poorly sorted, pelmatozoan-foraminiferal packstone. Foraminifera include *Eoendothyranopsis* of the group *E. rara* (Grozdilova *in* Lebedeva), *Globoendothyra* sp., *Earlandia* of the group *E. vulgaris* (Rauzer-Chernoussova and Reitlinger), *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova), *Earlandia* sp., and *Parathurammina* sp. Calcisphaerids are also present.

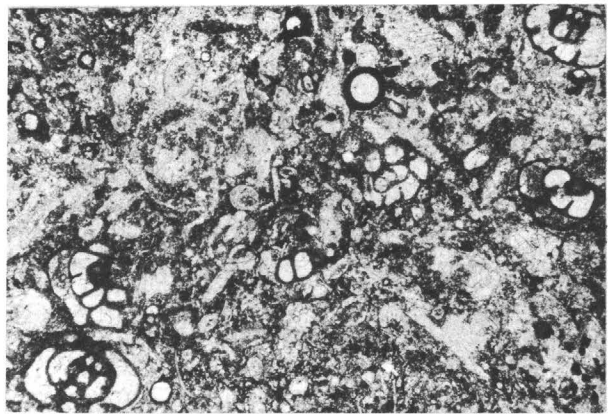
8. Univ. Montréal 203/27, 20–30 ft below top of section (× 25) Alapah Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.

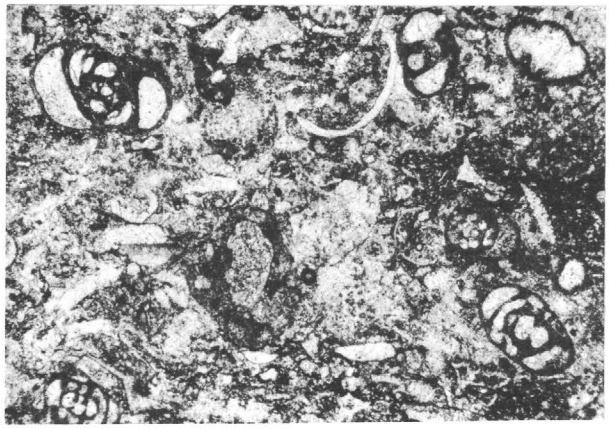
Tectonically stressed limestone. The original rock was probably a bryozoan-pelmatozoan grainstone or packstone. Note the sinuous twin lamellae confined to the ossicles of pelmatozoans.

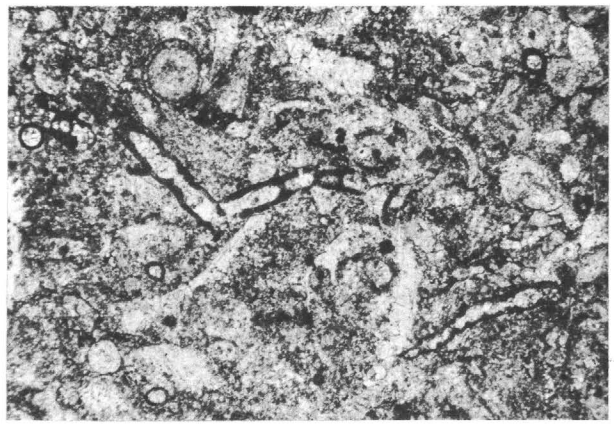

1

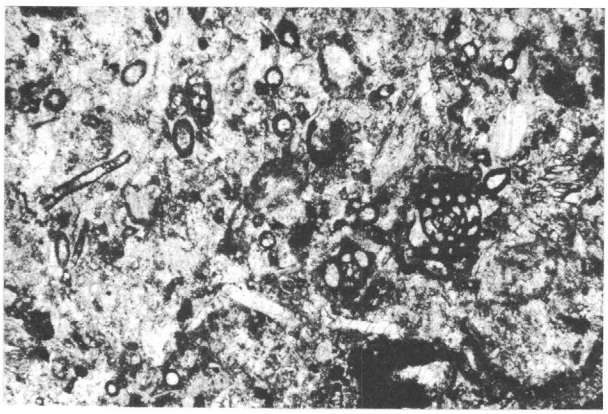

2

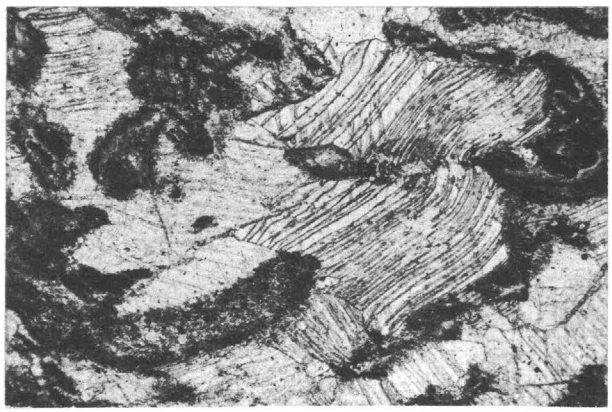

3


4


5


6


7


8

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.

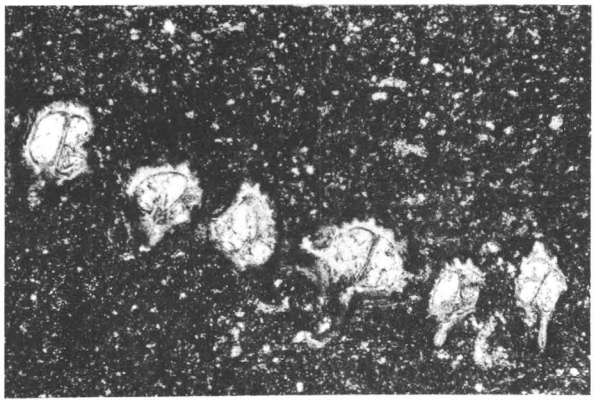
Old Man Creek section 69A–4

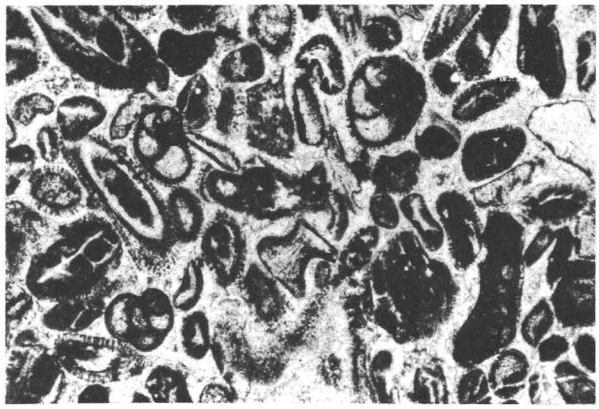
5. USNM 179955, 835 ft below top of section (× 25) Alapah Limestone, Zones 16_{inf} or 16_{sup}, undetermined latest Viséan zone, lower Chester equivalent.
Dolomitic mudstone. Note clear outer rims of the dolomitic rhombs.

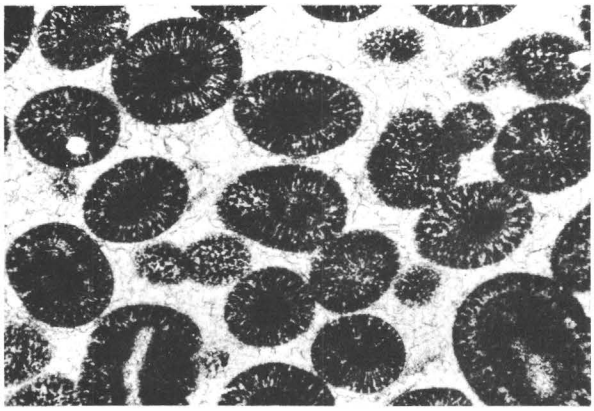
6. USNM 179956, 703 ft below top of section (× 30) Alapah Limestone, Zones 16_{inf} or 16_{sup}, undetermined latest Viséan zone, lower Chester equivalent.
Clear-rimmed dolomite rhombs. The darker dolomite centers are due to the concentration of organic and argillaceous material; iron oxides are also present. The pore spaces between the dolomite rhombs are filled by sparry calcite that has destroyed the porosity.

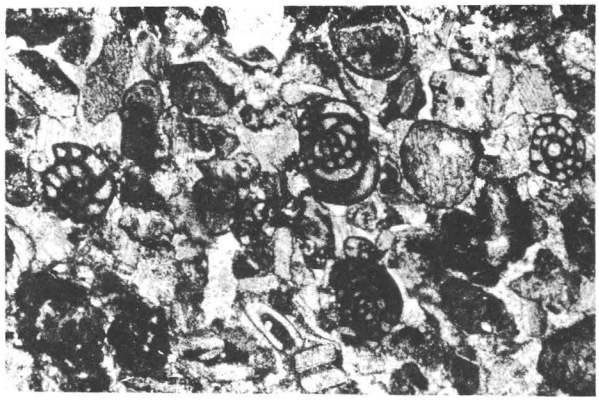
7. As figure 6 (× 97).

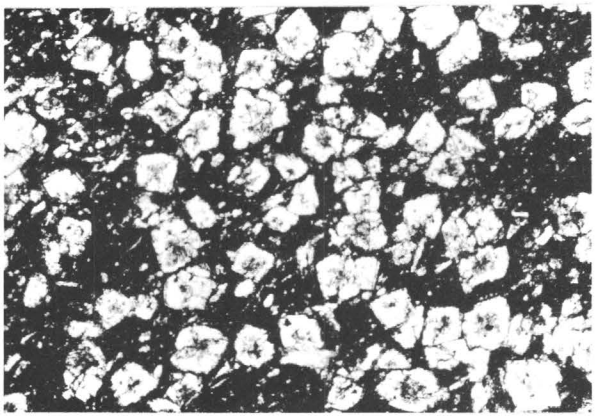
8. USNM 179957, 555 ft below top of section (× 95) Alapah Limestone, Zones 17 or 18, undetermined Early Namurian zone, middle or upper Chester equivalent.
Dolomite. Clear-rimmed dolomite rhombs with sparry calcite-filled vugs.

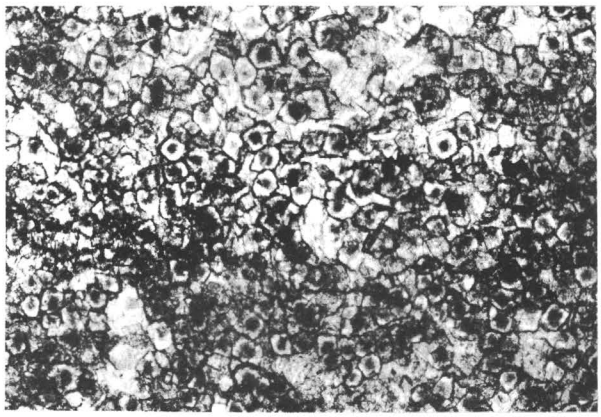


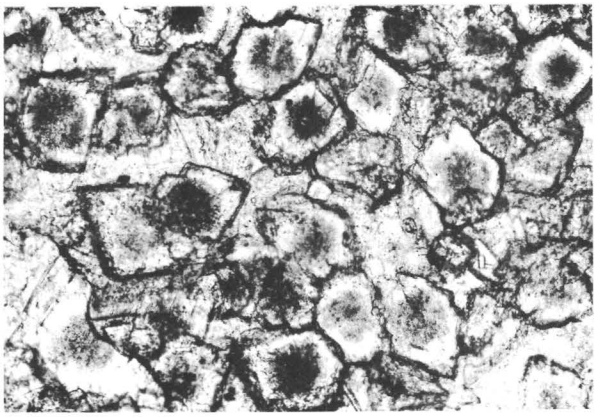


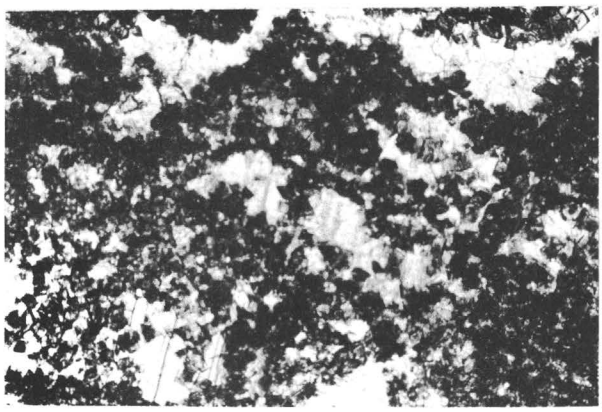












EGAKSRAK RIVER SECTION 68A–5, ROMANZOF MOUNTAINS

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.

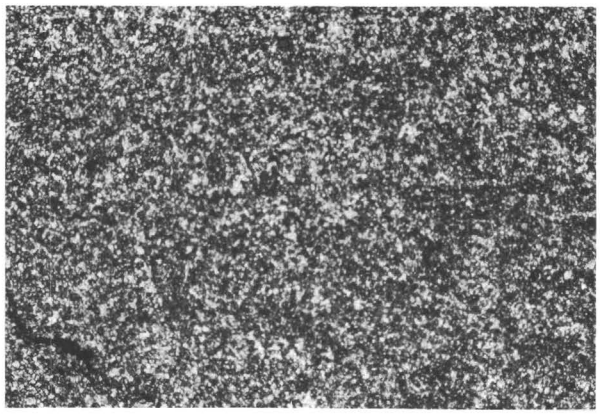
Euhedral dolomite rhombs in chert. Chertification and dolomitization were penecontemporaneous.

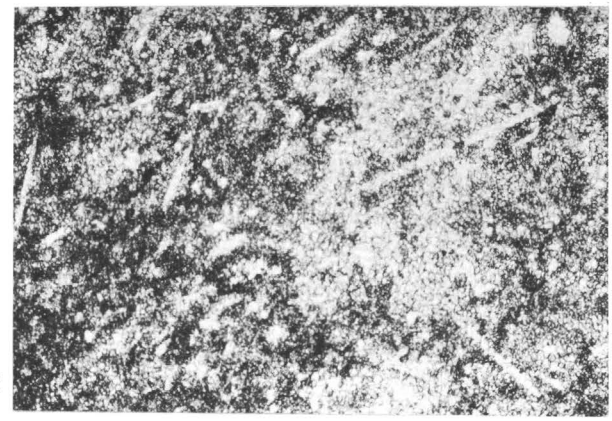
7. USNM 179962, 1,310 ft below top of section (× 25) Alapah Limestone, Zone 16_{sup} or 17, Late Viséan or Early Namurian, lower to middle Chester equivalent.

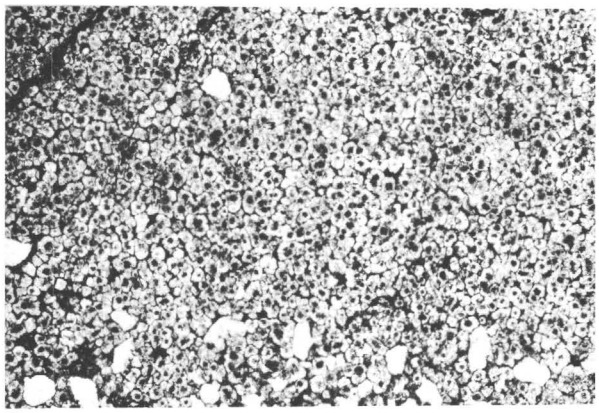
Medium-grained dolomite. Note the sparry calcite filling of micropores.

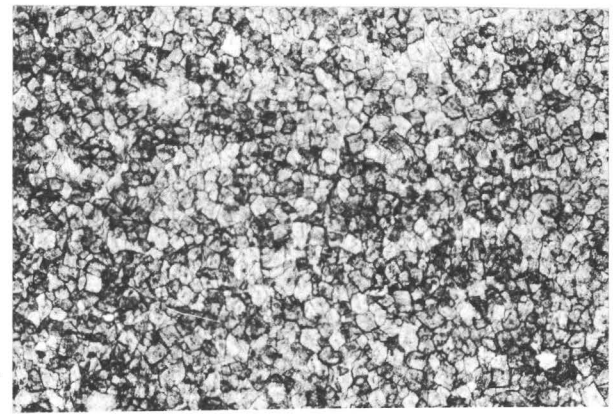
8. USNM 179963, 720 ft below top of section (× 25) Alapah Limestone, Zone 16_{sup} or 17, Late Viséan or Early Namurian, lower to middle Chester equivalent.

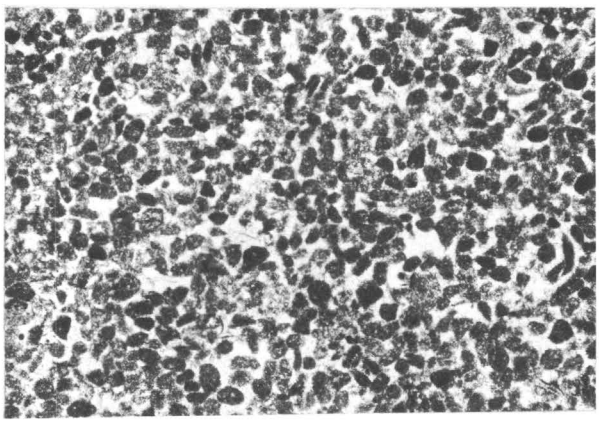
Very fine grained dolomite. Note the preservation in the dolomite of the original microbedding of the pelletoidal lime mudstone. Note also the wavy texture of the original lime mud, frequent as ghost.

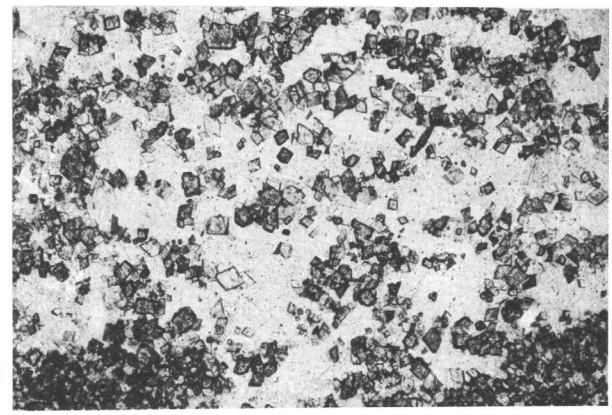

1

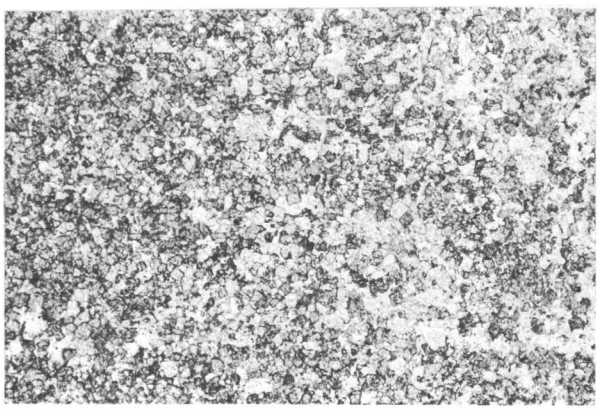

2

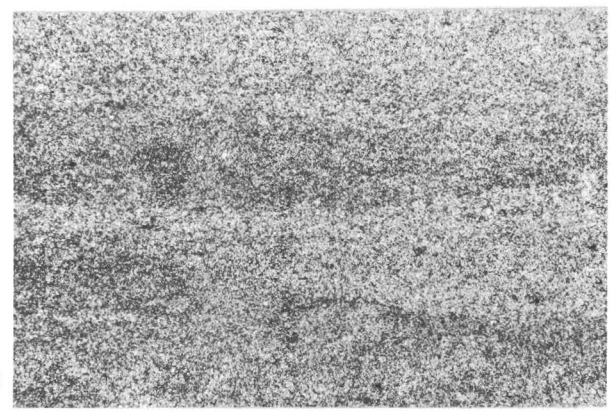

3


4


5


6


7


8

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.

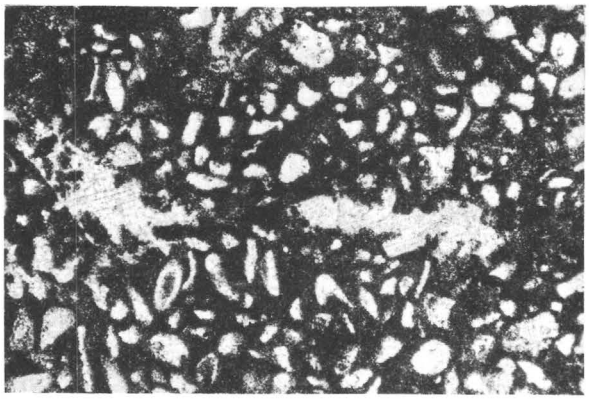
Coarse-grained, poorly sorted foraminiferal-lump grainstone. Oolites and proto-oolites are common. Note the wide variability of the test preservation.

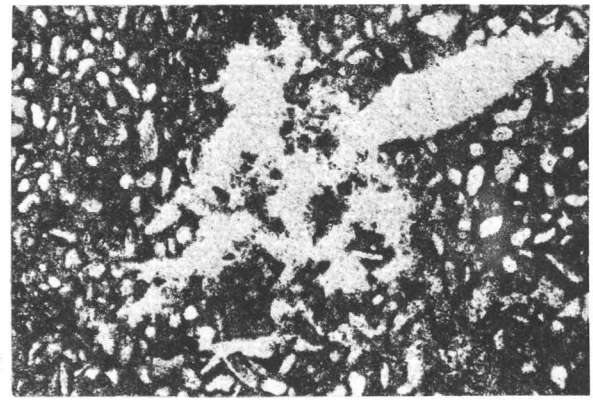
Figure 5 shows two highly recrystallized equatorial sections of *Pseudostaffella* sp. with *Eostaffella* sp., *Asteroarchaediscus* sp., *Eoschubertella*? sp., *Endothyra* sp., and the algae *Kamaena* sp.

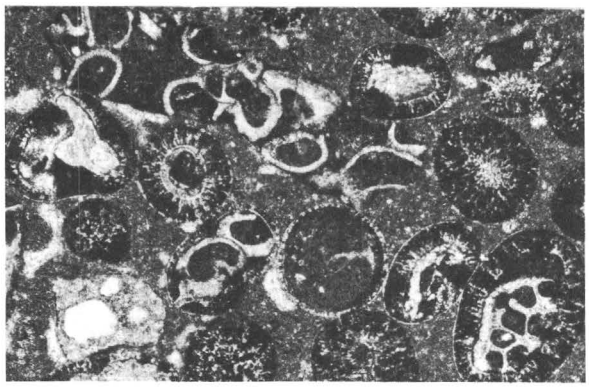
Figure 6 has *Pseudostaffella* sp., *Eoschubertella*? sp., *Pseudoendothyra* sp., *Eostaffella* sp., *Glomospiroides* sp., and *Pseudoglomospira* sp.

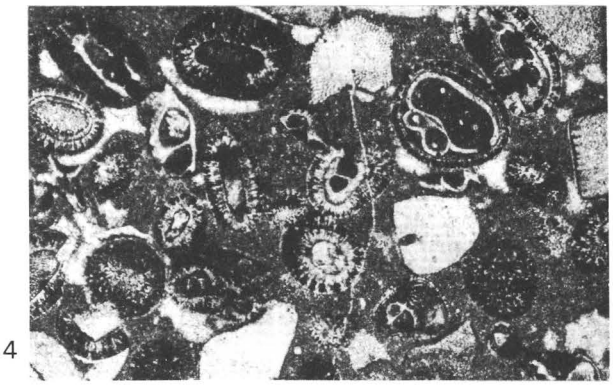
Figure 7 shows *Pseudostaffella* sp., *Eoschubertella*? sp., *Pseudoendothyra* sp., and endothyrids.

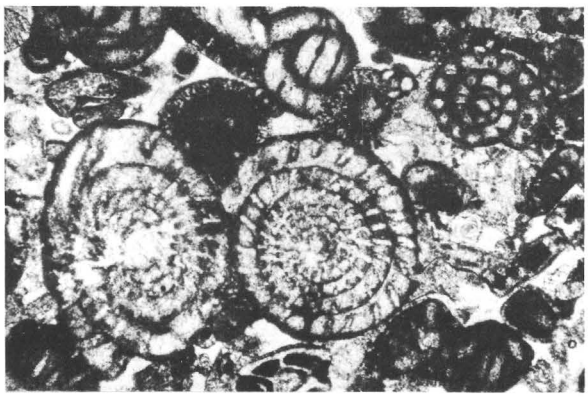
Figure 8 has *Eoschubertella*? sp., *Pseudoendothyra* sp., endothyrids, and calcispherids.

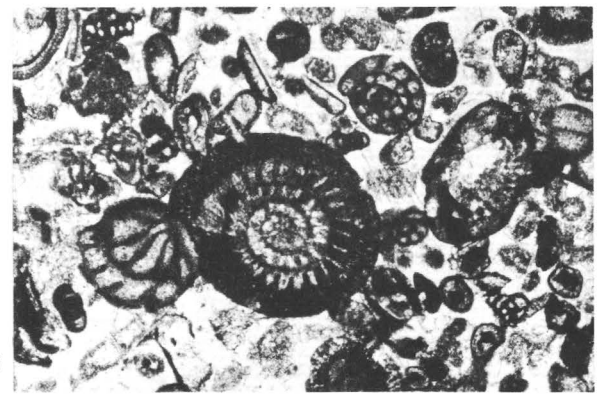

1

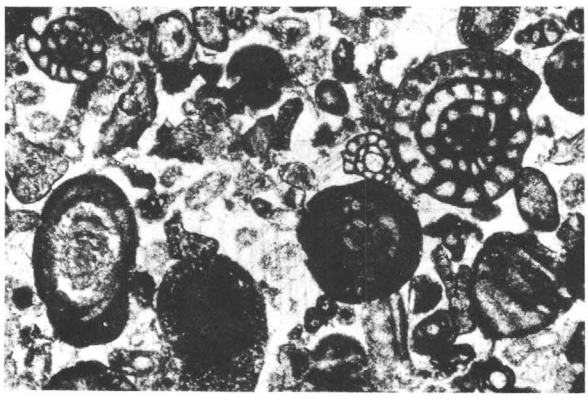

2

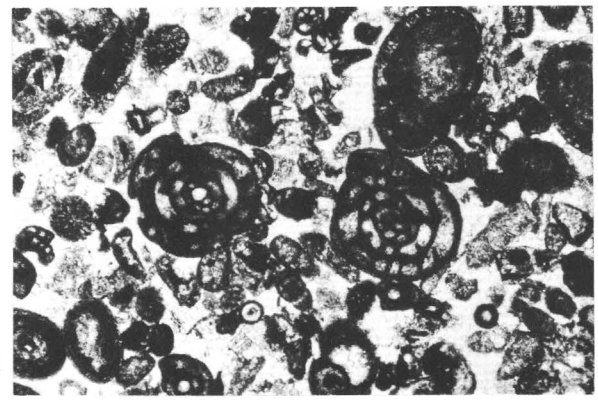

3


4


5


6


7


8

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_{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_{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_{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_{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_{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_{sup}, Late Viséan, lower Chester equivalent.

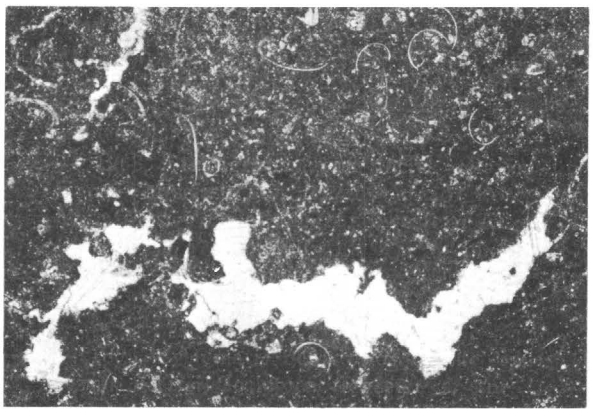
Very well sorted, fine-grained, micro-oolitic grainstone. Echinoid spines, abundant bryozoans, pelmatozoan fragments, algal bored brachiopods, and micropellets are present.

7. USNM 179973, 670 ft below top of section (× 30) Alapah Limestone, Zone 16_{sup}, Late Viséan, lower Chester equivalent.

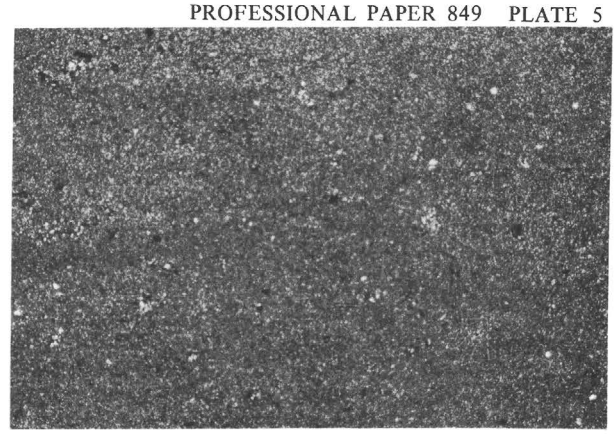
Two *Epistacheoides connorensis* Mamet and Rudloff in a bryozoan grainstone.

8. USNM 179974, 300 ft below top of section (× 97) Wahoo Limestone, Zone 19 or younger, Namurian, upper Chester equivalent.

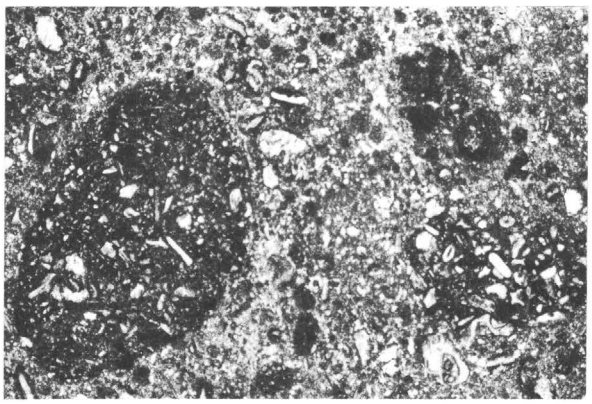
Neoarchaediscus sp. in a brachiopod wackestone.



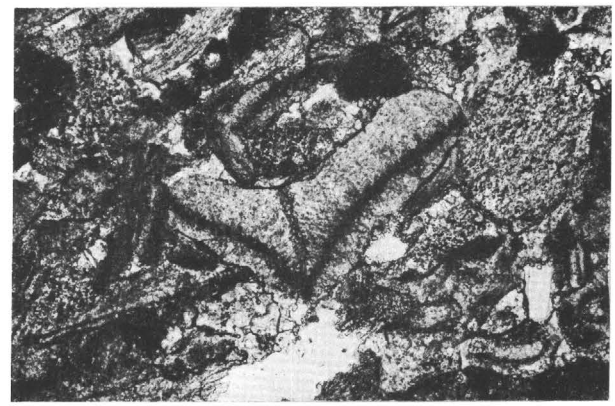
1



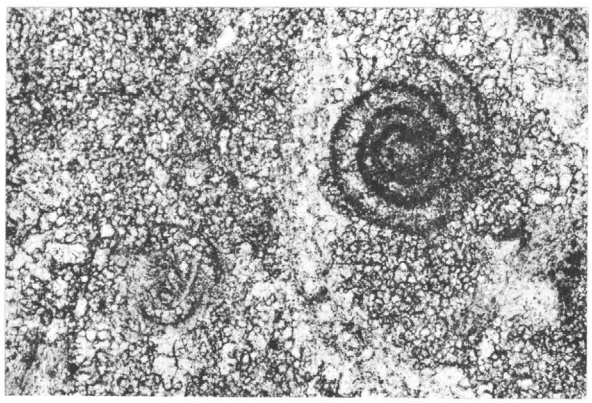
2



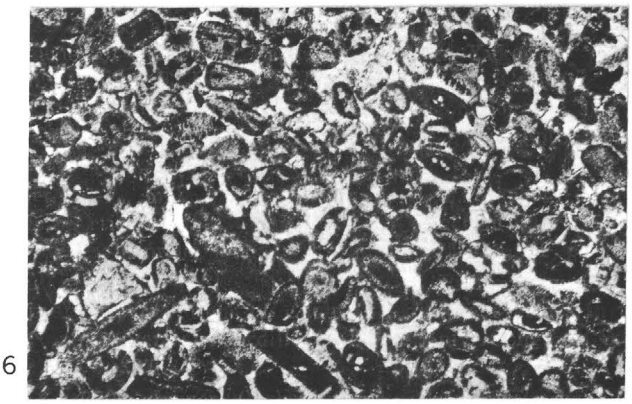
3



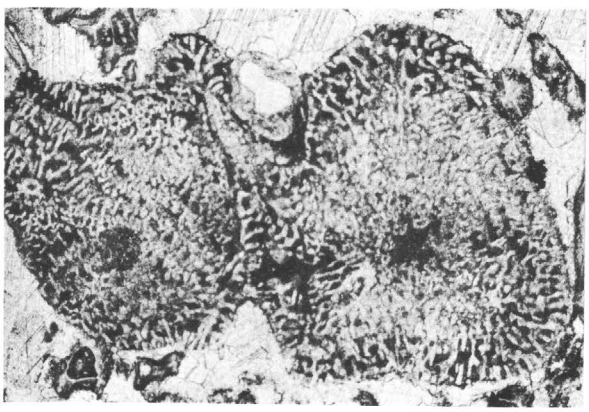
4



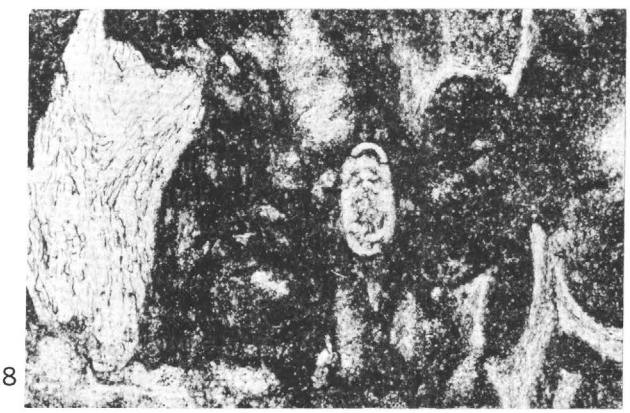
5



6



7



8

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.

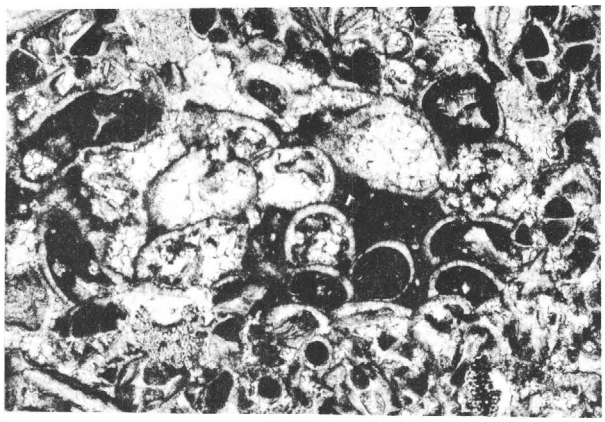
Unsorted, medium-grained, bryozoan-pelmatozoan, pelletoid, recrystallized packstone. Abundant *Planospirodiscus* sp., *Archaediscus* sp., *Neoarchaediscus* sp. are present. A silicified *Eostaffella* sp. is present on the lower left.

7. USNM 179980, 90 ft below top of section (× 25) Wahoo Limestone, Zone 20, Morrow equivalent.

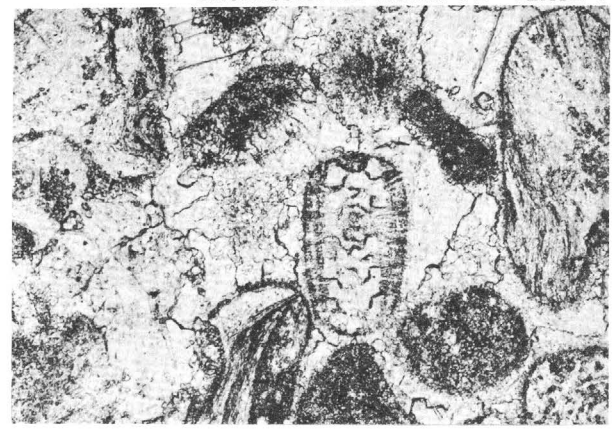
Fairly sorted, medium-grained, bryozoan-pelmatozoan-brachiopod grainstone. The algae *Stacheoides* sp. and foraminifers (*Millerella* sp., *Biseriella* sp.) are present.

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.

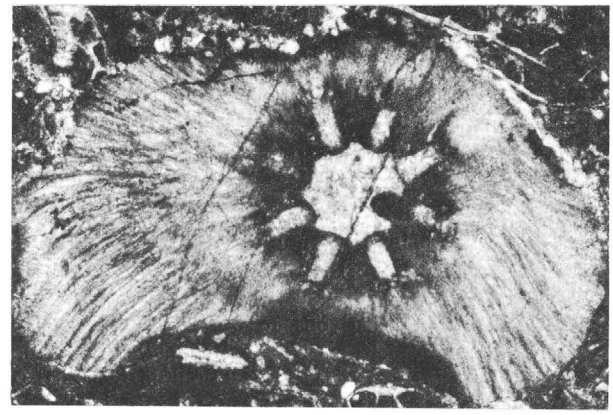


1

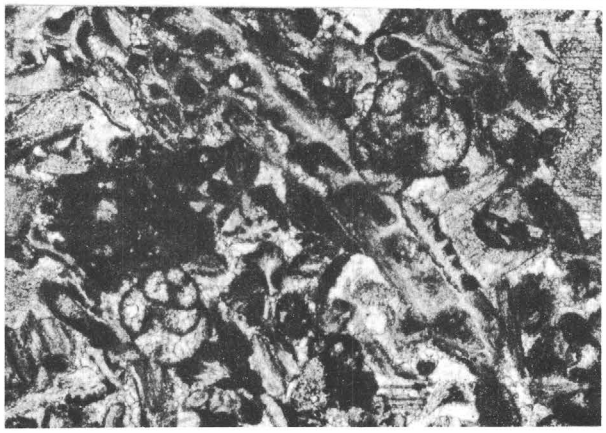


2

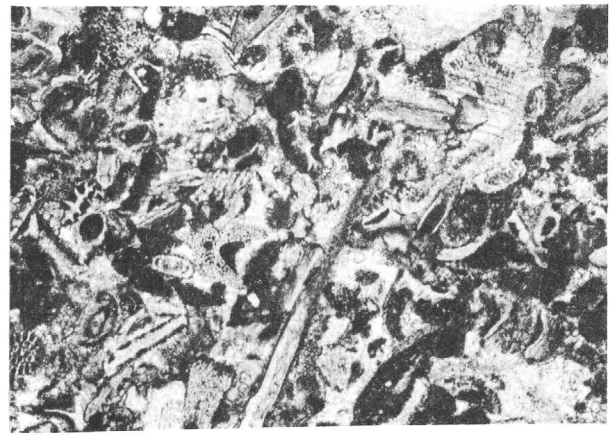
3



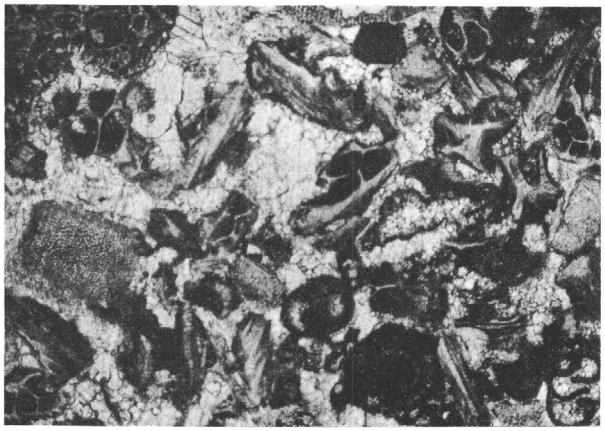
4



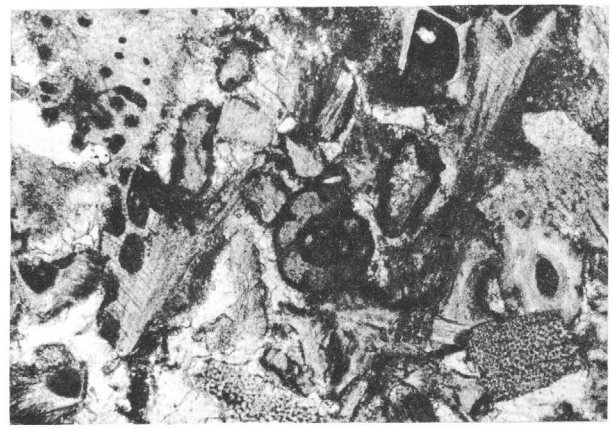
5



6



7



8

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.

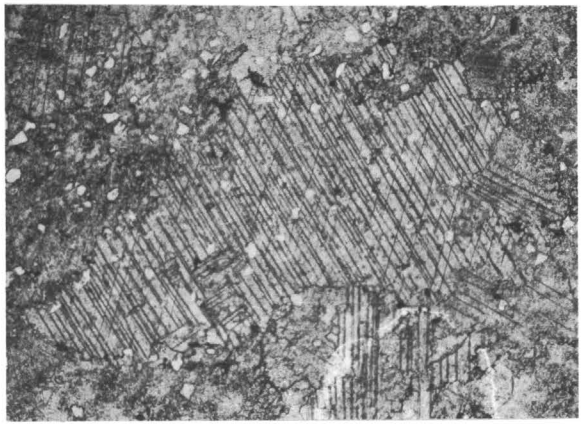
6. USNM 179985, 980 ft below top of section (× 30) Alapah Limestone, Zone 16_{sup}, Late Viséan, lower Chester equivalent.

Large dolomite rhombs in an argillaceous wackestone. Note the double rims indicating two generations of crystal growth.

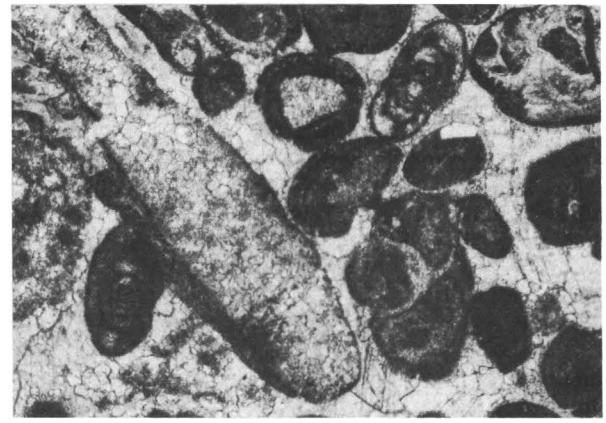
7, 8. USNM 179986, 850 ft below top of section (× 30) Alapah Limestone, Zone 17, Early Namurian, middle Chester equivalent.

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.

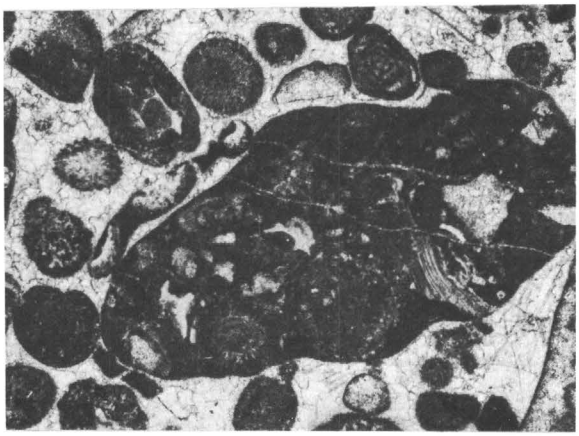
Figure 7 shows *Neoarchaediscus* sp. and *Endothyra* sp. Figure 8 shows *Planospirodiscus* sp.

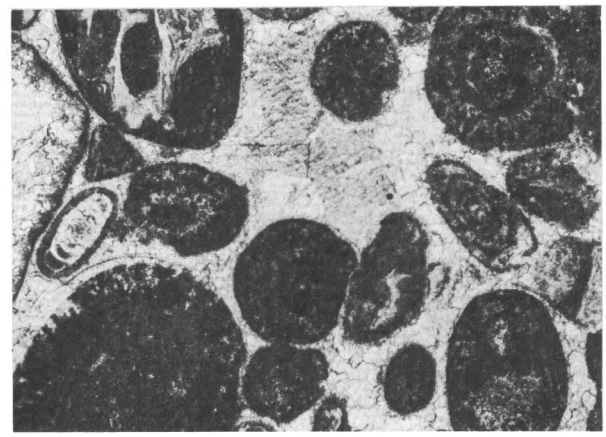


1

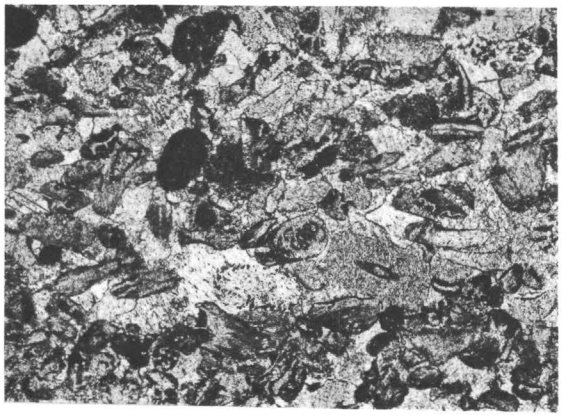


2

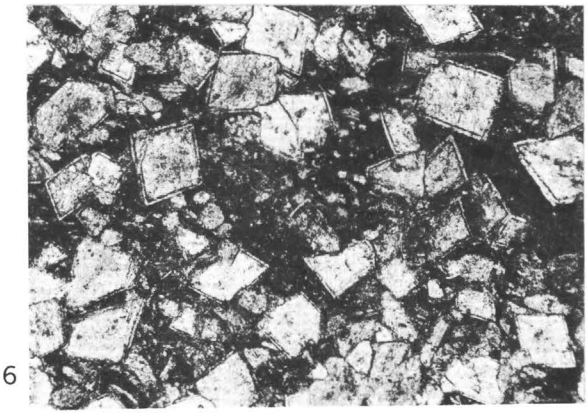




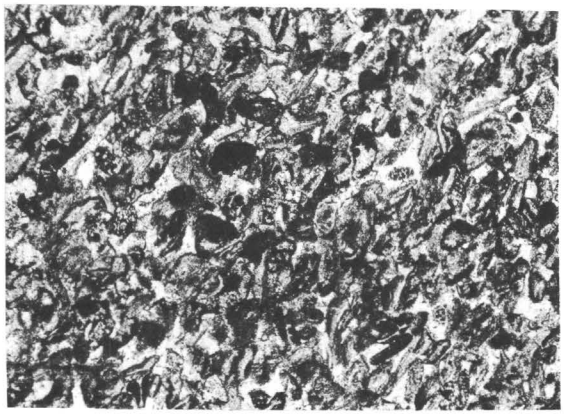
4



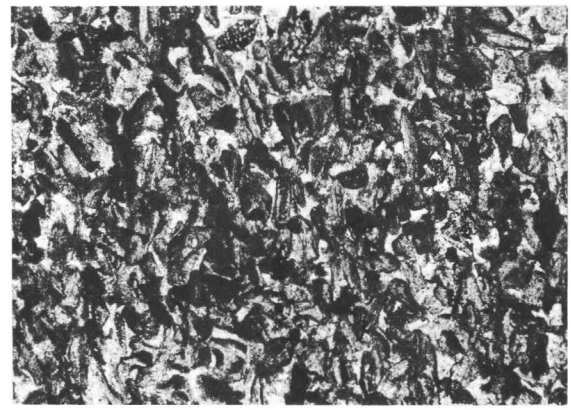
5



6



7



8

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.

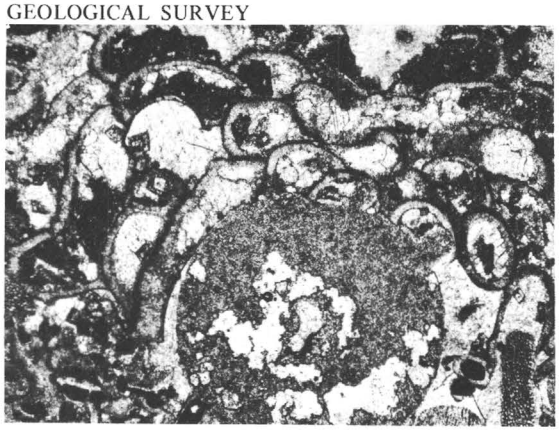
Well-sorted, coarse-grained to very coarse grained coated bryozoan-pelmatozoan-algal-brachiopod grainstone. Gastropods are present. All fragments show signs of reworking and rounding and various degrees of coating. Sparry calcite cement often in continuity with pelmatozoan plates. Foraminifers are restricted to *Globivalvulina* sp. sensu strictu and undeterminable endothyrids. *Stacheia*? *sp.*, *Epistacheoides* sp., and *Asphaltina* sp. are abundant.

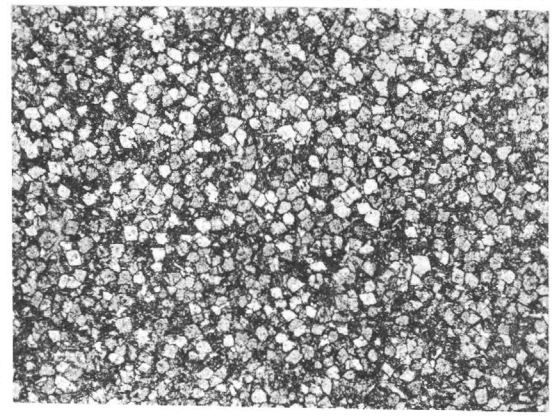
7. USNM 179991, 355 ft below top of section (× 30) Wahoo Limestone, Zone 21, Atoka equivalent.

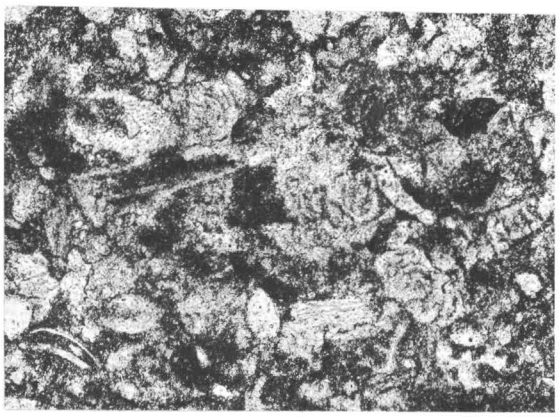
Well-sorted, fine-grained, bryozoan-pelmatozoan-brachiopod-pelletoidal recrystallized packstone. Some cement present. *Neoarchaediscus* sp., *Asteroarchaediscus* sp., *Biseriella* sp., and undeterminable endothyrids are present.

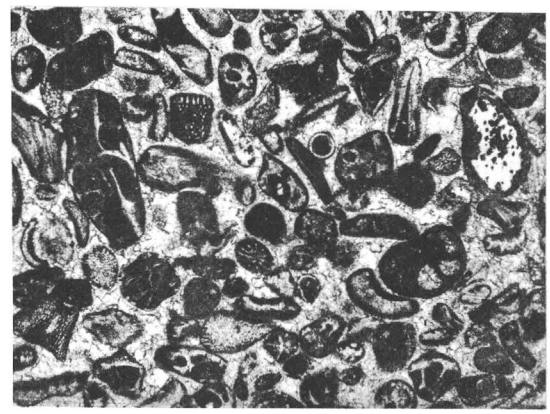
8. Same as figure 7 (× 97).

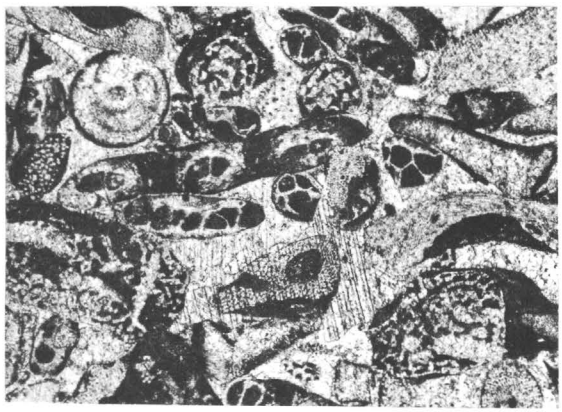
Asteroarchaediscus of the group *A. baschkiricus* (Krestovnikov and Teodorovitch), *Neoarchaediscus* sp., and *Girvanella* sp. are conspicuous.


1

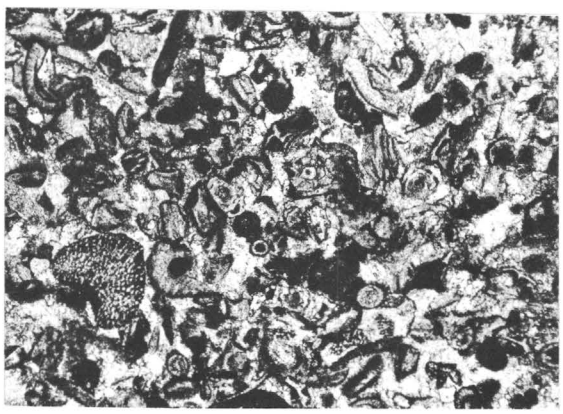

2


3


4


5

6


7

8

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_{inf}, 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.

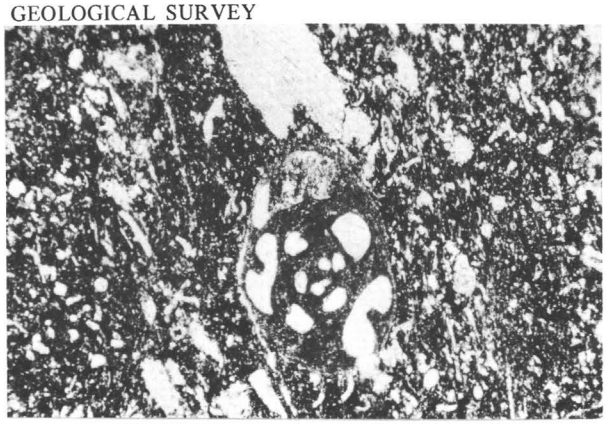
7. USNM 179997, 35 ft below top of section (× 25) Wahoo Limestone, Zone 21, Atoka equivalent.

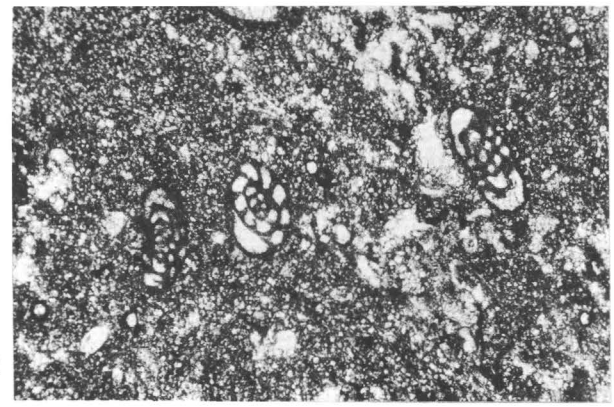
Well-sorted, coarse-grained, proto-oolitic to oolitic grainstone. Mud filled *Eoschubertella* sp., *Pseudostaffella*? sp., *Pseudoendothyra* sp., and *Eostaffella* sp. are present.

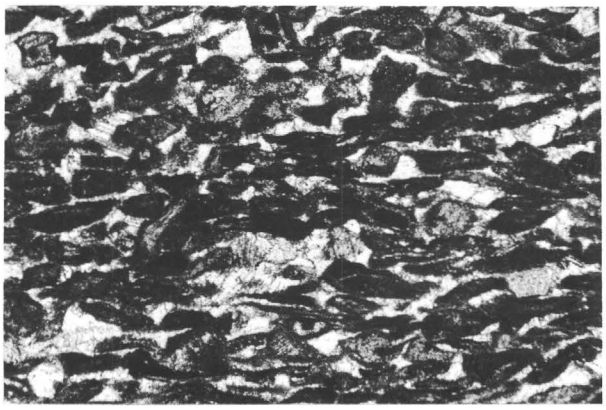
Echooka River section 60E–1 to 72

8. USNM 179998, uppermost top of outcrop (× 25) Wahoo Limestone, Zone 21?, Atoka equivalent.

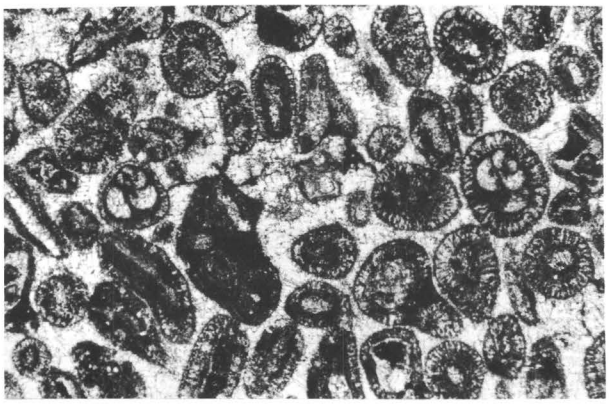
Stressed bryozoan packstone or grainstone? Note the fluid appearance of the bryozoan fronds and the wavy twin lamellae of the sparry calcite "cement."

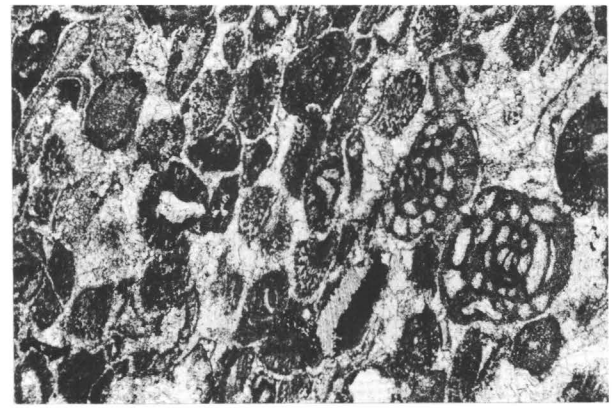

1

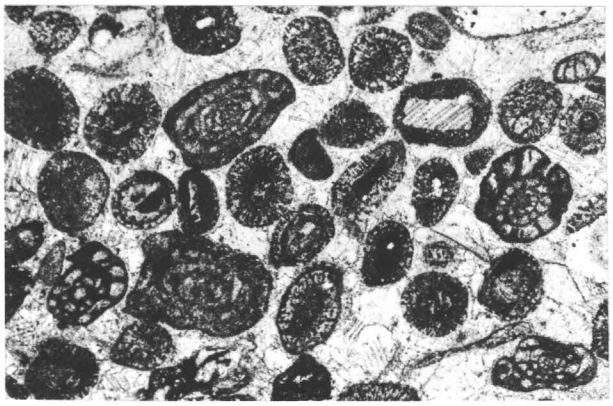

2

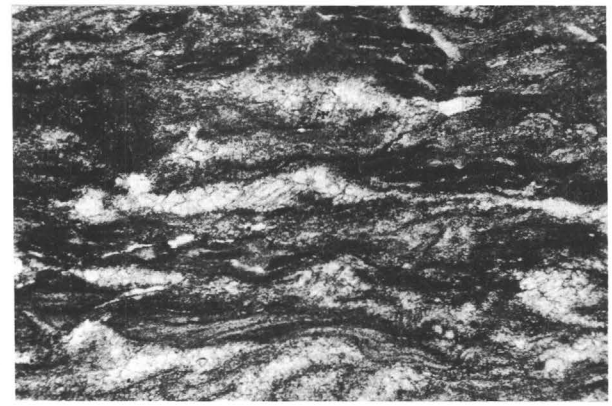

3

4


5


6


7


8

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.

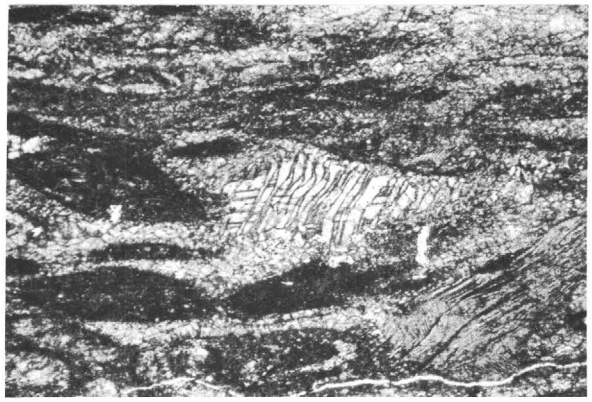
3. USNM 180001, 870 ft below top of outcrop (× 25) Alapah Limestone, undetermined Namurian zone.
Floating euhedral dolomite rhombs, in chert. Dolomite and chert are believed to be penecontemporaneous with the carbonate diagenesis.

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.

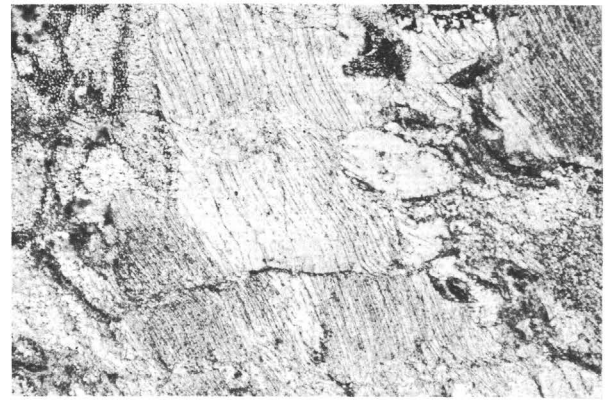
5. USNM 180003, 1,020 ft below top of outcrop (× 25) Alapah Limestone, undetermined Early Namurian zone.
Stressed pelmatozoan packstone. Stress deformation appears to be concentrated mainly in the crinoid ossicles and the matrix has a fluid texture.

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.

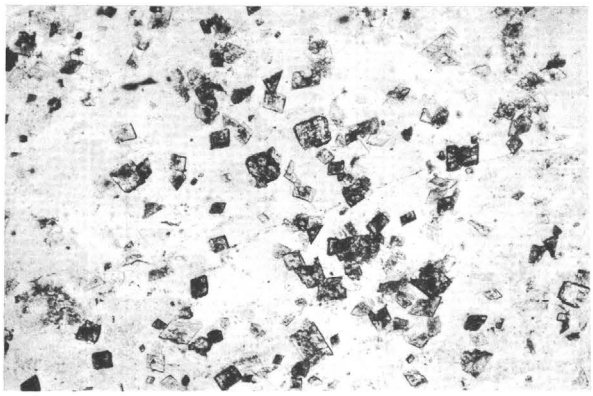
7, 8. USNM 180005, 2,608 ft below top of section (× 25) Alapah Limestone, Zone 14, Late Viséan, St. Louis equivalent.
A calcisphere-rich, poorly sorted, medium-grained, bioclastic packstone. Pelmatozoans are ubiquitous; ostracods, bryozoans, brachiopods are present. Foraminifera are restricted to *Eoendothyranopsis* sp. and *Globoendothyra* sp. Note the excellent preservation of the *Calcisphaera pachysphaerica* (Pronina) wall where the pores are visible.



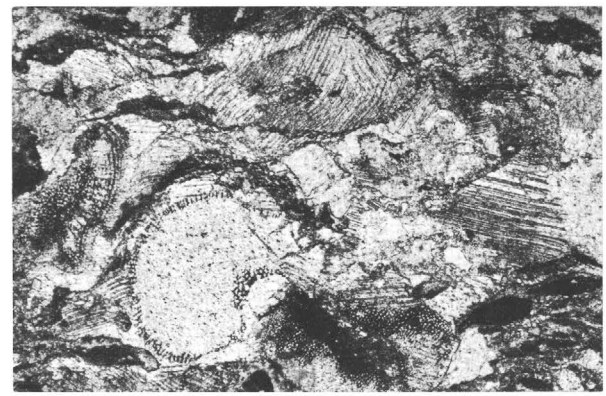
1



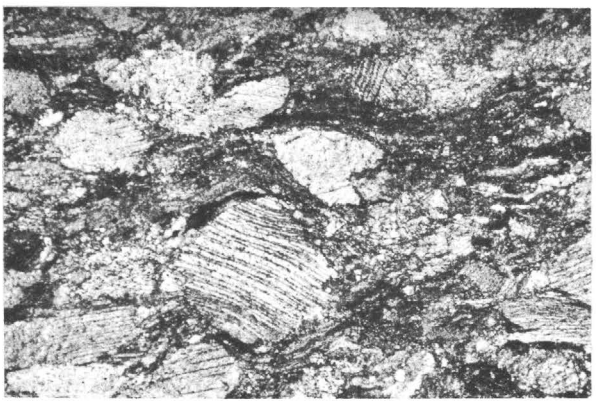
2



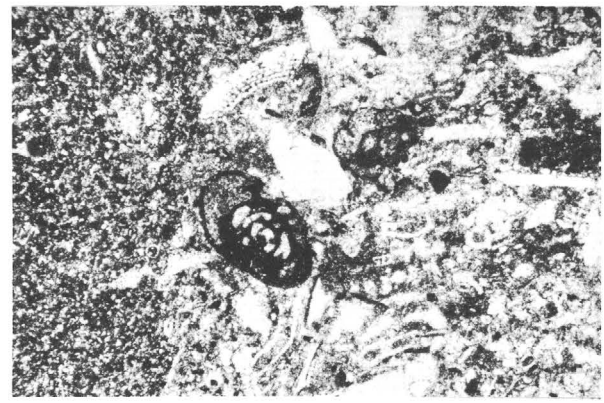
3



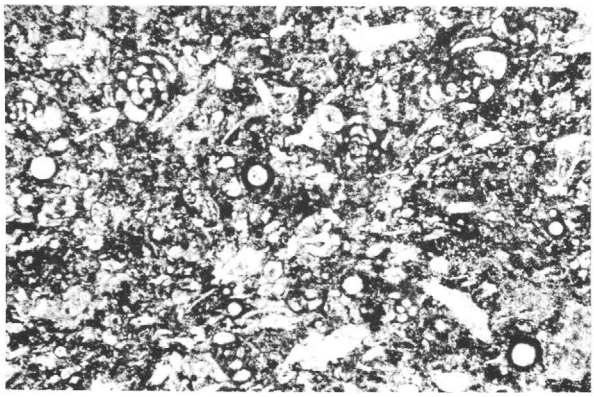
4



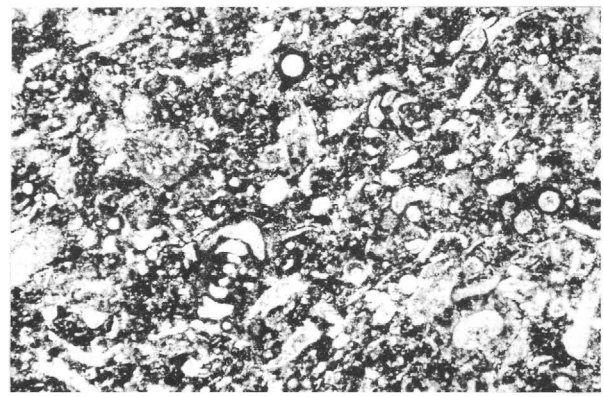
5



6



7



8

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.

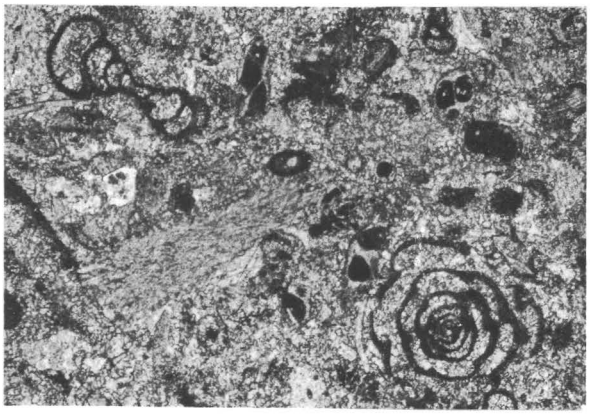
Poorly sorted, medium-grained, pelmatozoan-foraminiferal packstone or grainstone. The complete epitaxial overgrowth on the crinoidal ossicles does not permit the determination of the original pore filling (if any?) which may have been lime mud or sparry calcite. Microfauna is characterized by abundant 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.

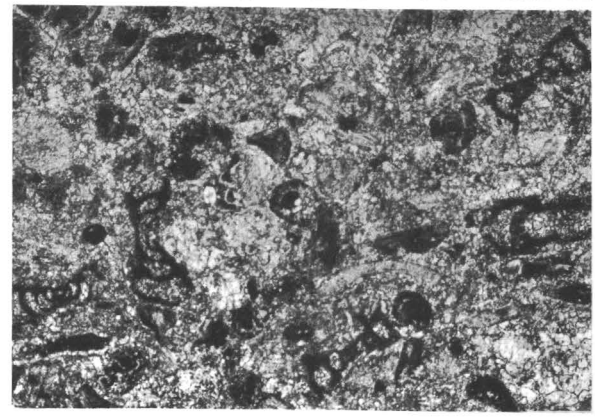
Sponge spiculite.

8. USNM 180009, 2,860 ft below top of section (× 25) Wachsmuth Limestone, Zone 9, latest Tournaisian, Osage equivalent.

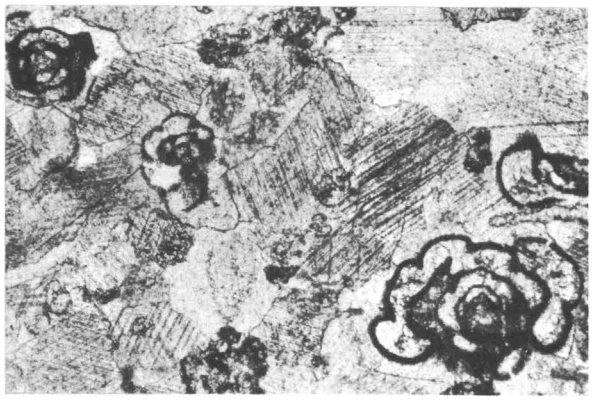
Poorly sorted, medium-grained, pelmatozoan foraminiferal packstone or grainstone? Same remarks as in figures 3 to 6. *Tournayella discoidea* Dain and an oblique section of *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova) are present.



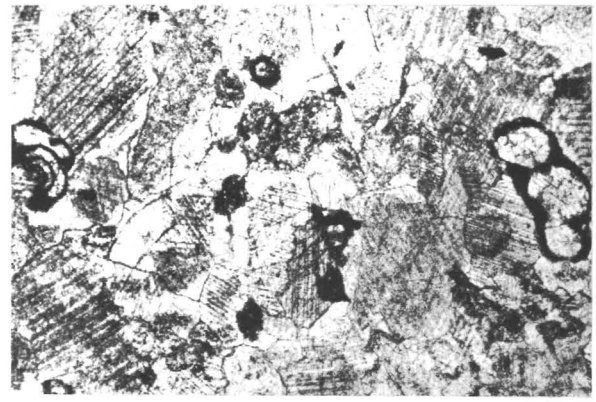
1



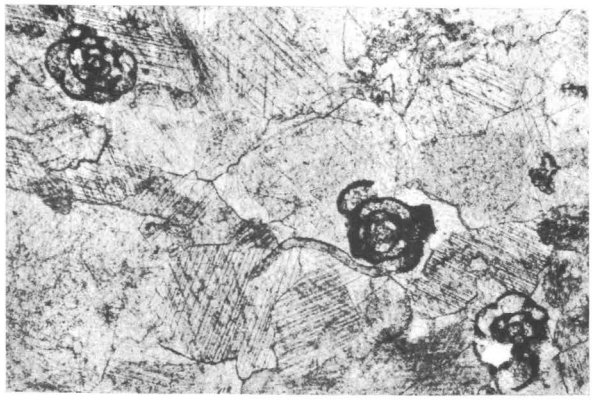
2



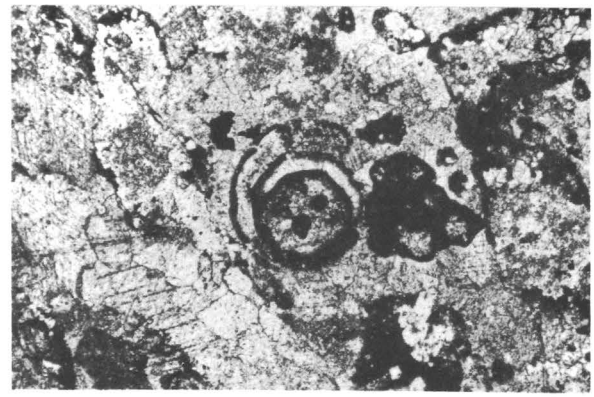
3



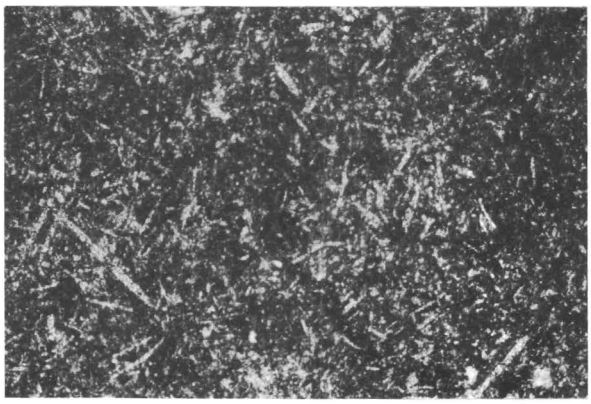
4



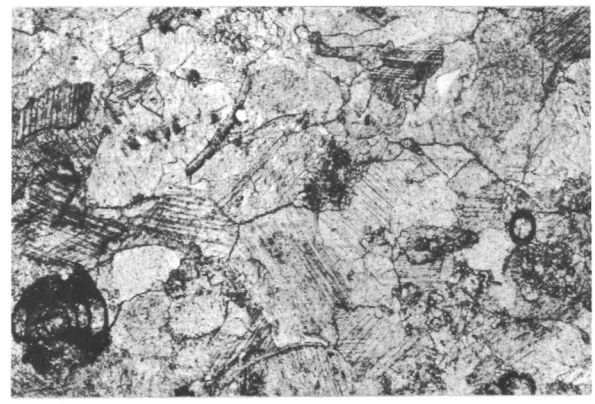
5



6



7



8

ITKILLIK LAKE SECTION 60C-1 TO 72, ENDICOTT MOUNTAINS

PLATE 12

Itkillik Lake section 60C–1 to 72 Endicott Mountains

FIGURE 1. USNM 180010, 2,780 ft below top of section (× 25) Wachsmuth Limestone, Zone 9, latest Tournaisian, Osage equivalent.

In situ accumulation of a crinoidal packstone. Lime mud ghosts are still visible in the sparry calcite. (This facies is termed "Petit granite" in the Tournaisian type region of Belgium.)

2. USNM 180011, 2,625 ft below top of section (× 30) Wachsmuth Limestone, Zones 10–11, Early Viséan? undifferentiated, Salem equivalent or older.

A radiolarian-rich chertified mudstone.

3. USNM 180012, 2,155 ft below top of section (× 30) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

Very poorly sorted, comminuted debris of pelmatozoan and foraminiferal packstone and wackestone. *Eoforschia* of the group *E. moelleri* (Dain) is conspicuous.

4. USNM 180013, 2,125 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

Poorly sorted, medium-grained pelmatozoan-brachiopod-packstone. Bryozoans are scarce.

5. USNM 180014, 2,100 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

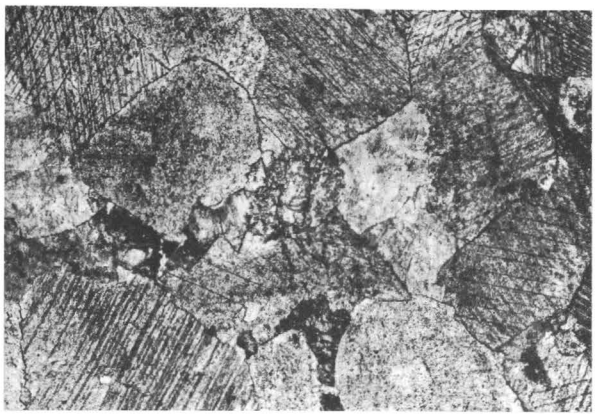
Poorly sorted, medium-grained pelmatozoan-foraminiferal wackestone-packstone. Equitaxial section of *Eoendothyranopsis* sp.

6. USNM 180015, 1,700 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

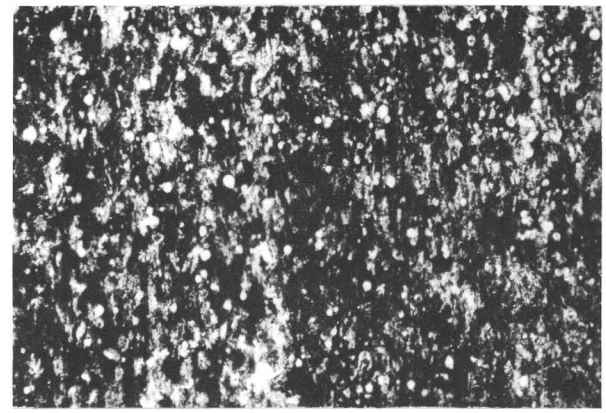
In situ accumulation of a crinoidal packstone (as figure 1).

7, 8. USNM 180016, 1,575 ft below top of section (× 97) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

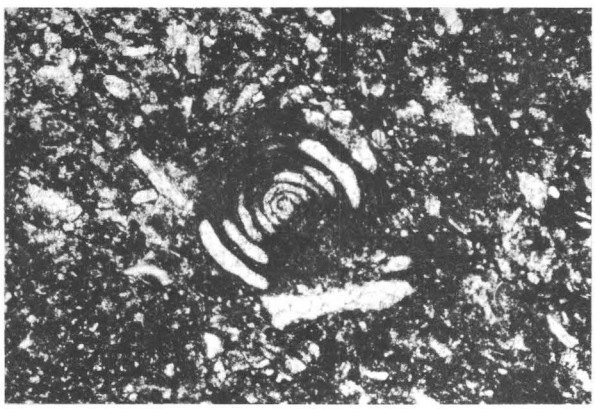
Dolomite rhombs and relict calcite crystals floating in chert. Rhombs are corroded at the dolomite-chert contact, but appear straight at the calcitic ghost-dolomite contact.



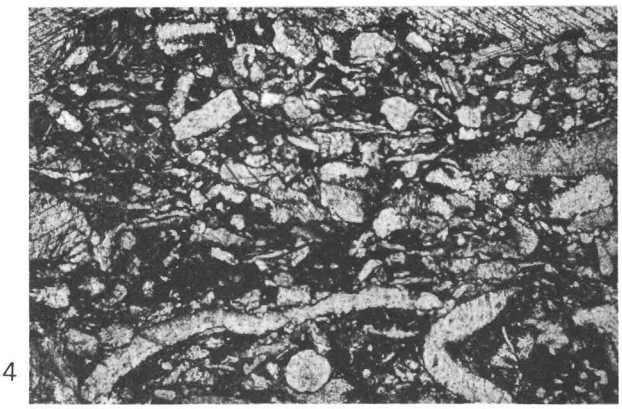
1



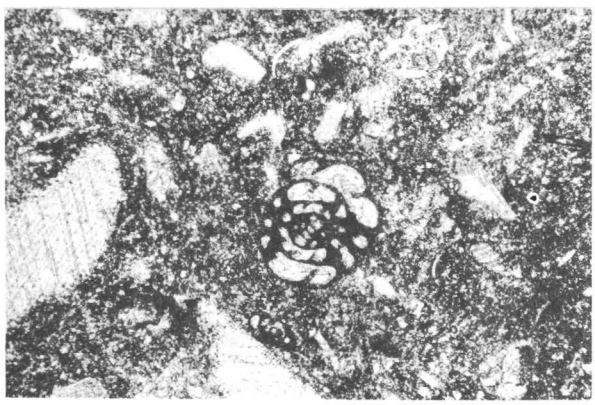
2



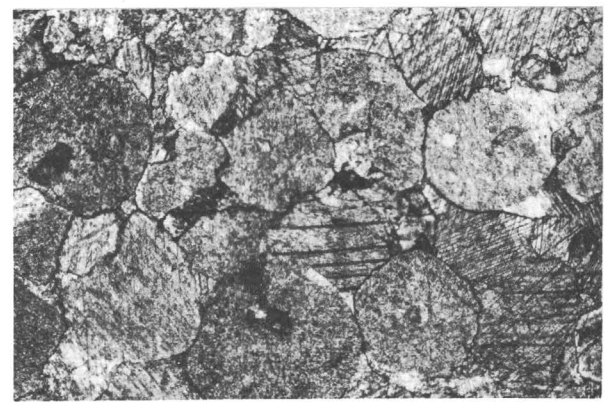
3



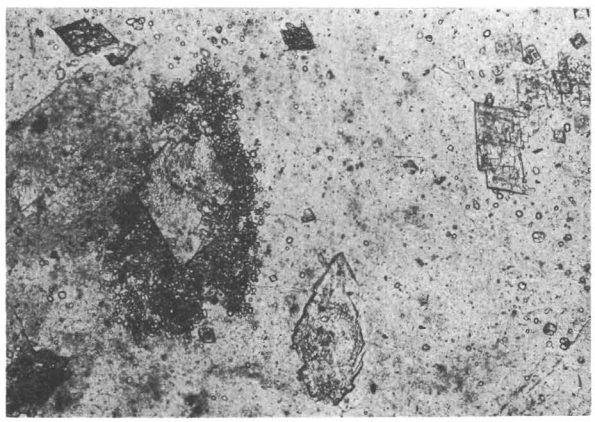
4



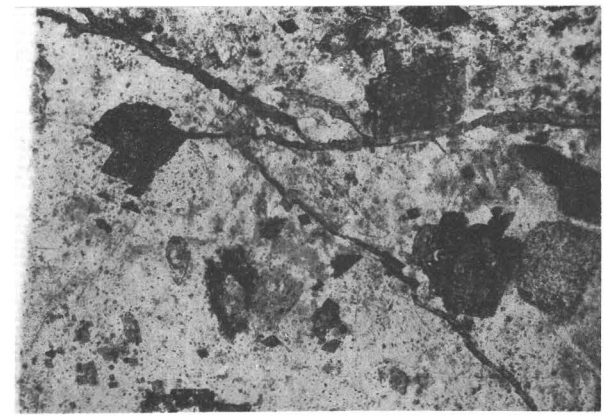
5



6



7



8

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.

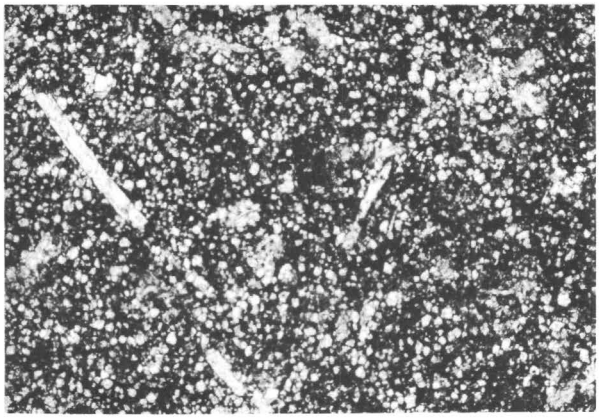
Poorly sorted, medium- to coarse-grained pelmatozoan-bryozoan-brachiopod–foraminifer packstone. Incipient recrystallization of the mud matrix. Rare dolomite rhombs. present. Foraminifera are numerous *Globoendothyra* of the group *G. tomiliensis* (Grozdilova *in* Lebedeva), *Earlandia* of the group *E. 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.

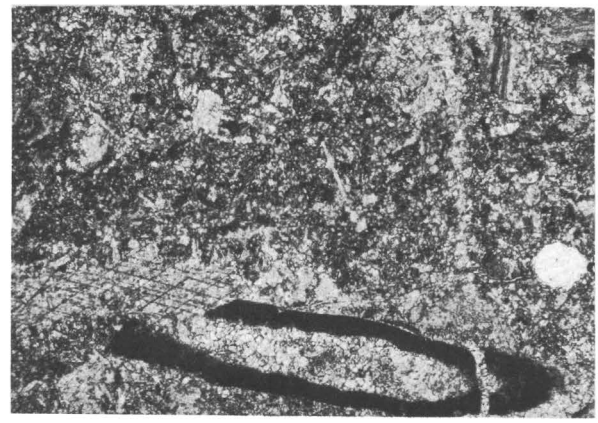
Poorly sorted, medium to coarse, pelmatozoan-bryozoan-foraminifer packstone. An equatorial section of *Eoendothyranopsis* of the group *E. rara* (Grozdilova in Lebedeva), (the "*Endothyra symmetrica*" of Zeller), an oblique view of *Eoendothyranopsis* sp., and an undeterminable endothyrid are present.

8. USNM 180022, 1,040 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

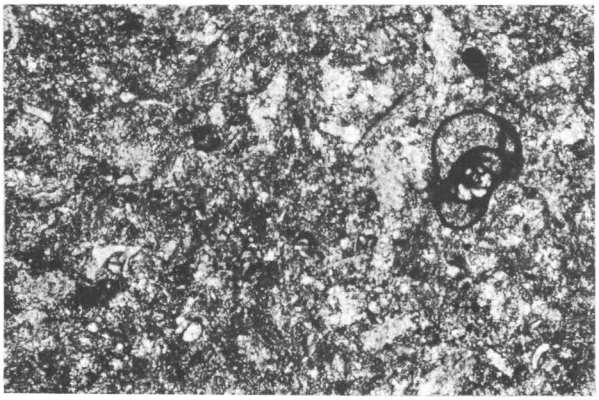
Poorly sorted, medium to coarse, pelmatozoan-bryozoan-foraminiferal packstone. Note the distortion of the foraminifers and the crushing of their chambers; this phenomenon is due to sedimentary compaction of the dark, euxinic, clayey mud matrix. *Globoendothyra* of the group *G. tomiliensis* (Grozdilova *in* Levedeva), *Eoendothyranopsis* sp., and *Endothyra* sp. are present.



1

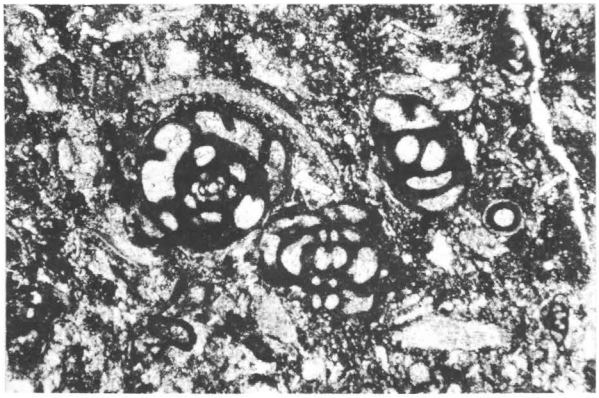


2

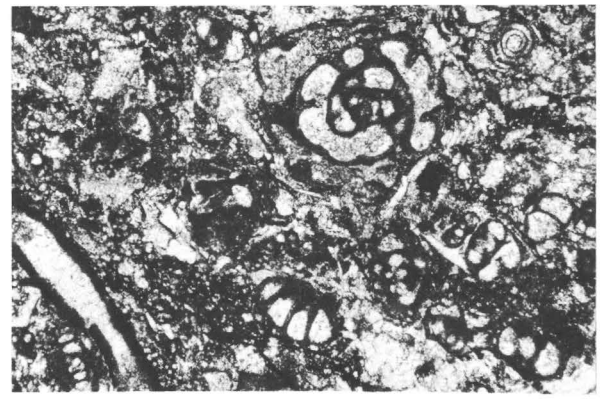


3

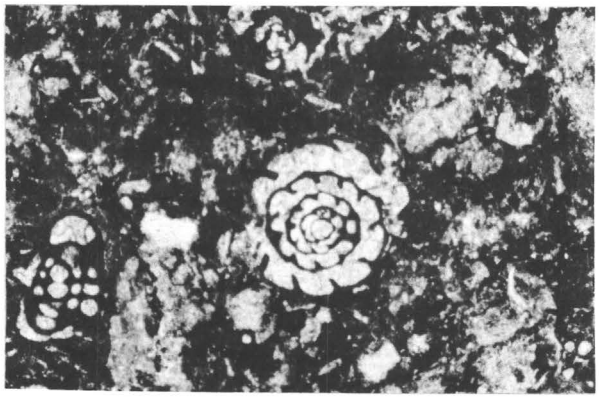
4



5



6



7

8

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* (Grozdilova 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.

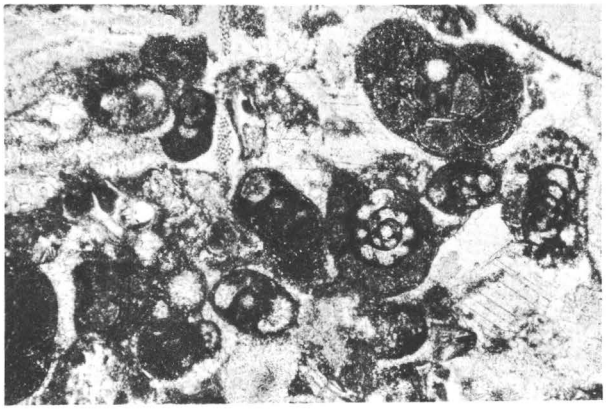
Well-sorted, coarse-grained, bryozoan-pelmatozoan-algal-foraminiferal grainstone. All microfloral (Stacheiinae) and foraminiferal elements (*Globoendothyra* sp., *Earlandia* sp., and *Eoforschia* sp.) are mud filled.

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.

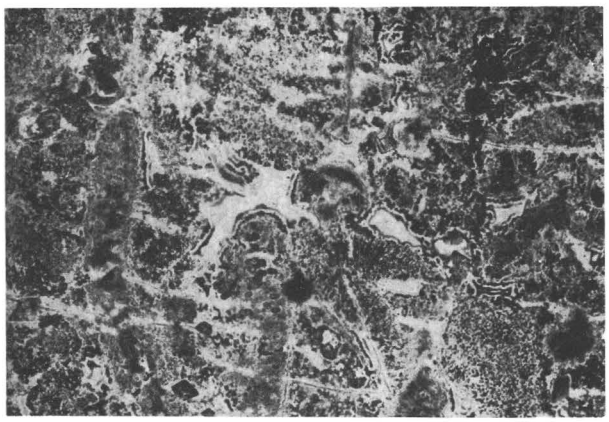
8. USNM 180029, about 840 ft below top of section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

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.

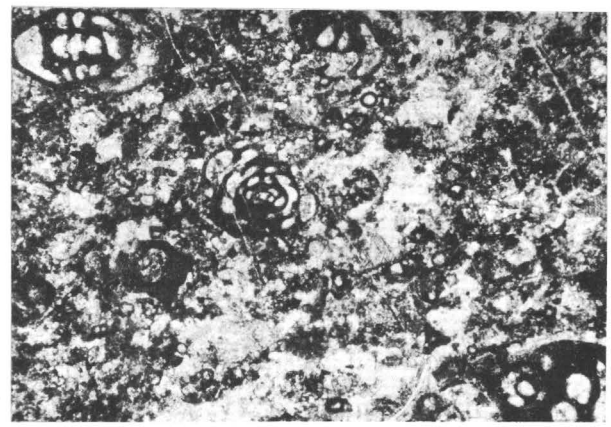


1

2

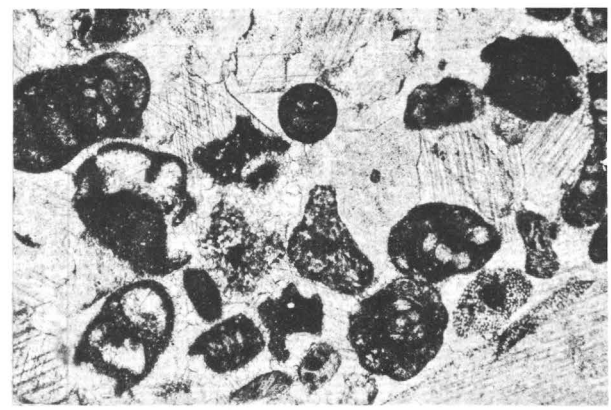


3

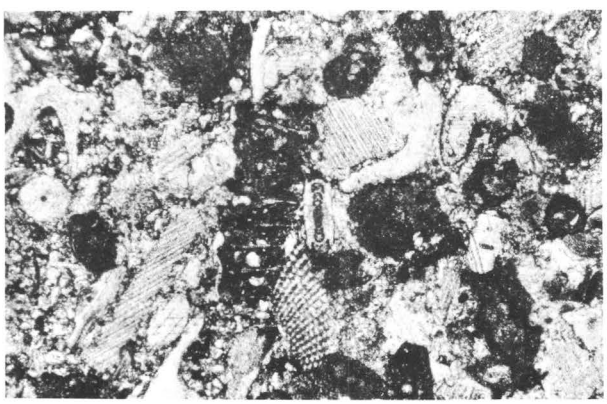


4

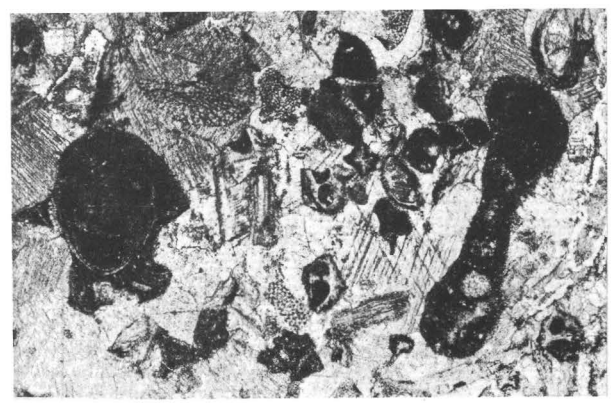
5



6



7



8

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.

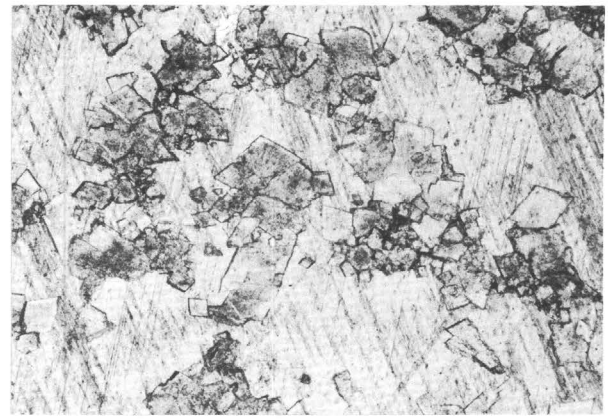
7. USNM 180033, 425 ft below top of section (× 25) Alapah Limestone, Zone, 15?, Late Viséan, Ste. Genevieve(?) equivalent.

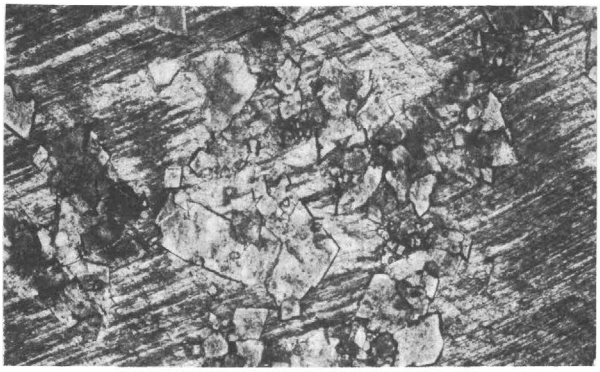
Chertified, fairly sorted, medium-grained pelmatozoan packstone. Crinoid ossicles are still clearly visible. Small euhedral dolomite rhombs.

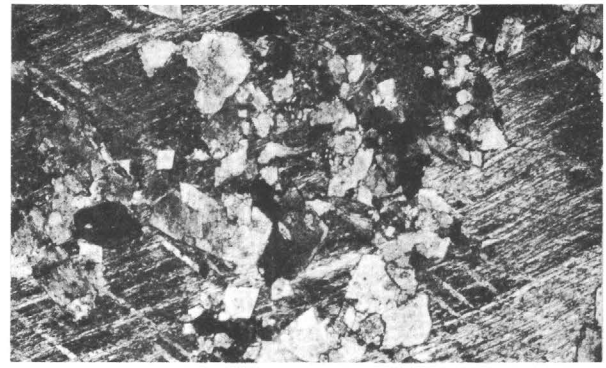
8. USNM 180034, 410 ft below top of section (× 25) Alapah Limestone, Zone 16, Late Viséan, lower Chester equivalent.

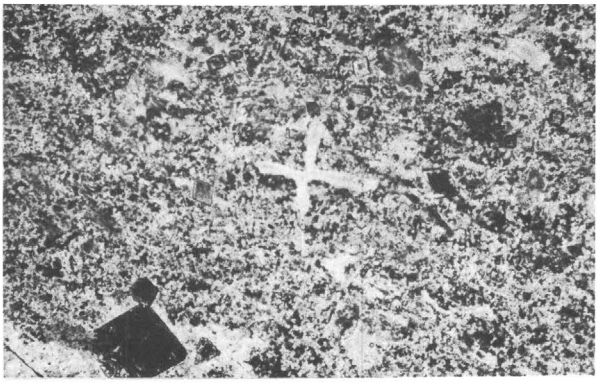
Poorly sorted, medium- to coarse-grained, pelmatozoan-bryozoan packstone. Note the fine bryozoan hash, the stylolitic band, and the stylolitic outline of the interpenetrating debris.

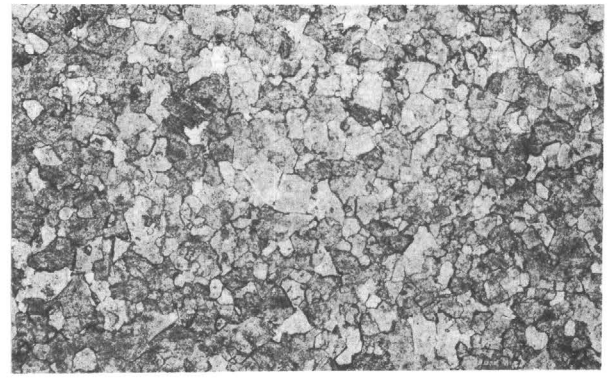
1

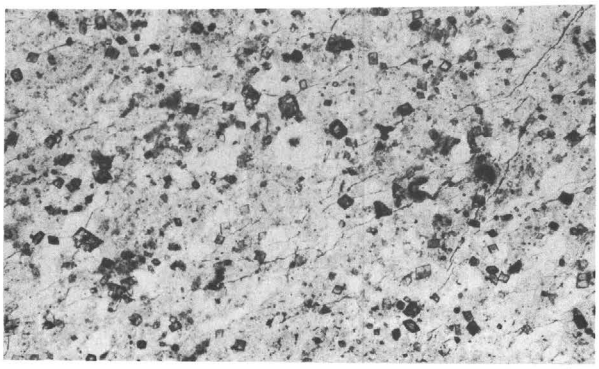

2

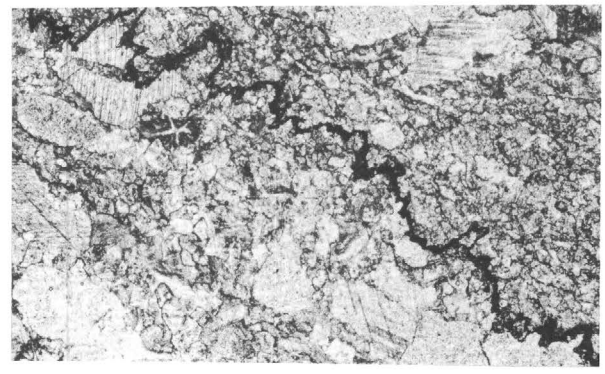

3


4


5


6


7


8

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.

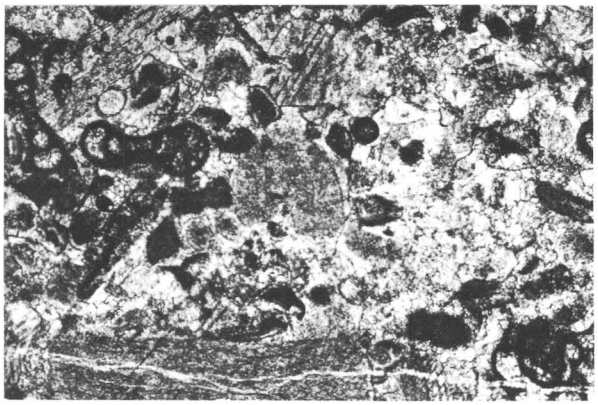
Dolomite, coarse-grained, interlocking crystals. Probably formed from a pelmatozoan packstone or grainstone.

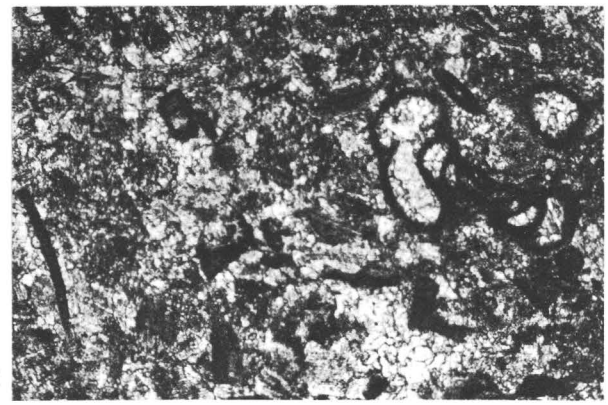
7. USNM 180038, 1,883 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

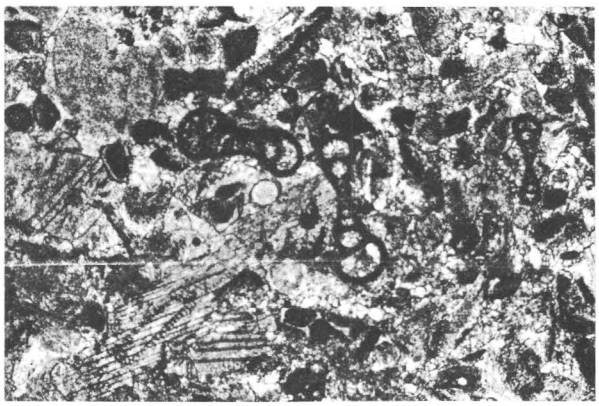
Mostly in situ pelmatozoan-algal grainstone. Silicification and ferruginous coating of the *Stacheia*? *skimoensis* Mamet and Rudloff wall resulted in excellent preservation of the cell's morphology. (See also pl. 37, fig. 9.)

8. USNM 180039, 1,280 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

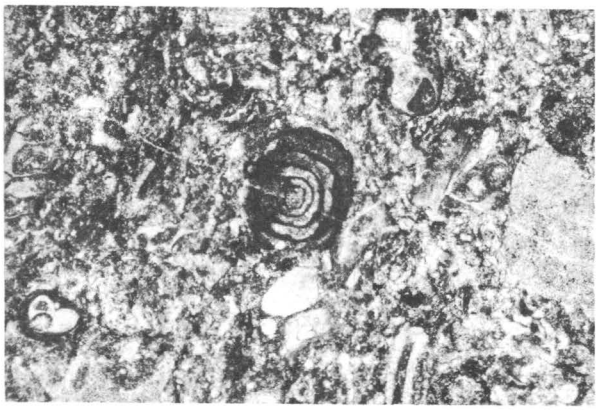
A coarse-grained, in situ pelmatozoan-bryozoan grainstone. Epitaxial rim cement of the crinoid fragments is well developed.

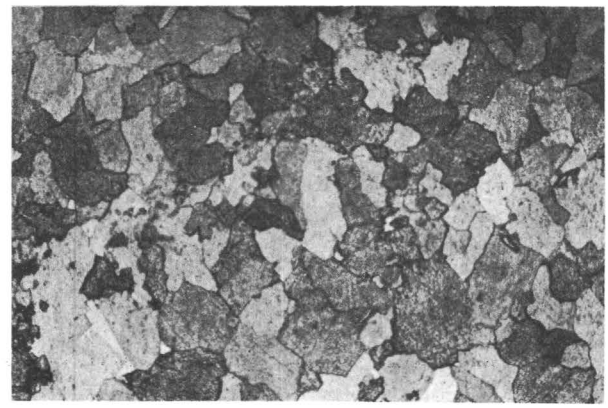

1

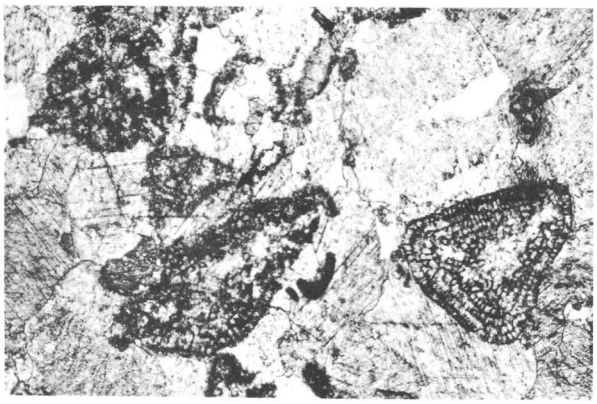

2

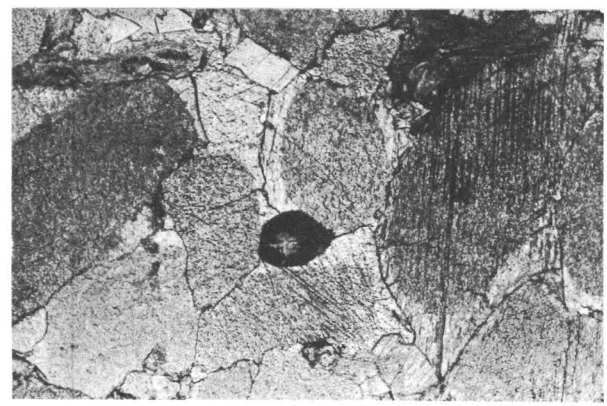

3

4


5


6


7


8

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.

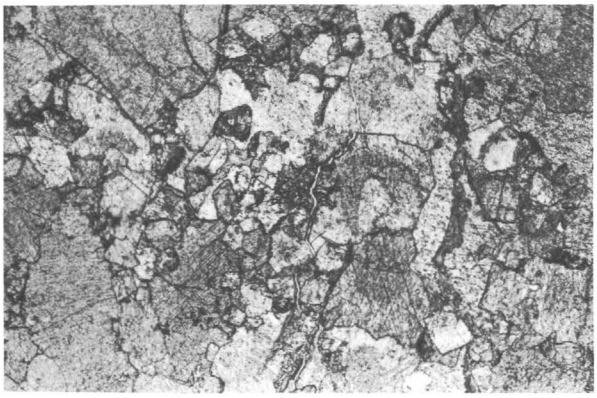
Medium-sorted, coarse-grained, foraminiferal-lump bryozoan-pelmatozoan packstone-grainstone. Recrystallized matrix and cement are both present. All elements have been abraded and rounded, but not coated. Note the very uncommon chertified mud filling of the foraminifers. The upper left *Globoendothyra* 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).

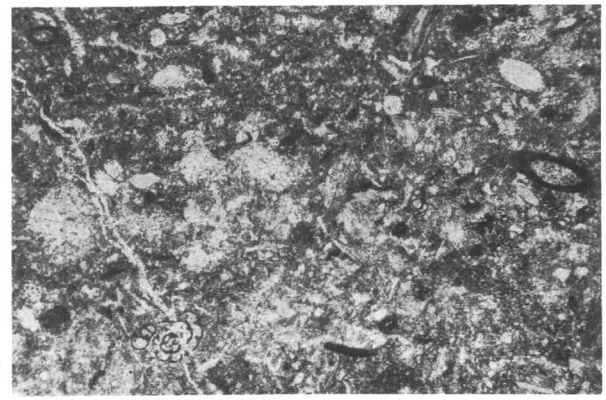
6. USNM 180042, 851 ft below top of section (× 119) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

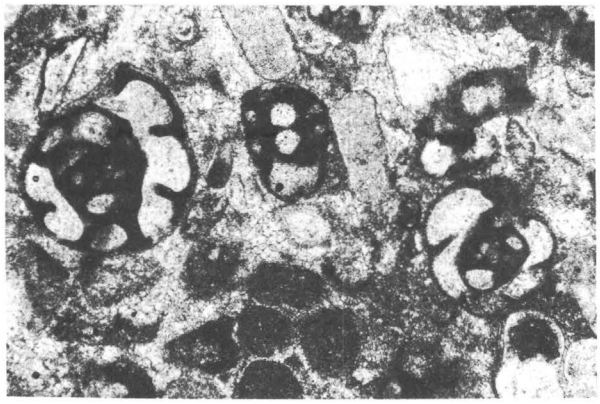
Microstructure of a silicified pelmatozoan fragment. Chertification preserves the original framework. Pelmatozoan plates are in optical continuity; this characteristic is not due to the growth of one single crystal but by epitaxial filling of voids within a calcite framework. Weathering of this filling 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.

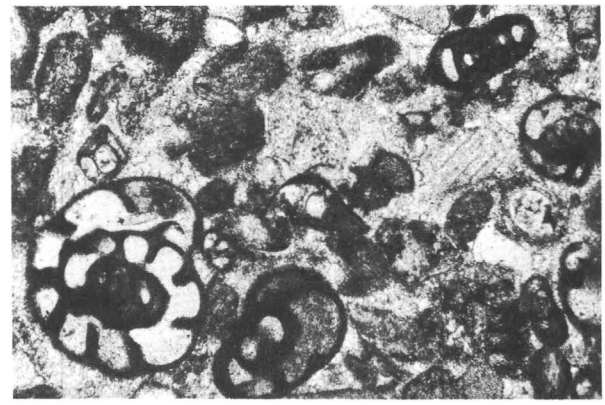
7, 8. USNM 180043, 730 ft below top of section, (× 25) Alapah Limestone, top of Zone 13, Middle Viséan, St. Louis equivalent.

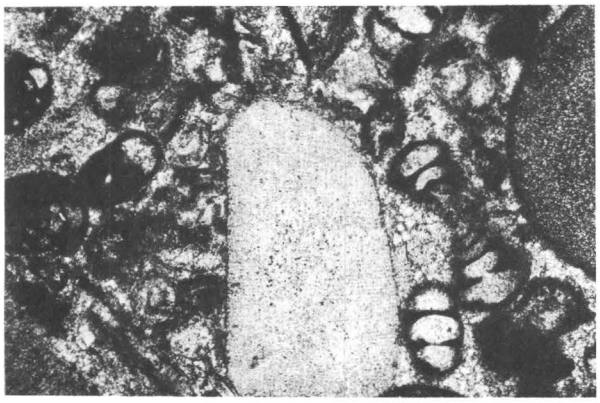
Poorly sorted, coarse-grained, pelmatozoan-foraminiferal recrystallized packstone-grainstone. Recrystallized lime mud matrix and sparry cement are present. Fragments of bryozoans and brachiopods are present. *Endothyranopsis* sp., *Eoendothyranopsis* of the group *E. ermakiensis* (Grozdilova *in* Lebedeva), *Globoendothyra* sp., *Paracaligelloides*? sp., and *Stacheoides tenuis* Petryk and Mamet are present.

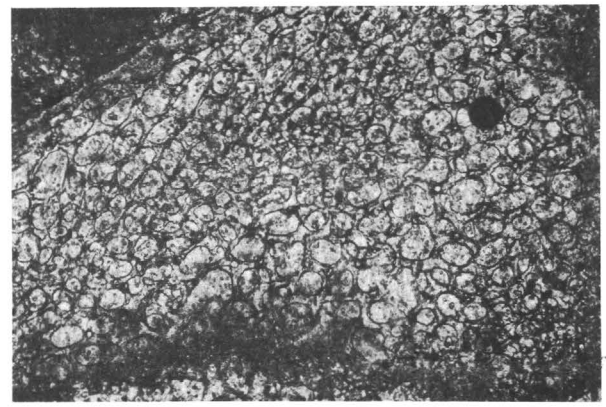

1

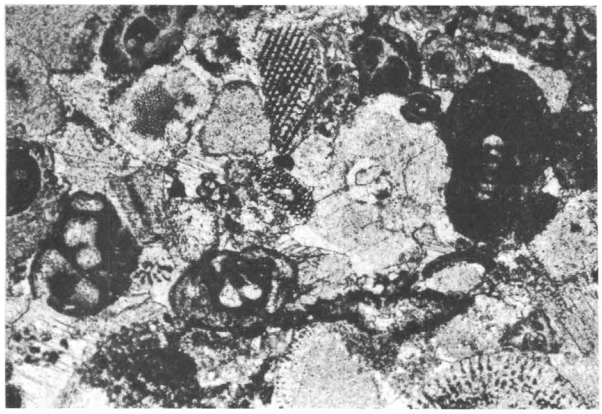

2

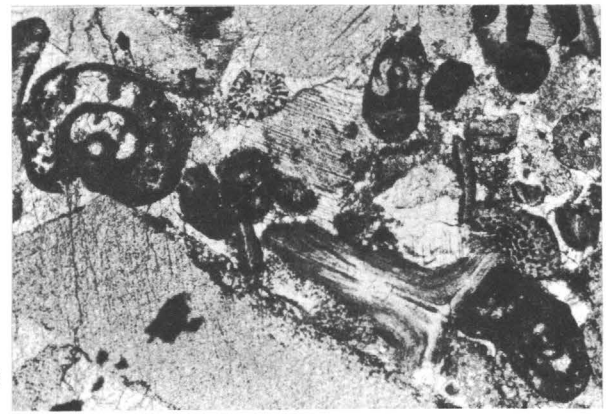

3


4


5


6


7


8

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.

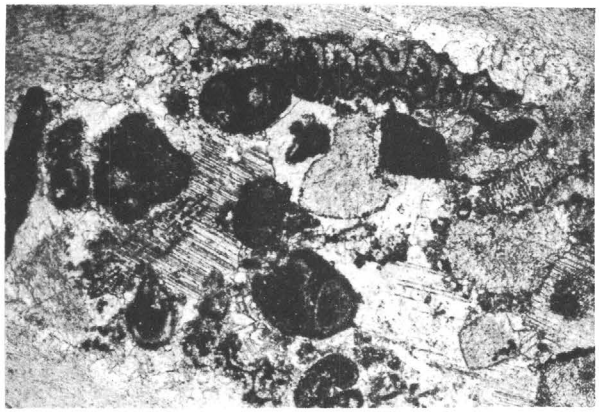
Poorly sorted, coarse-grained, bryozoan-pelmatozoan-foraminiferal recrystallized packstone. Algal coatings. Bryozoans are present. Mud-filled foraminifers are *Eoendothyranopsis* sp. and *Globoendothyra* sp.

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").

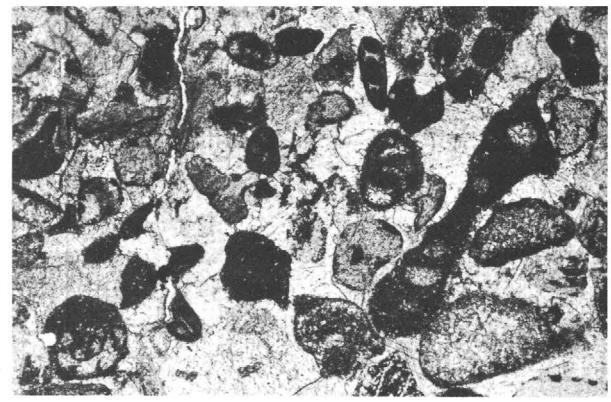
8. USNM 180046, 10 ft below top of section (× 25) Alapah Limestone, Zone 16_{inf}, Late Viséan, lower Chester equivalent.

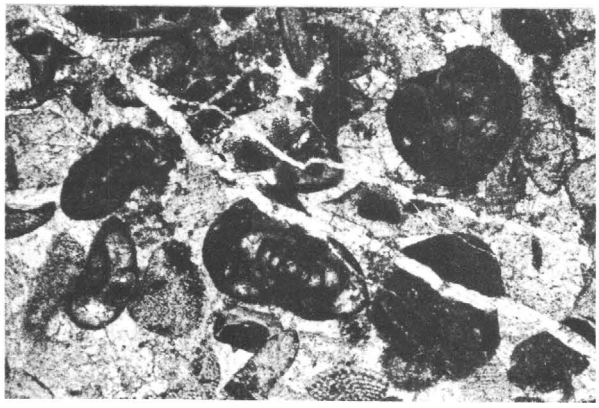
Sponge-spiculite packstone. Undetermined spherical taxa filled with chert and phosphate.

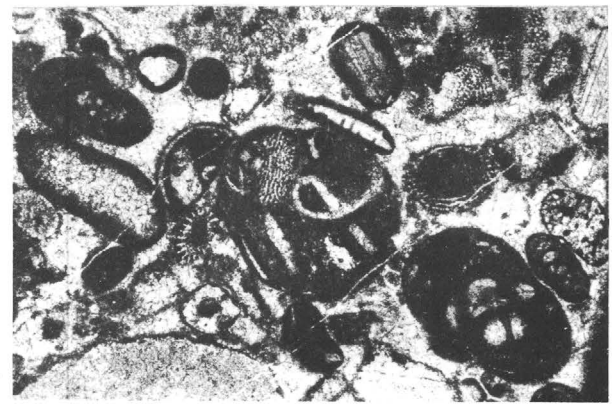

1

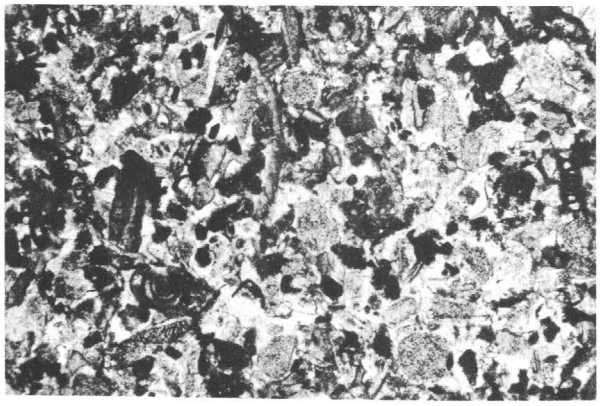
2

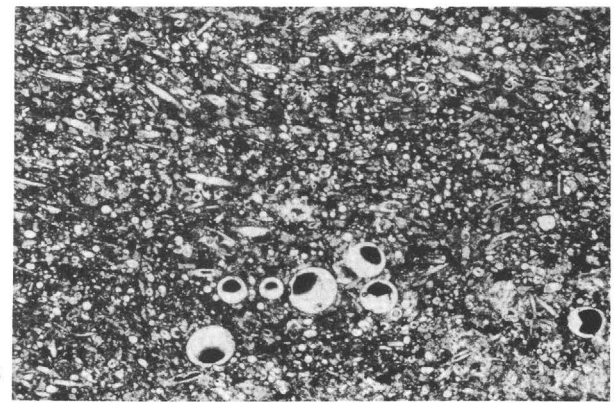
3


4


5


6


7


8

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.

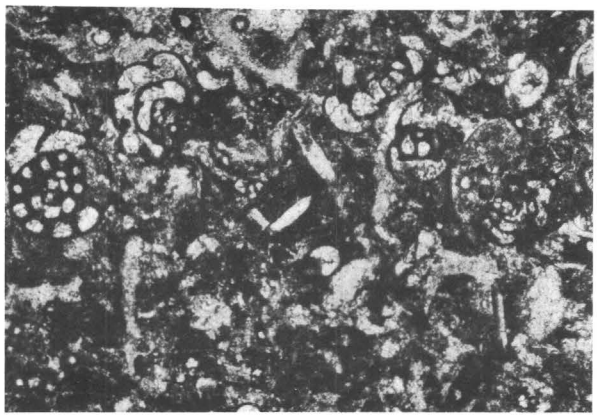
6. USNM 18050, top of the section (× 25) Alapah Limestone, undetermined late Viséan zone, undetermined upper Meramec equivalent.

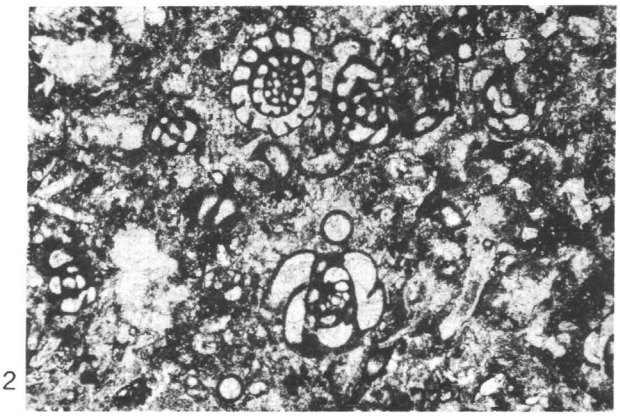
Dolomitized chert. Euhedral dolomite rhombs. Original texture of the rock is completely obliterated.

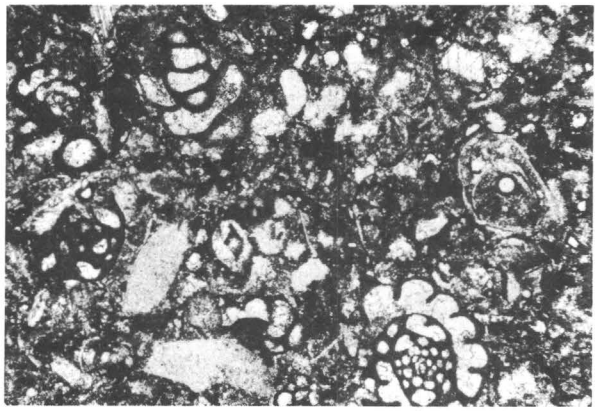
Skimo Creek section W–138 to 200, Endicott Mountains

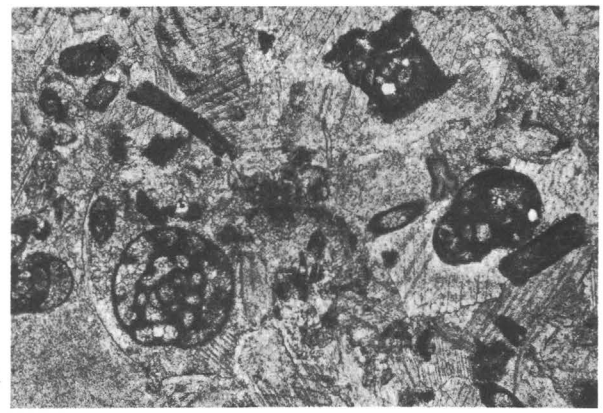
7, 8. Univ. Montréal 205/2 and 205/21, 3,130 ft below top of section (× 30) Wachsmuth interfingering in Kayak Shale, Zone 8?, Late Tournaisian?, middle Osage equivalent? or older?

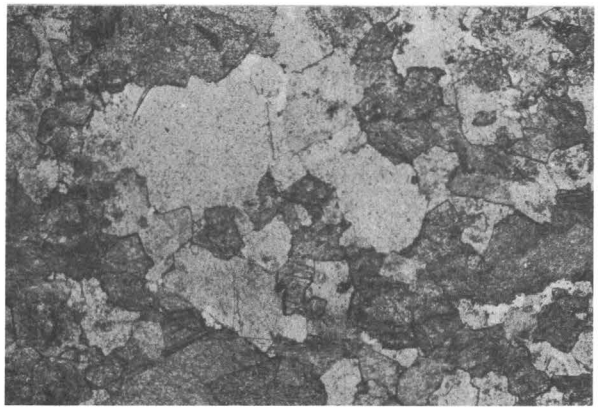
Poorly sorted, coarse-grained, pelmatozoan-ostracod-brachiopod recrystallized packstone. Angular mud lumps are present. Foraminifera include an uncoiled *Rectoseptaglomospiranella* sp., two sections of *Tournayella*, *Earlandia* of the group *E. elegans* (Rauzer-Chernoussova), *Earlandia* of the group *E. clavatula* (Howchin), and *Parathurammina* sp.

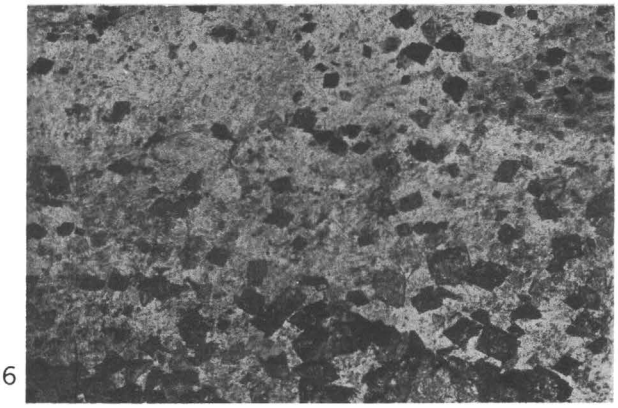

1

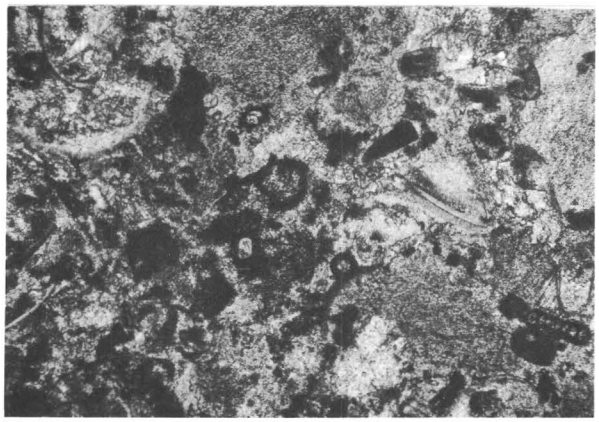

2

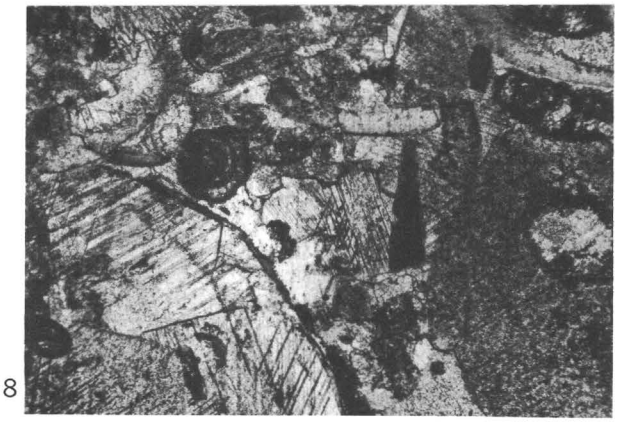

3


4


5


6


7


8

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.

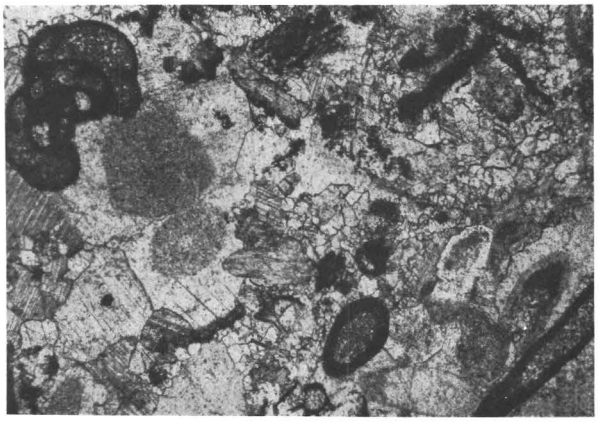
Poorly sorted, pelmatozoan-foraminiferal wackestone. Some chertification is restricted to the pelmatozoan ossicles. A large *"Septatournayella" henbesti* Skipp, Holcomb, and Gutschick is present.

4, 5. USNM 180052, 2,570 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

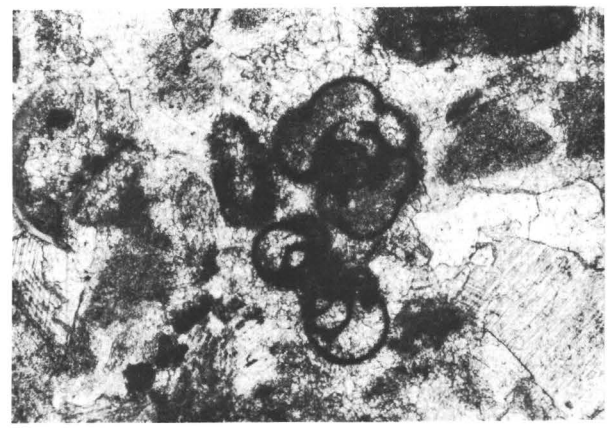
Poorly sorted, pelmatozoan-foraminiferal packstone. Ostracods are present. Foraminifera are *Eoendothyranopsis* of the group *E. spiroides* (Zeller), *Eoendothyranopsis hinduensis* (Skipp), *Earlandia* of the group *E. vulgaris* (Rauzer-Chernoussova and Reitlinger), and an undetermined endothyrid.

6–8. USNM 180053, 2,530 ft below top of section (× 25) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.

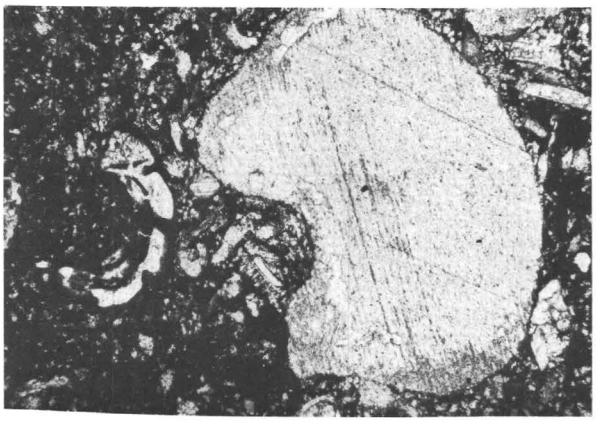
Poorly sorted, foraminiferal-pelmatozoan recrystallized packstone. Chonetid brachiopods, ostracods, and echinoid spines are also abundant. Foraminifera include *Eoendothyranopsis* of the group *E. spiroides* (Zeller), *Dainella anivikensis* n. sp. Mamet, *Endothyra* sp., *Planoendothyra rotayi* (Lebedeva), and *Earlandia* sp.



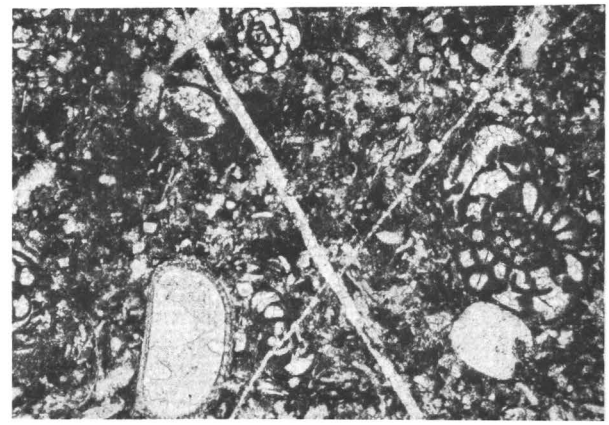
1



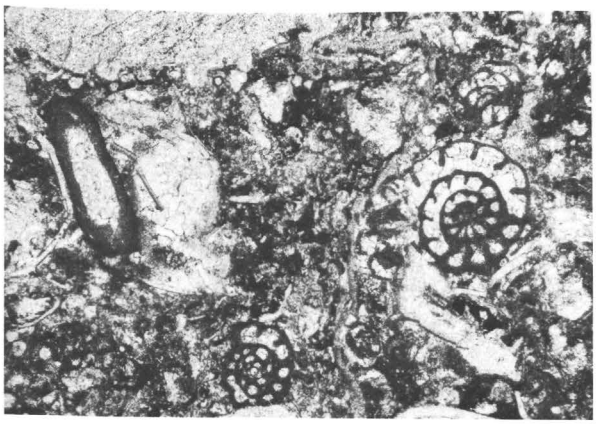
2



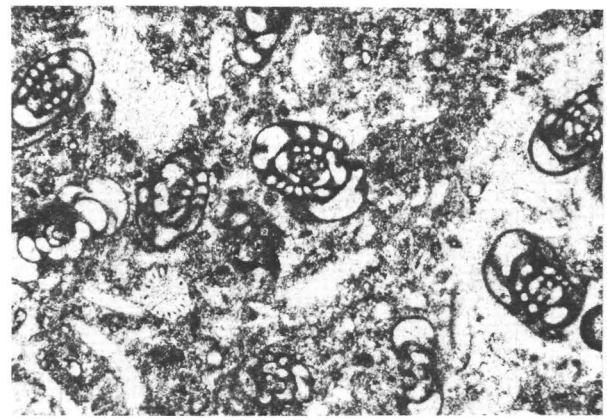
3



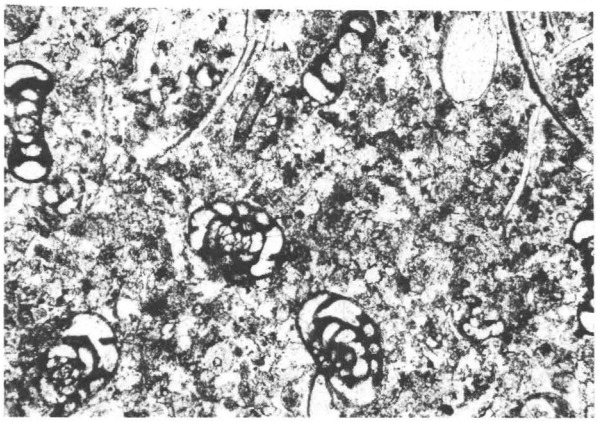
4



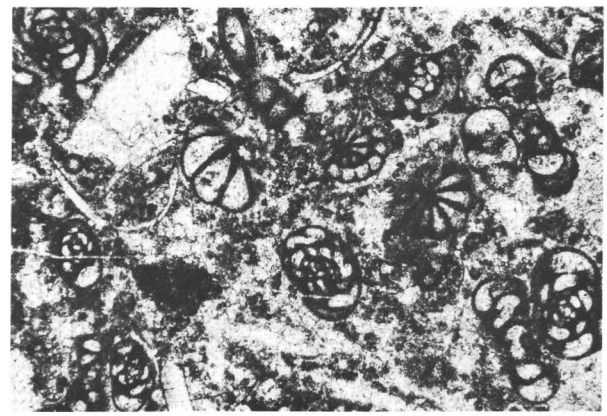
5



6



7



8

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.

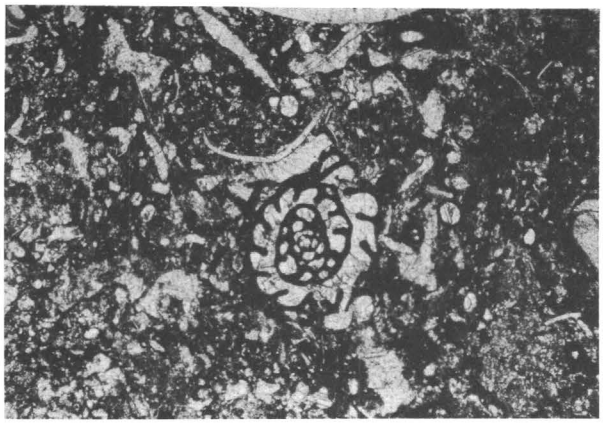
Poorly sorted, pelmatozoan-foraminiferal packstone. *Endothyranella* sp., *Parathurammina* sp., and a high equatorial section of *Globoendothyra* of the group *G. baileyi* (Hall), and an undeterminable endothyrid are present.

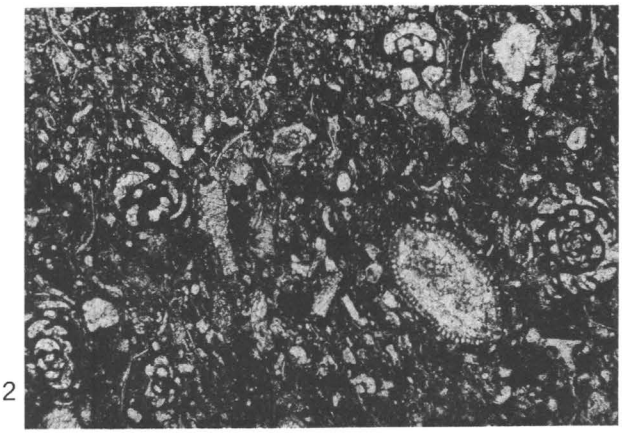
5–7. USNM 180055, 2,060 ft below top of section (× 25) Wachsmuth Limestone, boundary of Zones 12 and 13, Middle Viséan, Salem-St. Louis boundary equivalent.

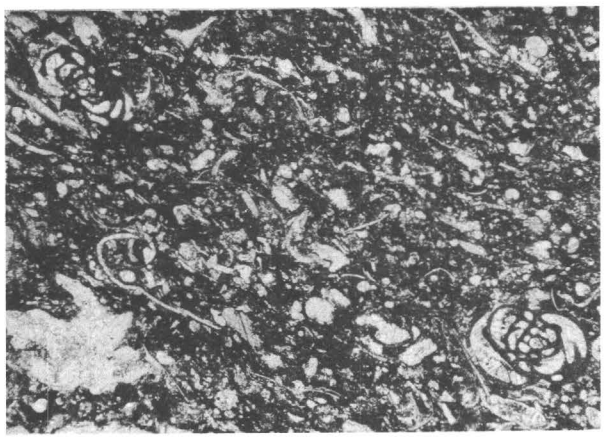
Poorly sorted, coarse-grained, pelmatozoan-brachiopod-foraminiferal recrystallized packstone. Ostracods are present. Foraminifera are *Eoendothyranopsis* of the group *E. rara* (Grozdilova *in* Lebedeva), *E. hinduensis* (Skipp), *Globoendothyra* sp., *Endothyra* sp., *Planoendothyra rotayi* (Lebedeva), and *Parathurammina* sp.

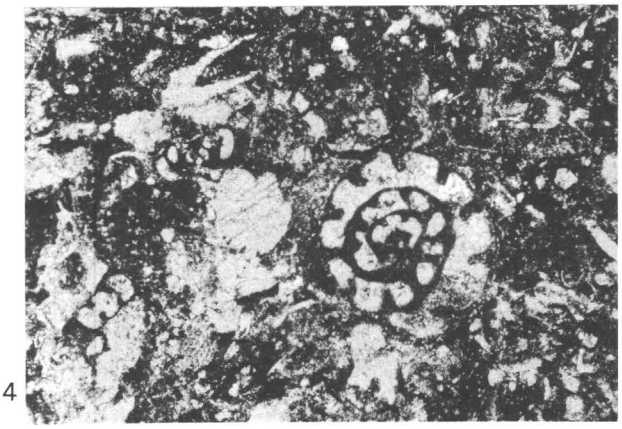
8. USNM 180056, 1,960 ft below top of section (× 25); Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

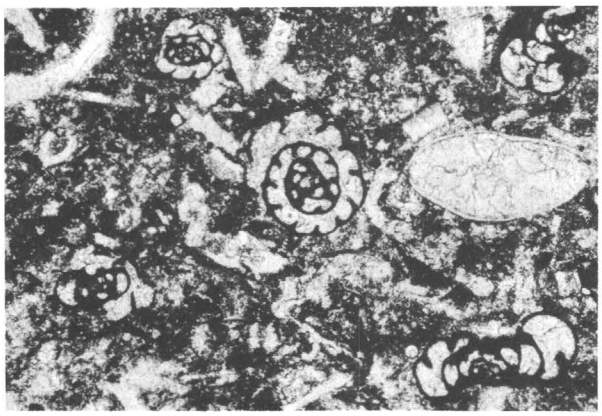
Poorly sorted, pelmatozoan-brachiopod-foraminiferal packstone. Note the crushing of the foraminifers due to compaction of the mud matrix during lithification. Foraminifera are *Skippella redwallensis* (Skipp *in* McKee and Gutschick), *Earlandia* sp., *Globoendothyra* sp., and crushed indeterminable endothyrids.

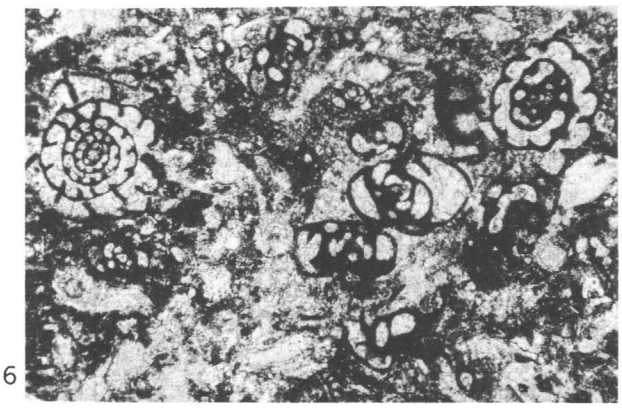

1

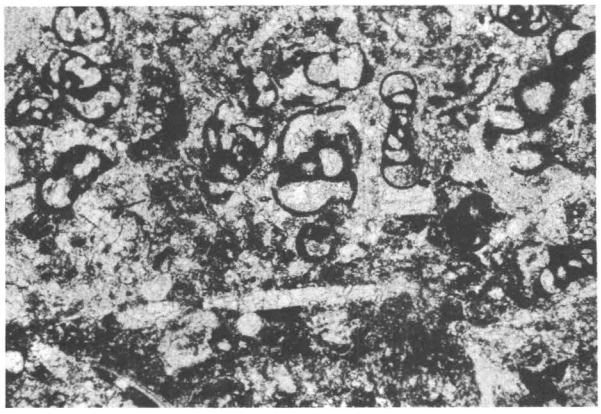

2

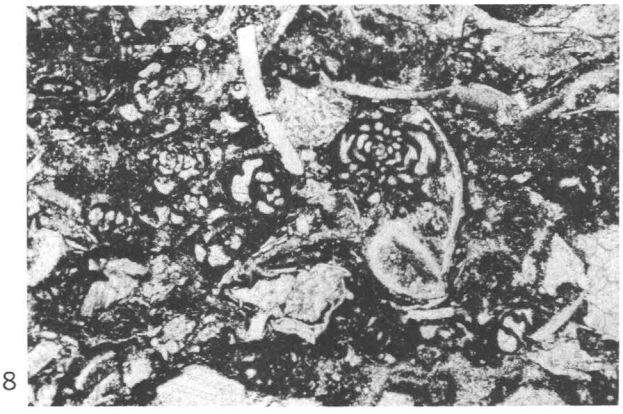

3


4


5


6


7


8

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.

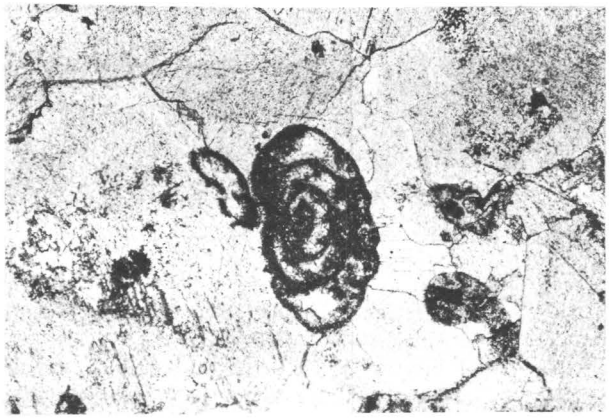
Medium-sorted, medium-grained pelmatozoan glauconitic packstone. Fresh, deep green glauconite represents 25 percent of the debris. A conodont is conspicuous in lower left center.

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.

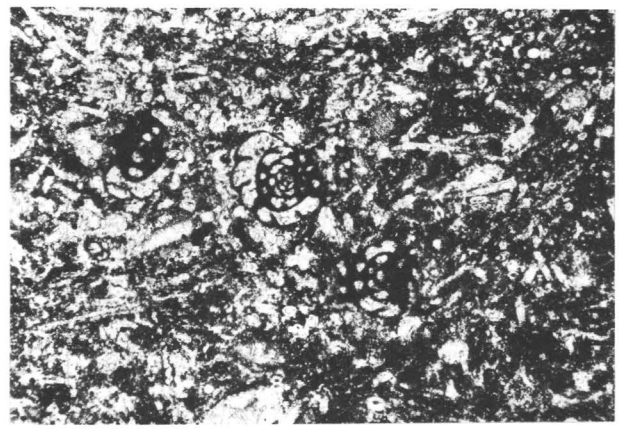
Poorly sorted, coarse-grained pelmatozoan-algal-proto-oolitic grainstone. Calcispherids are present. Numerous sections of *Brunsia* sp. are present associated with *Stacheia*? sp., and *Priscella* of the group *P. prisca* (Rauzer-Chernoussova and Reitlinger).

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.

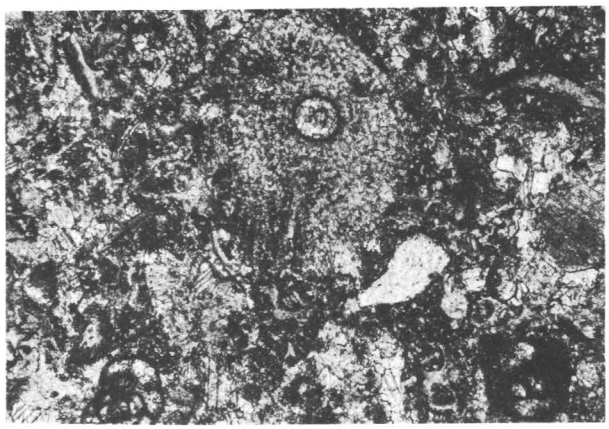
Medium-sorted, medium-grained, pelmatozoan-lump proto-oolitic grainstone. Present are *Brunsia* sp. and *Pseudotaxis* of the group *P. eominima* (Rauzer-Chernoussova). Pseudofibrous appearance of this *Pseudotaxis* is a diagenetic feature.



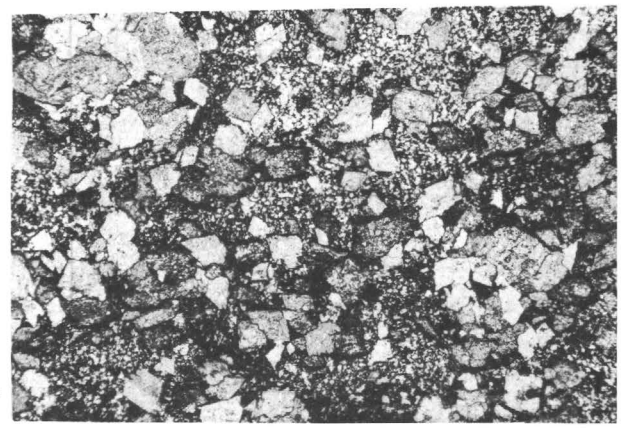
1



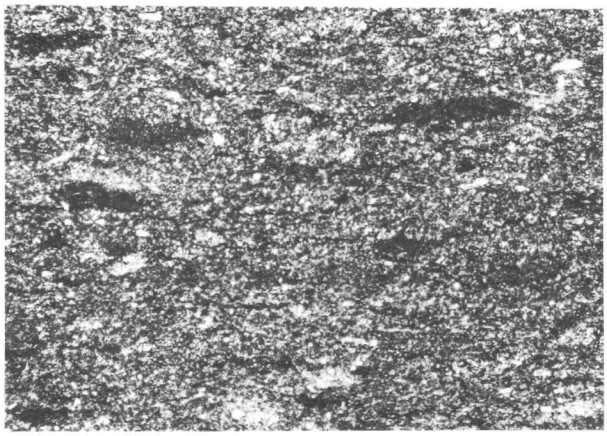
2



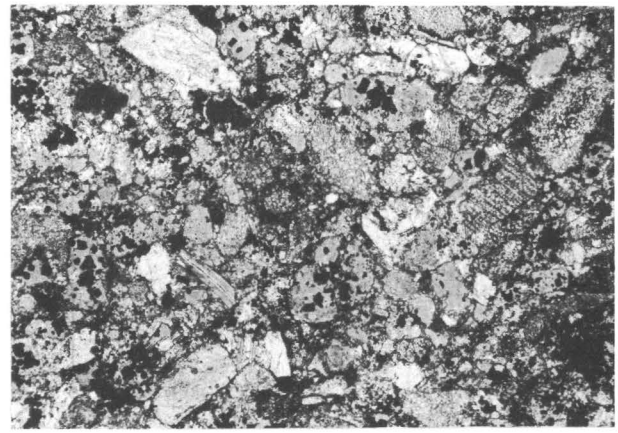
3



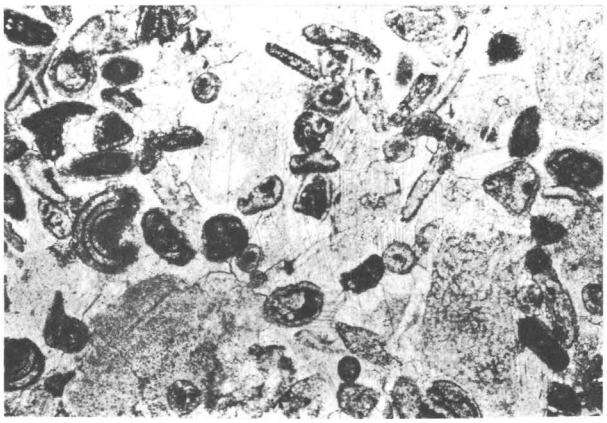
4



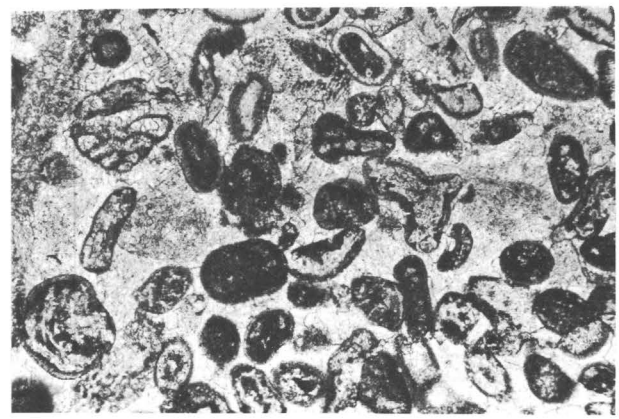
5



6



7



8

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.

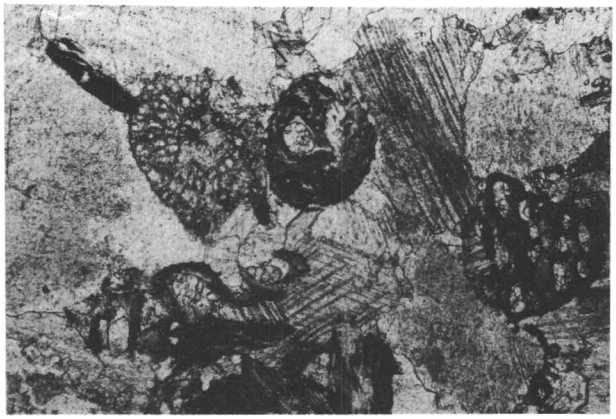
Poorly sorted, uneven grained, pelmatozoan-bryozoan packstone. Some pellets are present. Foraminifera are *Globoendothyra* sp., *Earlandinella* sp., and *Endothyra* of the group *E. bowmani* Phillips emend. Brady.

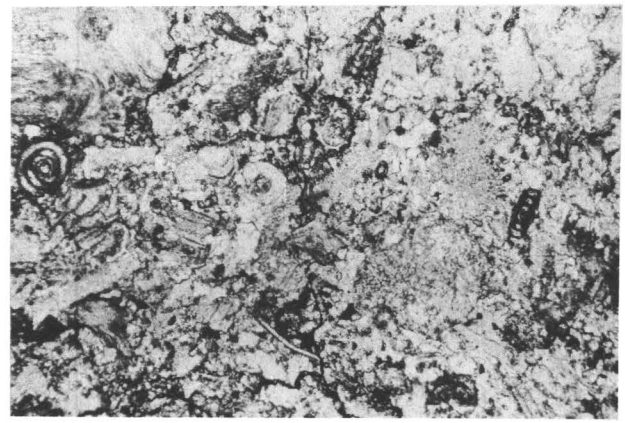
6. USNM 180068, 1,885 ft below top of section (× 25) Kogruk Formation, undetermined Viséan zone, undetermined Meramec? equivalent.

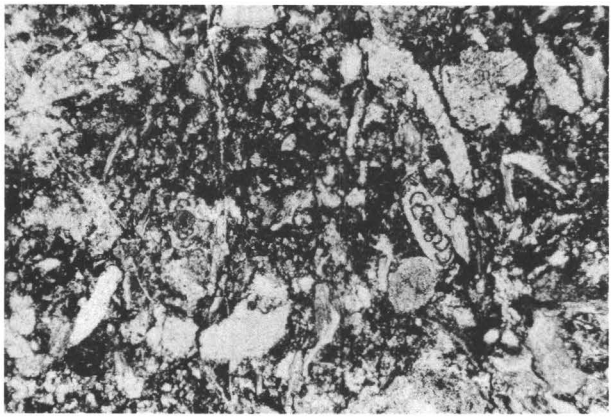
Poorly sorted, uneven grained, bryozoan-brachiopod packstone. Pelmatozoans are scarce. Foraminifera include *Globoendothyra* sp., *Endothyra* sp., and numerous *Brunsia* sp.

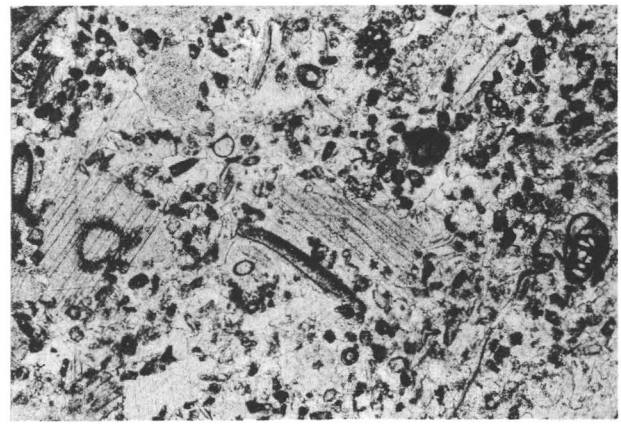
7, 8. USNM 180069, 1,895 ft below top of section (× 25) Kogruk Formation, undetermined Viséan zone, undetermined Meramec equivalent.

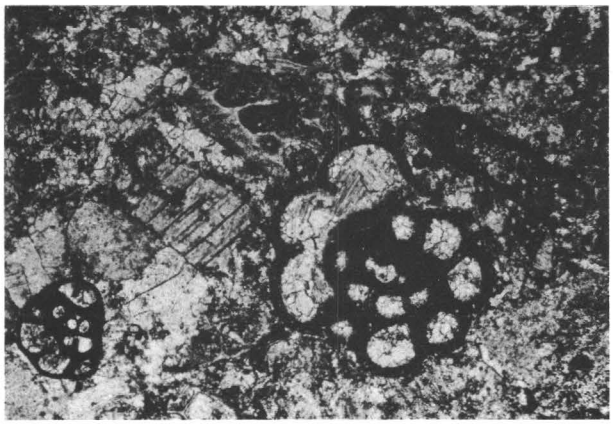
Poorly sorted, uneven grained, pelmatozoan-bryozoan-pelletoid wackestone grading to packstone. Foraminifera are *Archaediscus* of the group *A. krestovnikovi* Rauzer-Chernoussova, *Endothyra* sp., *Brunsia* sp., and *Earlandia* sp.

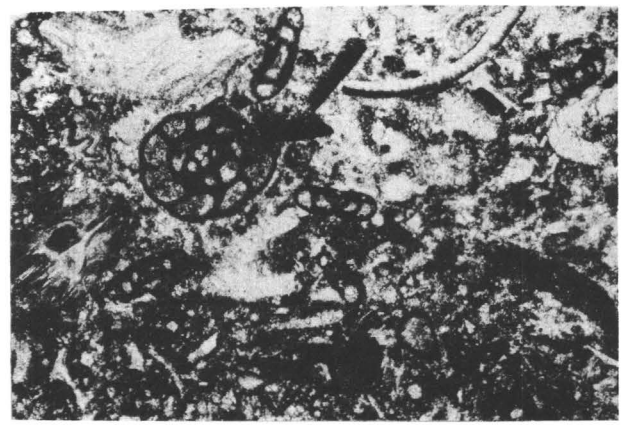


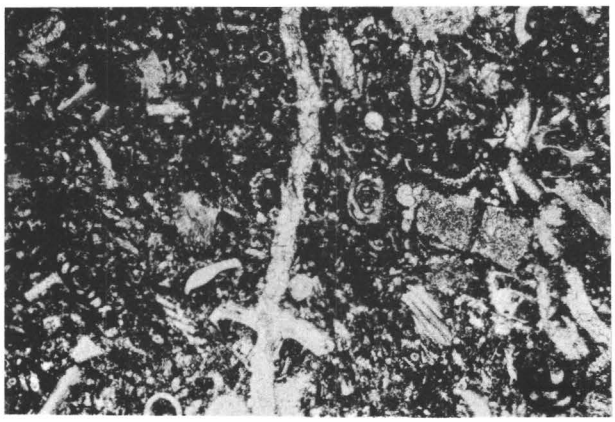


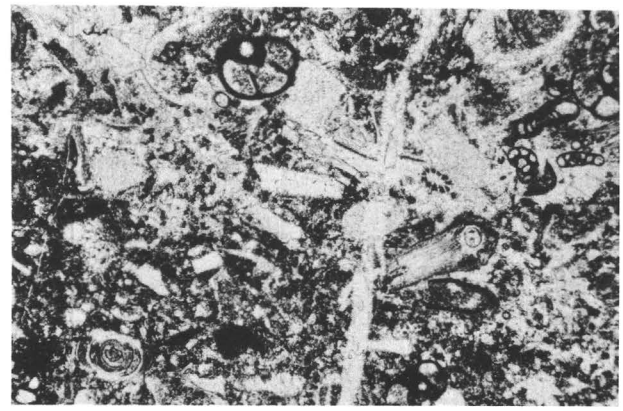












CIRQUE SECTION 62C–15, DE LONG MOUNTAINS,
AND TRAIL CREEK SECTIONS 60A–400–403, DE LONG MOUNTAINS

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.

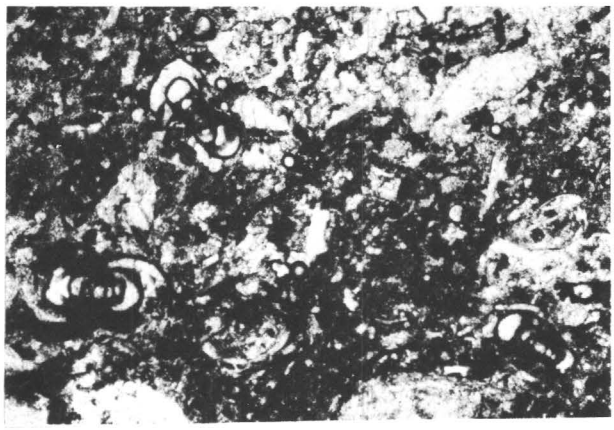
6, 7. USNM 180073, 175 ft below top of the section (× 25) Nasorak Formation, Zone 16_{inf}, Late Viséan, lower Chester equivalent.

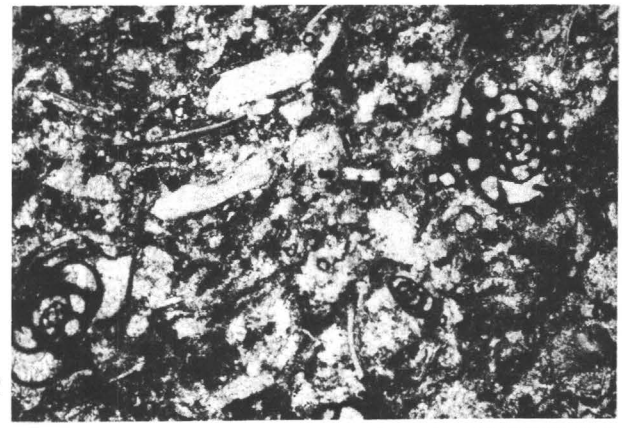
Medium-sorted, medium-grained, pelmatozoan-phosphatic debris mud lump packstone. Pressure solution between grains is well developed.

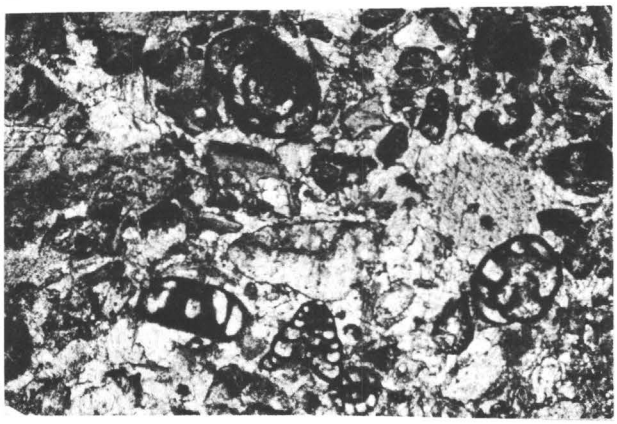
Cape Lewis section 68A–9 to 11, Lisburne Peninsula

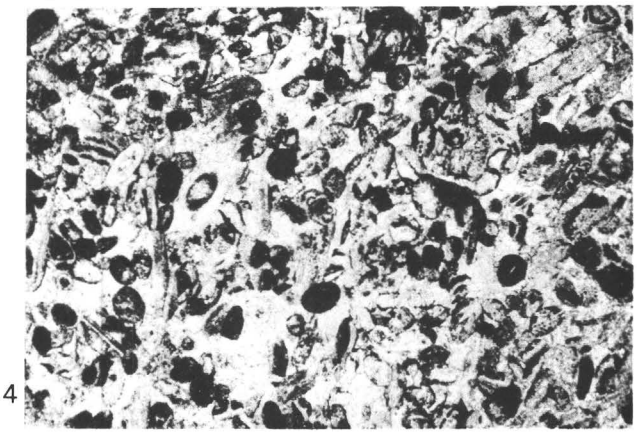
8. USNM 180074, 3,018 ft below top of the section (× 25) Nasorak Formation, Zone $_{inf}$, Late Viséan, lower Chester equivalent.

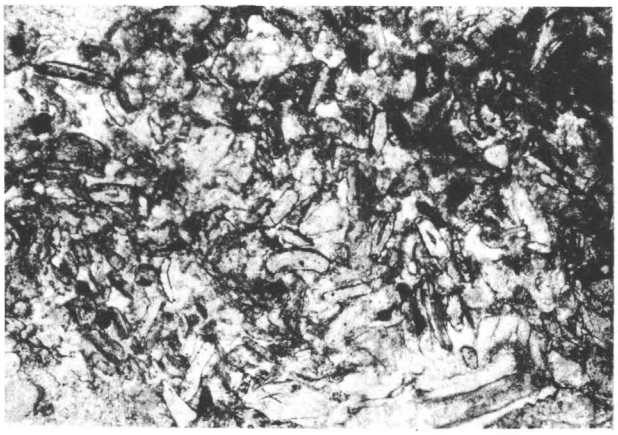
Poorly sorted, uneven grained, pelmatozoan-bryozoan highly recrystallized packstone. Small dolomitic rhombs are widespread. The pelmatozoan plates in the rock have been replaced by glauconite.

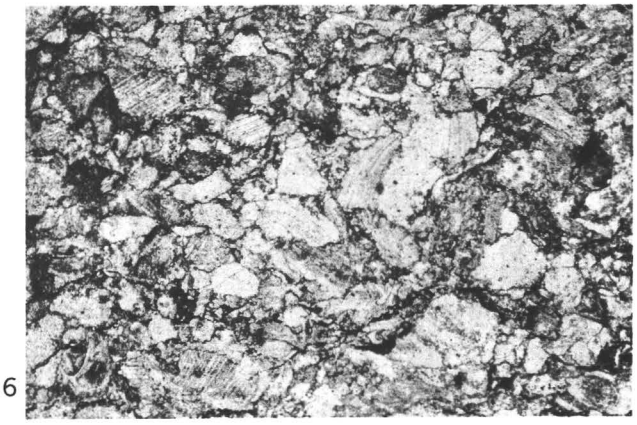

1

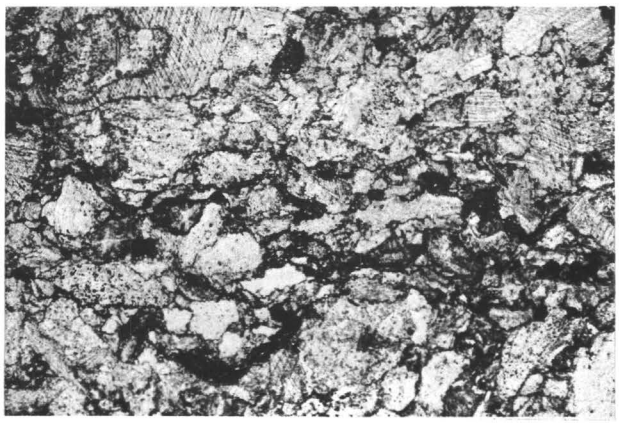

2

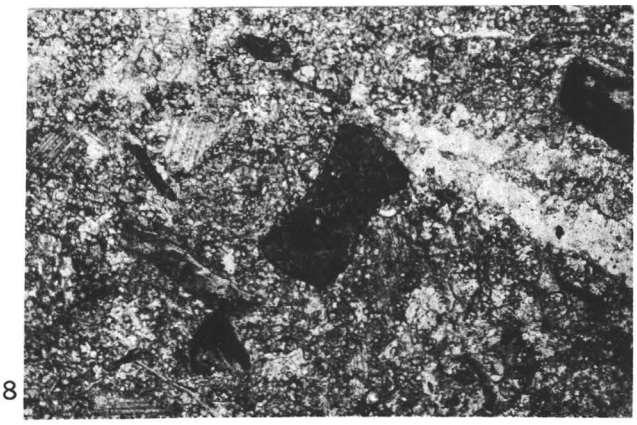

3


4


5


6


7


8

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.

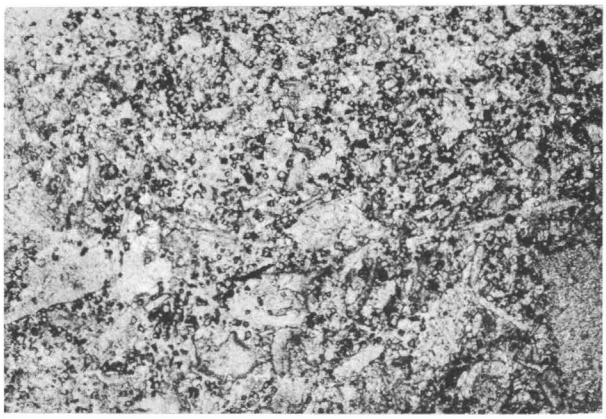
Disarticulated debris of *Lithostrotionella* walls in a bryozoan packstone.

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.

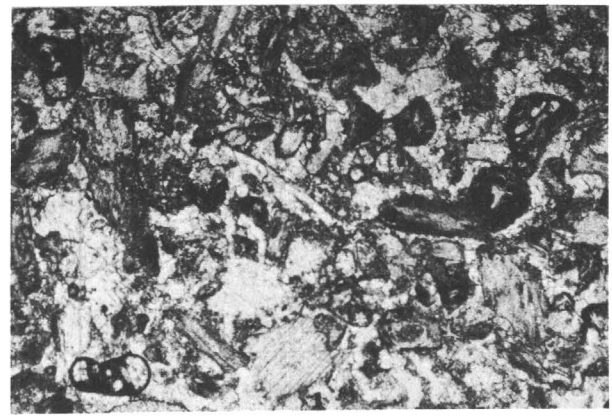
Layered dolomite derived from the diagenesis of banded lime mudstone.

8. USNM 180081, 432 ft below top of the section (× 25) Kogruk? Formation, Zone 17, Early Namurian, middle Chester equivalent.

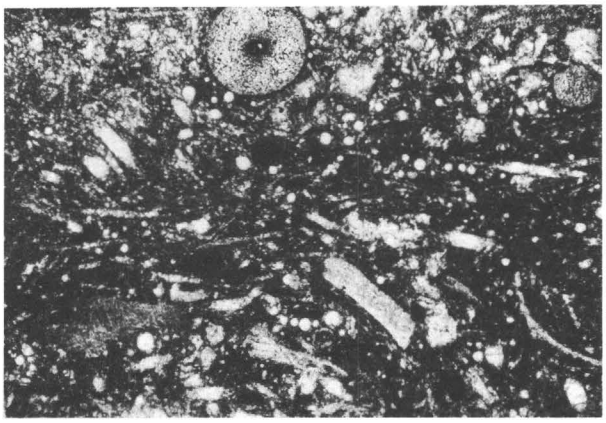
Siliceous dolomitized lime mudstone.



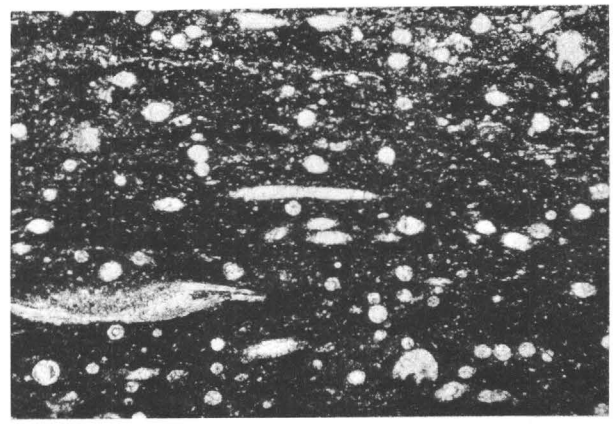
1



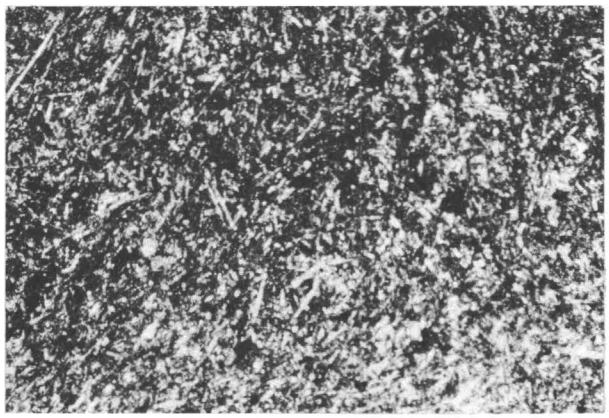
2



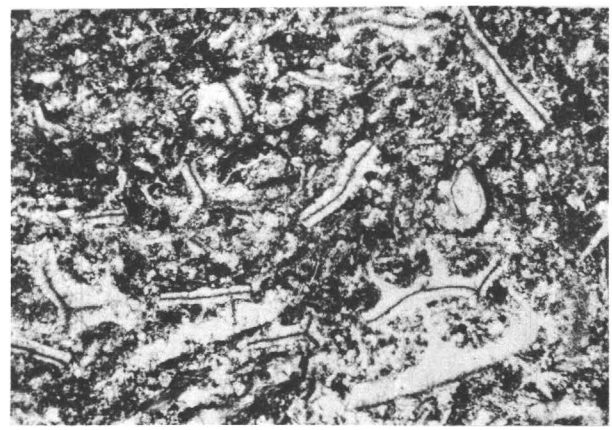
3



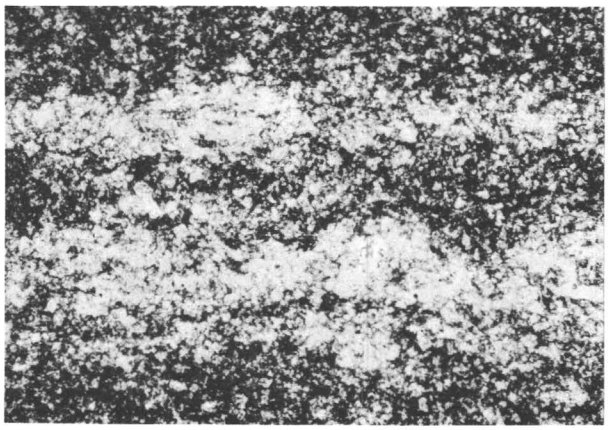
4



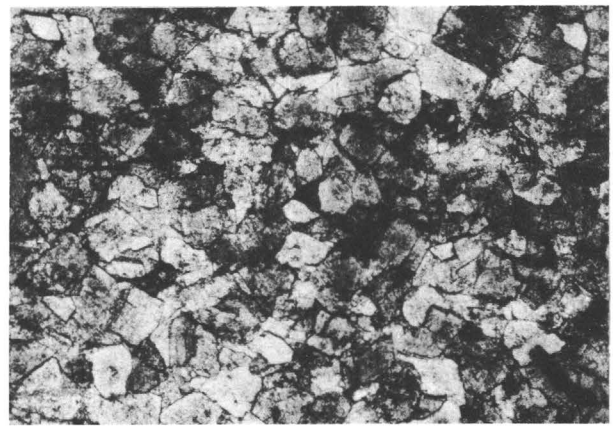
5



6



7



8

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.

PLATE 26 —Continued

FIGURES 26, 27. *Pseudoammodiscus volgensis* (Rauzer-Chernoussova) (p. 27).

26. USNM 179335, West Sadlerochit Mountains section, 1,350 ft below the top of the section (× 119) Alapah Limestone, Zone 16_{inf}, Late Viséan, lower Chester equivalent, axial section.

27. USNM 179336, Old Man Creek section, base of the section (× 97) Alapah Limestone, Zone 14, Late Viséan, St. Louis equivalent, equatorial section.

28. *Pseudoammodiscus priscus* (Rauzer-Chernoussova) (p. 28).

USNM 179337, Shainin Lake section, 457 ft below the top of the section (× 97) Alapah Limestone, Zone 14, Late Viséan, St. Louis equivalent.

29. *Brunsia* of the group *B. pulchra* Mikhailov (p. 29).

USNM 179339, Itkillik Lake section, 1,035 ft below the top of the section (× 119) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

30–32. *Brunsia* of the group *B. lenensis* Bogush and Yuferev (p. 30).

30. USNM 179340, Trail Creek section, 225 ft below the top of the section (× 119) Kogruk Formation, Zone 13 or 14, late Middle or early Late Viséan, St. Louis? equivalent, equatorial section.

31. USNM 179341, Trail Creek section, 1,890 ft below the top of the section (× 97) Kogruk Formation, undetermined Viséan zone, undetermined Meramec? equivalent, equatorial section.

32. USNM 179342, as figure 31, oblique section.

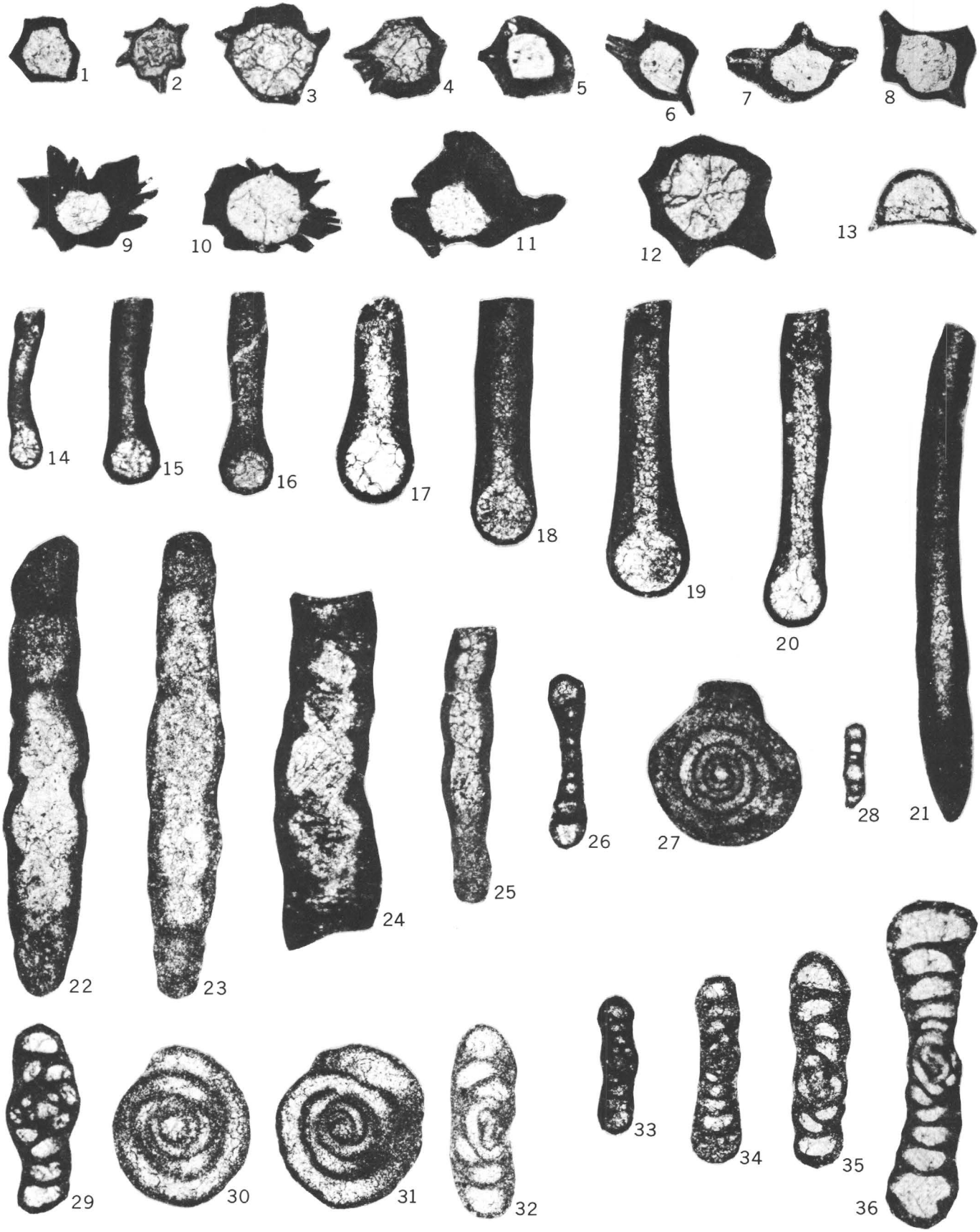
33–36. *Brunsia* of the group *B. irregularis* (con Möller (p. 30).

33. USNM 179343, Cirque section, 1,750 ft below the top of the section (× 97) Kogruk Formation, Zone 13 or 14, late Middle or early Late Viséan, St. Louis? equivalent, axial section.

34. USNM 179344, Cirque section, 1,730 ft below the top of the section (× 97) Kogruk Formation, Zone 13 or 14, late Middle or early Late Viséan, St. Louis? equivalent, axial section.

35. USNM 179345, as figure 29, but (× 97) axial section.

36. USNM 179346, Itkillik Lake section, 1,067 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis 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.

PLATE 27—Continued

29–33. *Planospirodiscus minimus* (Grozdilova and Lebedeva) (p. 41).

29. USNM 179364, Sadlerochit Mountain section, about 1,000 ft below the top of the section (× 119) Alapah Limestone, Zone 16_{sup}, Late Viséan, lower Chester equivalent.

30. Univ. Montréal 222/8, West Sadlerochit Mountain section, 900 ft below the top of the section (× 97) Alapah Limestone, Zone 16_{sup} or 17, Late Viséan or earliest Namurian, lower or middle? Chester equivalent.

31. Univ. Montréal 222/11, same as figure 30.

32. Univ. Montréal 203/37, Joe Mountain section, about 2,680 ft below the top of the section (× 119) Alapah Limestone, Zone 16_{sup}, Late Viséan, lower Chester equivalent.

33. Univ. Montréal 221/31, same as figure 30.

34–38. *Planospirodiscus taimyricus* Sossipatrova. (p. 41).

34. USNM 179365, Sadlerochit Mountain section, about 650 ft below the top of the section (× 119) Alapah Limestone, Zone 18, Early Namurian, upper Chester equivalent.

35. USNM 179366, West Sadlerochit Mountain section, 150 ft below the top of the section (× 119) Alapah? Limestone, Zone 18 or younger, Early Namurian or younger, upper Chester? equivalent.

36. USNM 179367, West Sadlerochit Mountain section, 130 ft below the top of the section (× 119) Alapah? Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.

37. USNM 179368, West Sadlerochit Mountain section, 100 ft below the top of the section (× 119) Alapah? Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.

38. USNM 179369, Sadlerochit Mountain section, about 500 ft below the top of the section (× 97) Wahoo Limestone, Zone 20, Morrow equivalent.

39. *Planospirodiscus* sp. (p. 41).

USNM 179370, Sunset Pass section, 630 ft below the top of the section (× 97) Alapah? Limestone, Zone 18 or younger, Early Namurian or younger, upper Chester? equivalent.

40–44. *Asteroarchaediscus* of the group *A. baschkiricus* (Krestovnikov and Teodorovitch) (p. 42).

40. USNM 179371, Sadlerochit Mountain section, about 650 ft below the top of the section (× 97) Alapah Limestone, Zone 18, Early Namurian, upper Chester equivalent.

41. USNM 179372, West Sadlerochit Mountain section, 110 ft below the top of the section (× 97) Wahoo? Limestone or uppermost Alapah Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.

42. Univ. Montréal 219/20, West Sadlerochit Mountain section, 50 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.

43. USNM 179373, West Sadlerochit Mountain section, 181 ft below the top of the section (× 119) Alapah Limestone, Zone 18 or younger, Early Namurian or younger, upper Chester equivalent.

44. USNM 179374, Sadlerochit Mountain section, about 1,000 ft below the top of the section (× 119) Alapah Limestone, Zone 16_{sup}, Late Viséan, lower Chester equivalent.

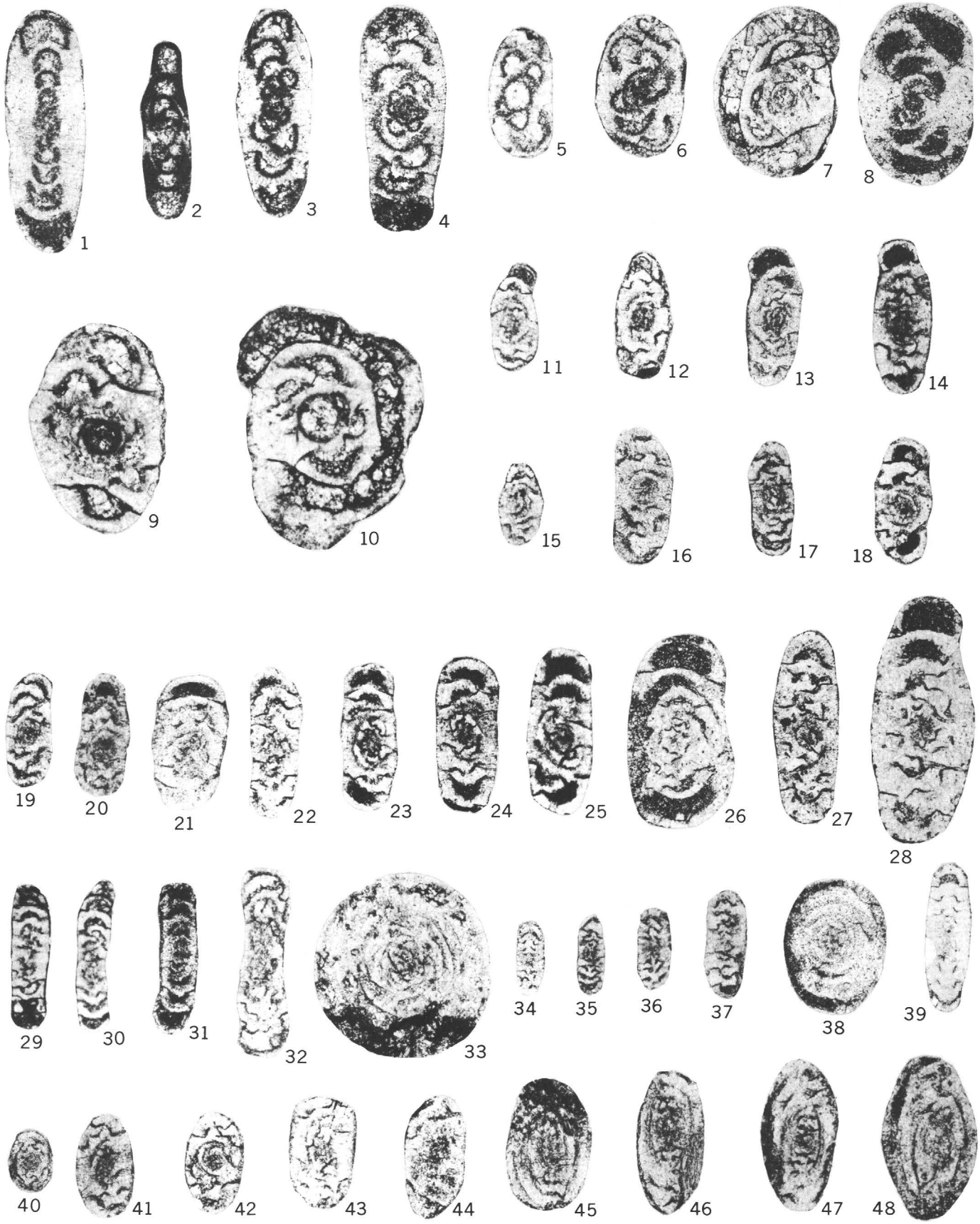
45–48. *Quasiarchaediscus*? *rugosus* (Brazhnikova) (p. 43).

45. USNM 179375, West Salderochit Mountain section, 100 ft below the top of the section (× 119) Alapah? Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.

46. USNM 179376, West Sadlerochit Mountain section, same as figure 45.

47. USNM 179377, West Sadlerochit Mountain section, 115 ft below the top of the section (× 119) Alapah? Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.

48. USNM 179378, West Sadlerochit Mountain section, 130 ft below the top of the section (× 119) Alapah? Limestone, Zone 19, Middle Namurian, uppermost Chester equivalent.



PROPERMODISCUS, *PLANOARCHAEDISCUS*, *ARCHAEDISCUS*, *NEOARCHAEDISCUS*, *PLANOSPIRODISCUS*, *ASTEROARCHAEDISCUS*, AND *QUASIARCHAEDISCUS*?

PLATE 28

FIGURE

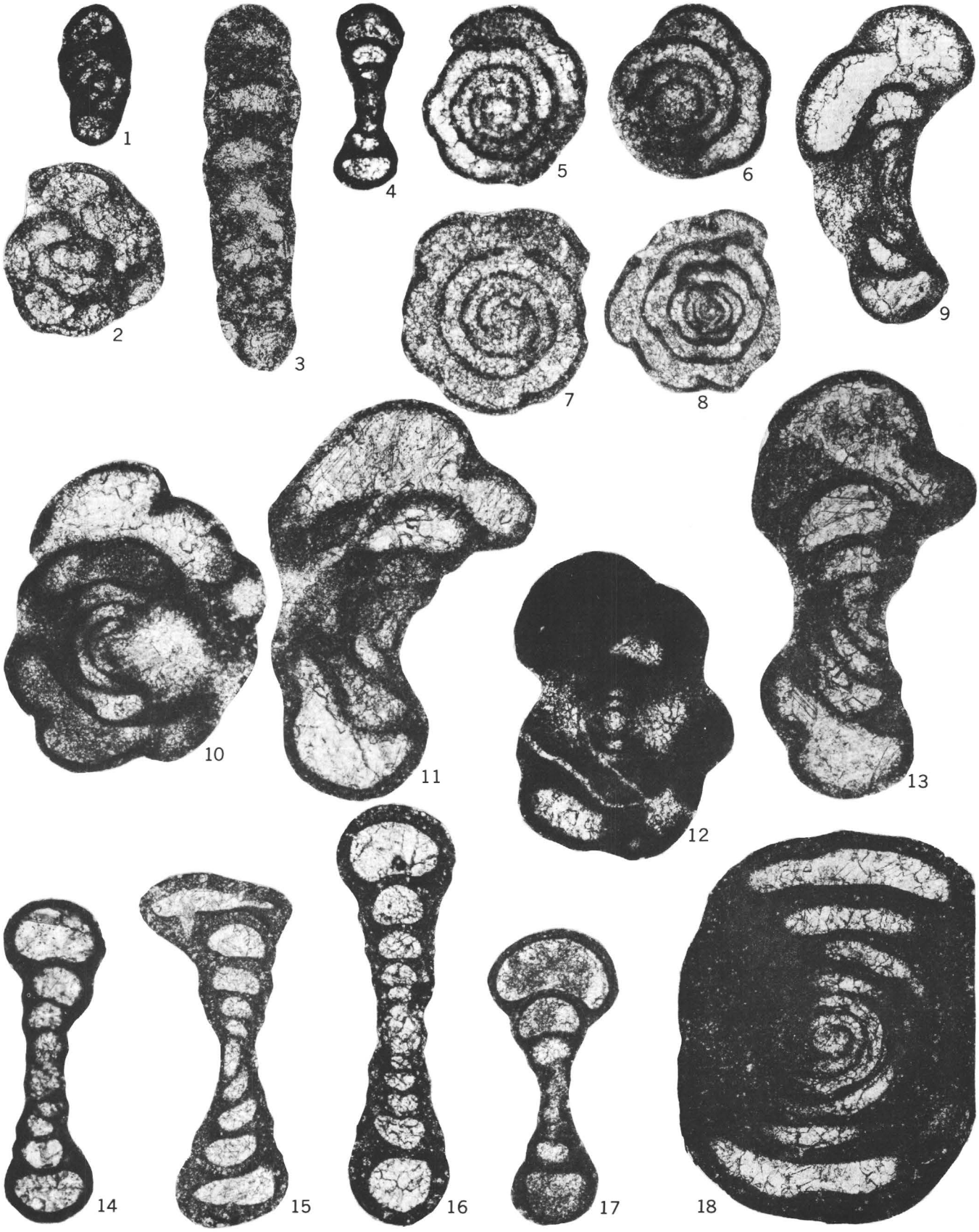
1. *Glomospiranella* sp. (p. 44).
   USNM 179379, Shainin Lake section, 2,241 ft below the top of the section (× 77) Wachsmuth Limestone, Zone 9, Late Tournaisian, Osage equivalent.
2. *Septaglomospiranella* of the group *S. chernoussovensis* Mamet, new name (p. 45).
   USNM 179380, Itkillik Lake section, 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).

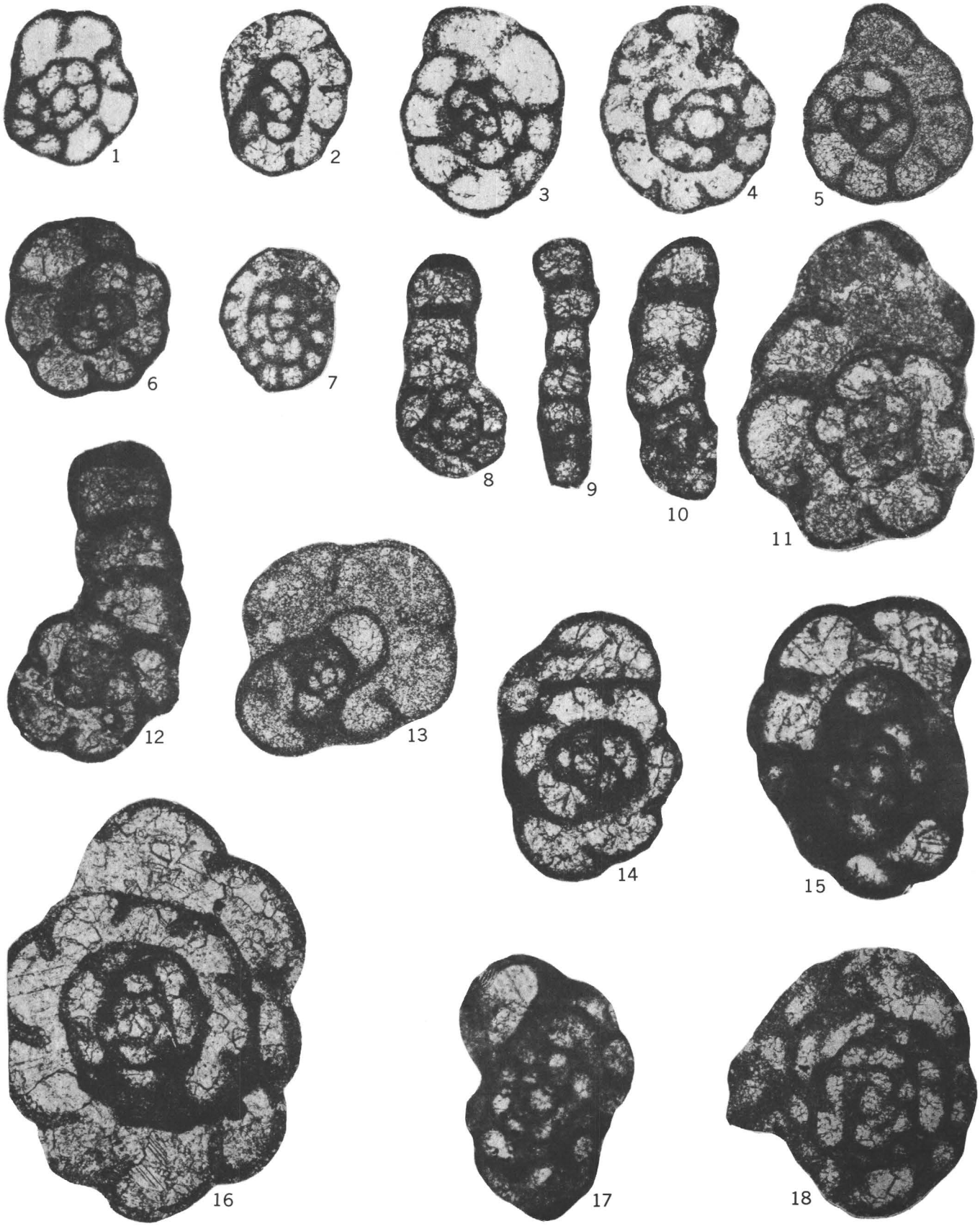
USNM 179406, Itkillik Lake section, 1,160 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

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.

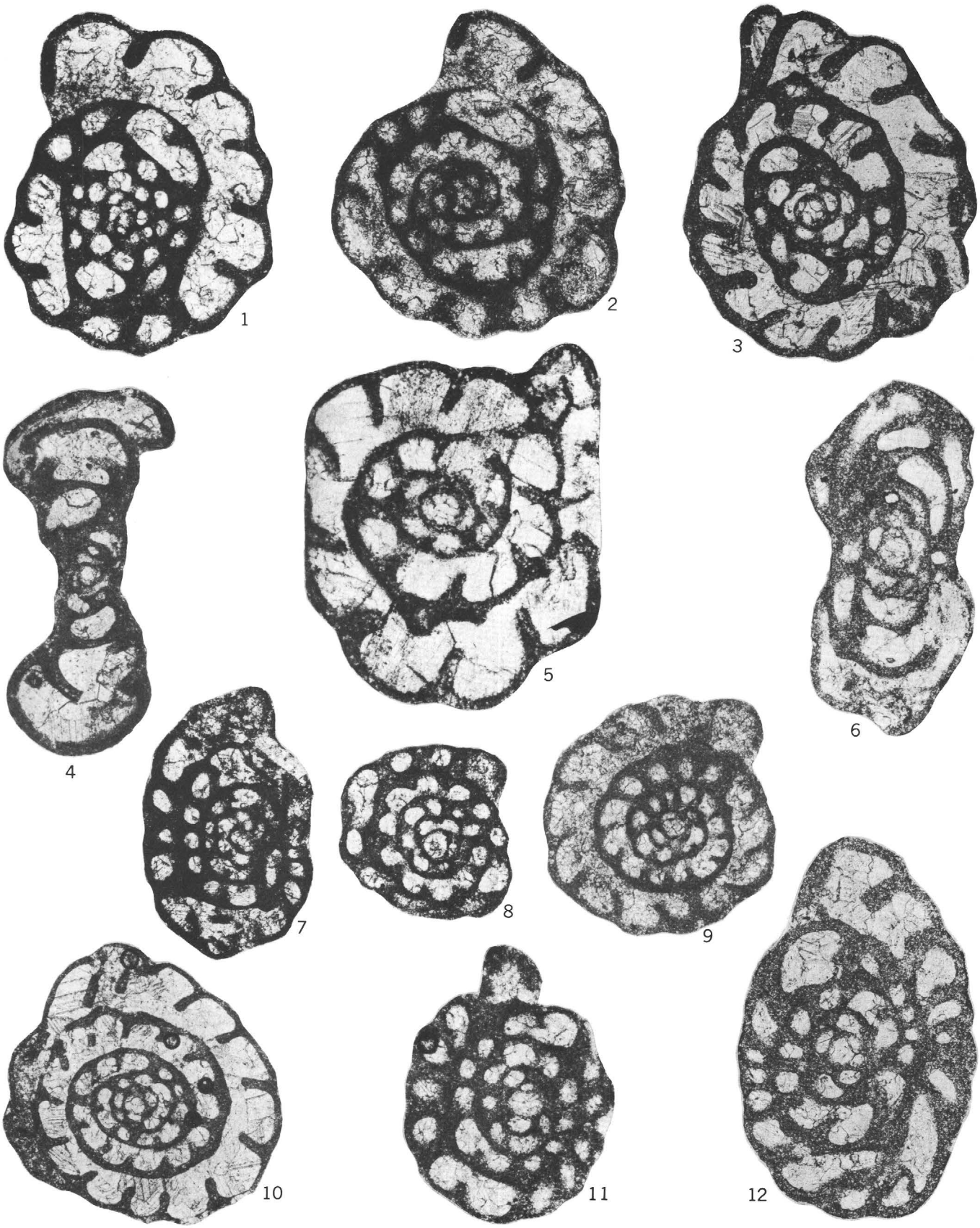
7–11. *Eoendothyranopsis* of the group *E. spiroides* (Zeller) (p. 76).

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.

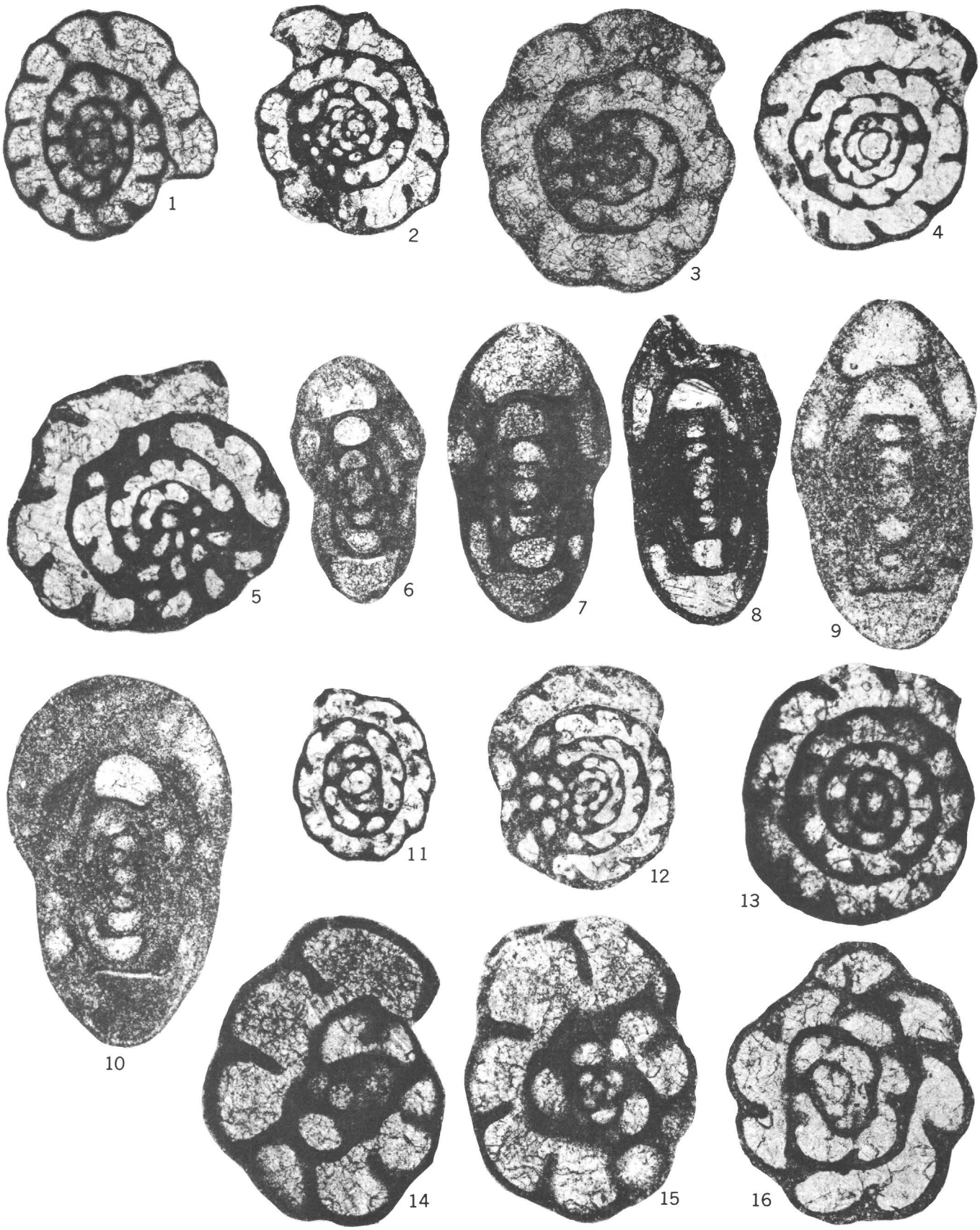
14–16. *Endothyra* of the group *E. bowmani* Phillips emend. Brady (p. 67).

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

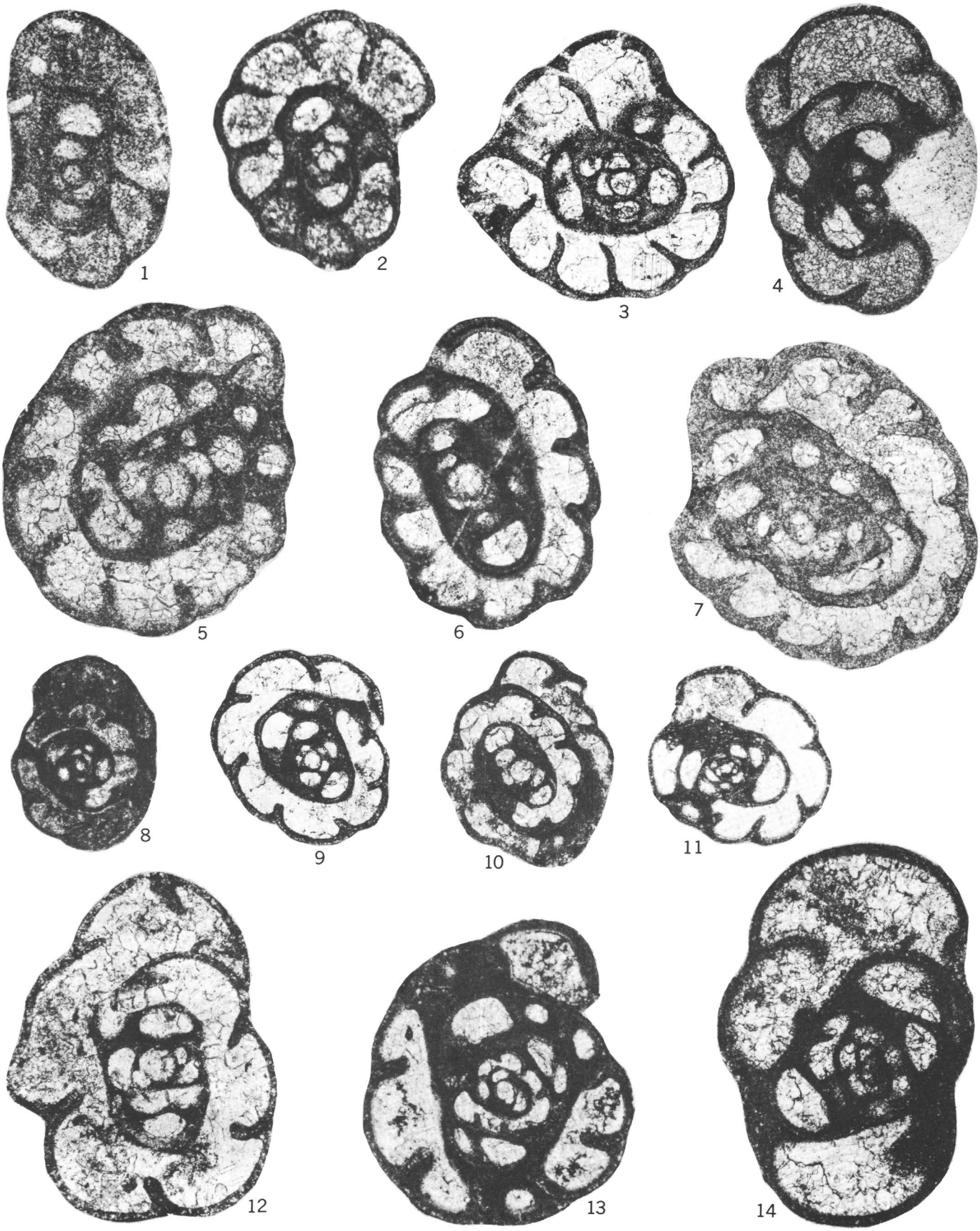
1. *Endothyra paramosquensis* Mamet new name (p. 70).
   USNM 179433, West Sadlerochit Mountain section, 50 ft below the top of the section (× 97) Wahoo Limestone, Zone 21, Atoka equivalent.

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.

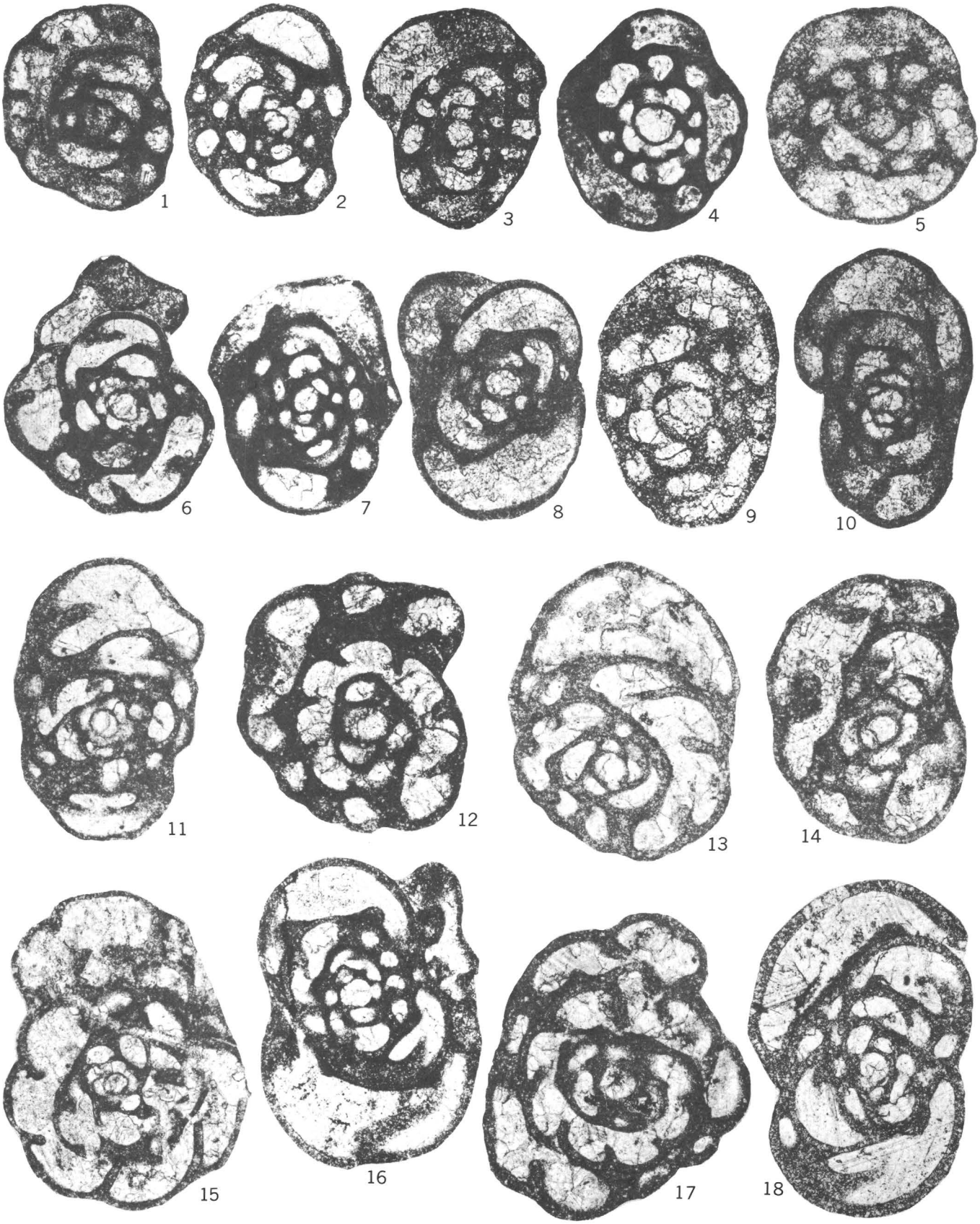


ENDOTHYRA, TRANSITIONAL FORM BETWEEN *LATIENDOTHYRA*? AND *GLOBOENDOTHYRA*?, AND *GLOBOENDOTHYRA*

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).

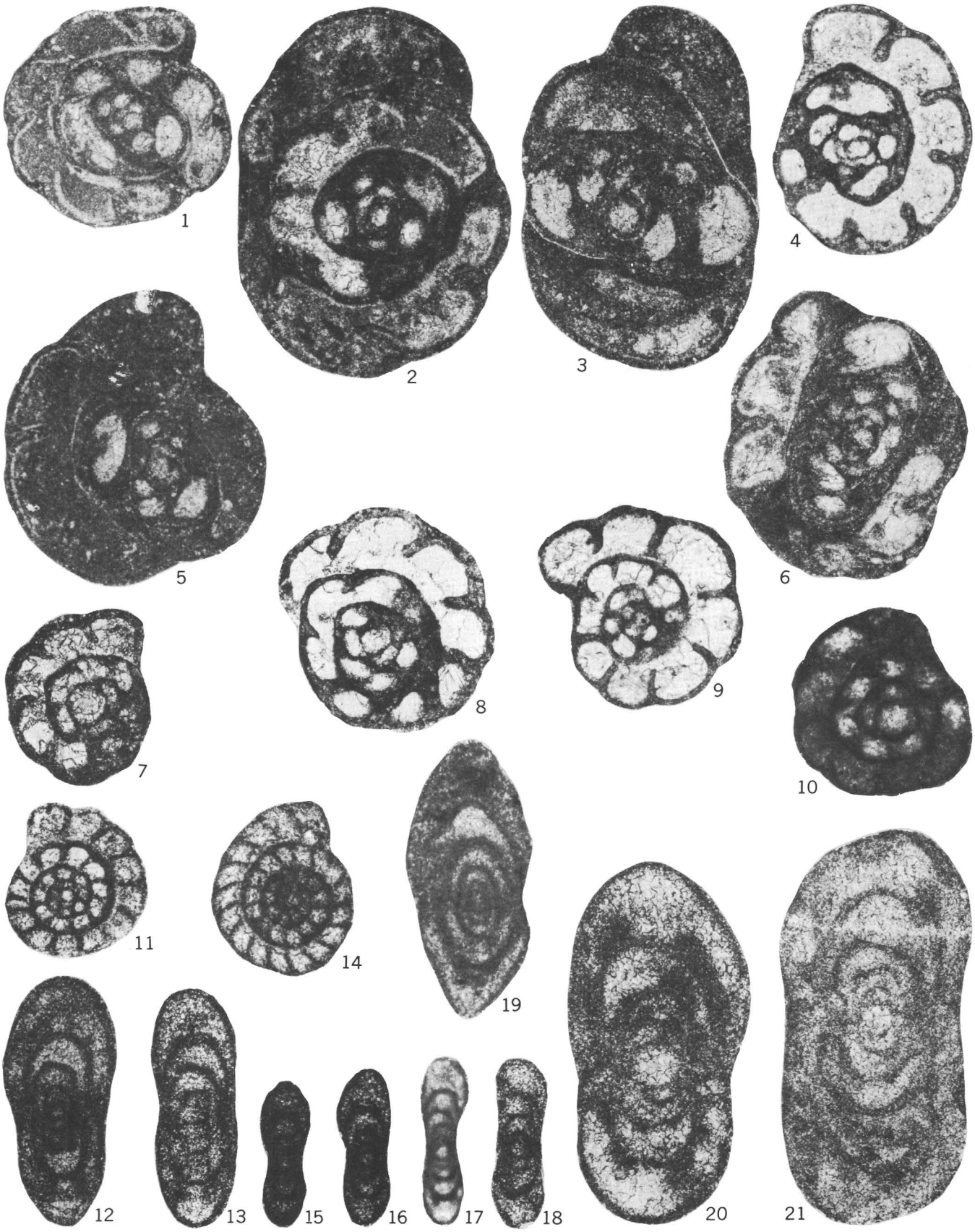
15. Univ. Montréal 219/33, West Sadlerochit Mountain section, same as figure 13.
16. Univ. Montréal 219/12, West Sadlerochit Mountain section, same as figure 13.
18. Univ. Montréal 219/11, West Sadlerochit Mountain section, same as figure 13.

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.

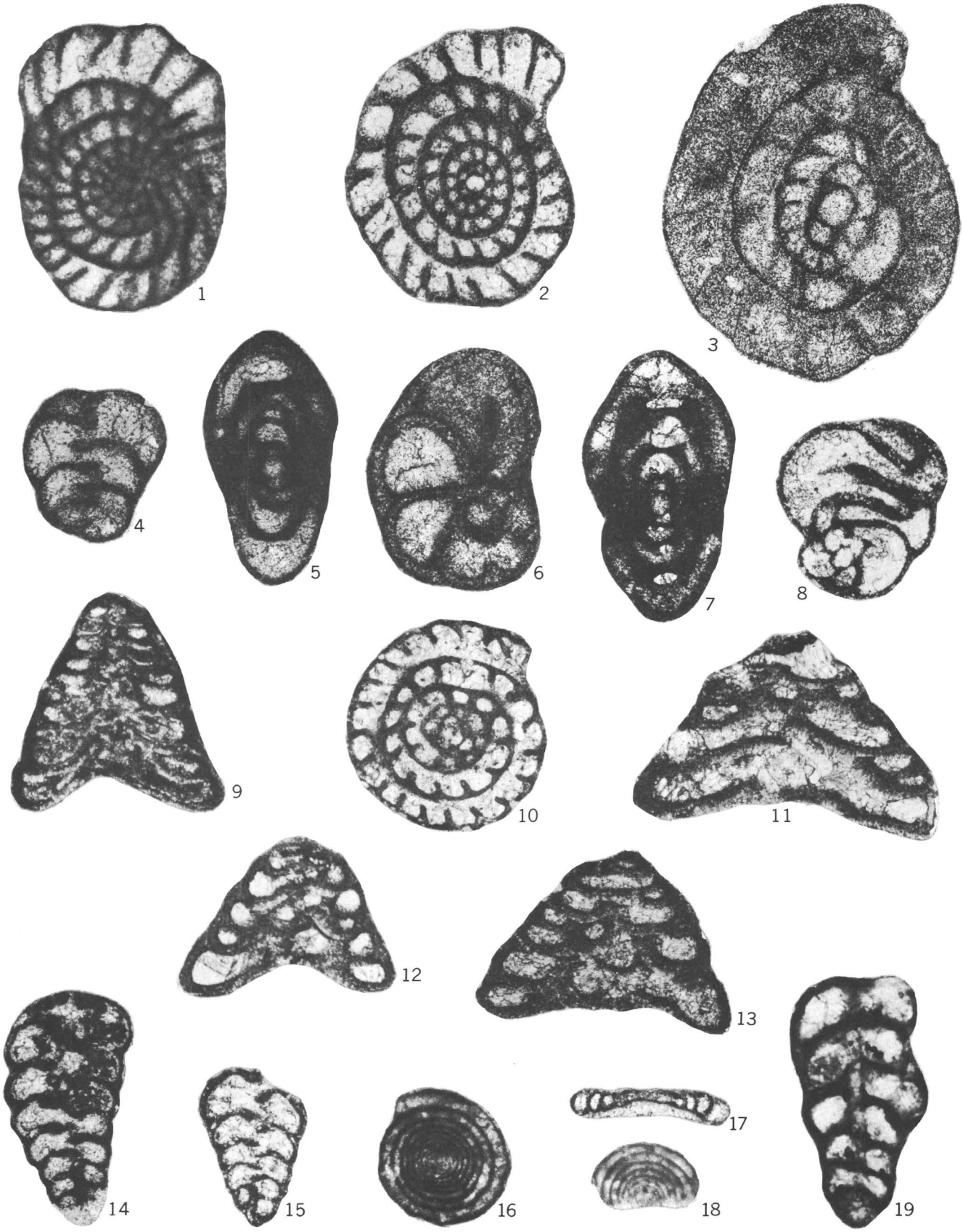
14, 15. *Cribrostomum bradyi* (von Möller) (p. 93).

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).

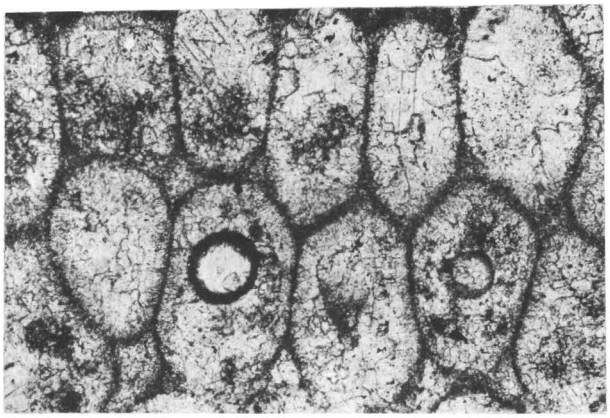
5. USNM 179483, Itkillik Lake section, 857 ft below the top of the section (× 40) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.

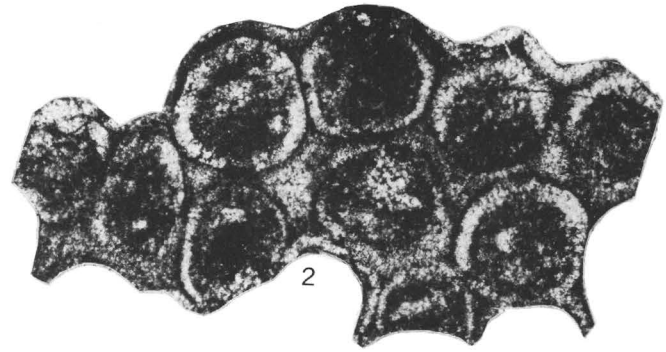
6–9. *Sphinctoporella lisburnensis* Mamet and Rudloff (p. 104).

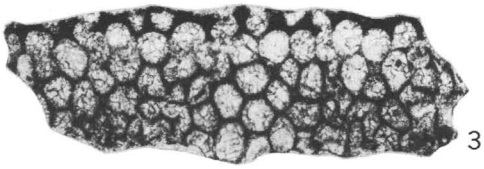
6. USNM 179484, same as figure 5.
7. USNM 179485, same as figure 5, but (× 97).
8. USNM 179486, same as figure 5.
9. USNM 179487, same as figure 5, but (× 63).

10–13. *Yukonella bamberi* Mamet and Rudloff (p. 104).

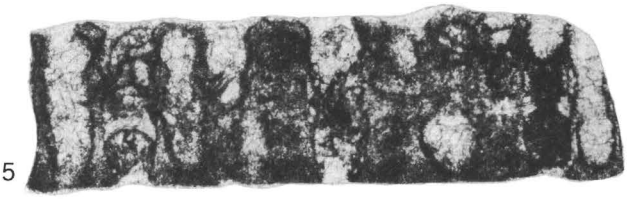
10. Univ. Montréal 204/13, Joe Mountain section, 3,750 ft below the top of the section (× 97) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
11. Univ. Montréal 204/16, same as figure 10.
12. Univ. Montréal 203/13, same as figure 10.
13. Univ. Montréal 204/17, same as figure 10, but (× 63).


1

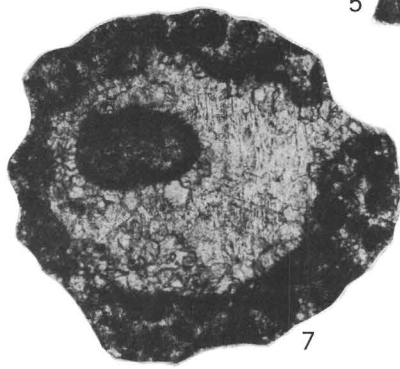

2

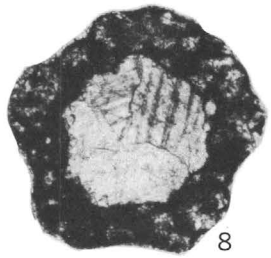

3

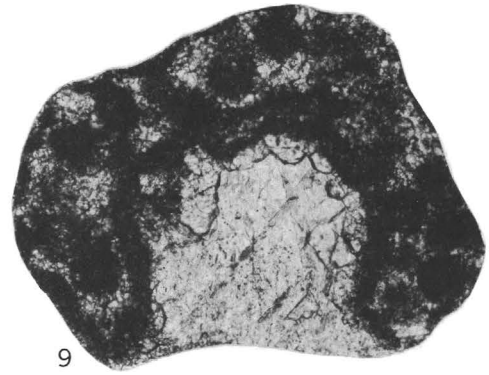
4


5

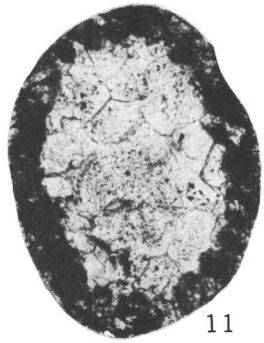
6

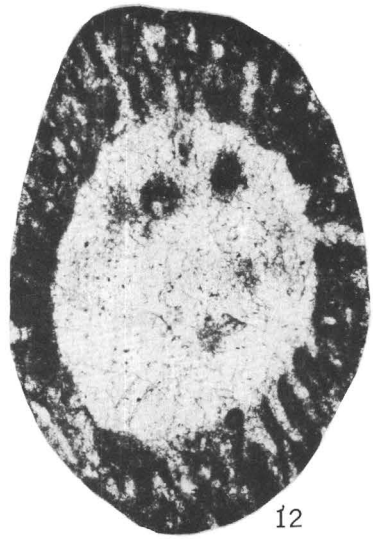

7

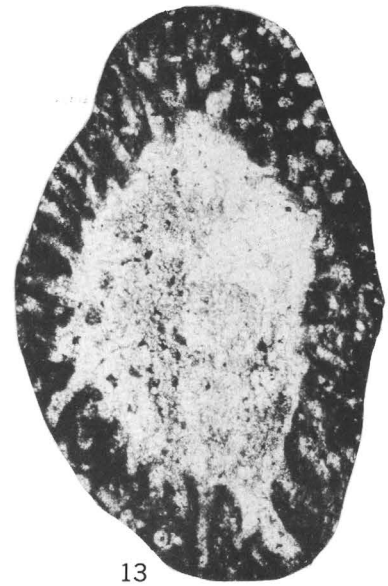

8


9

10


11


12

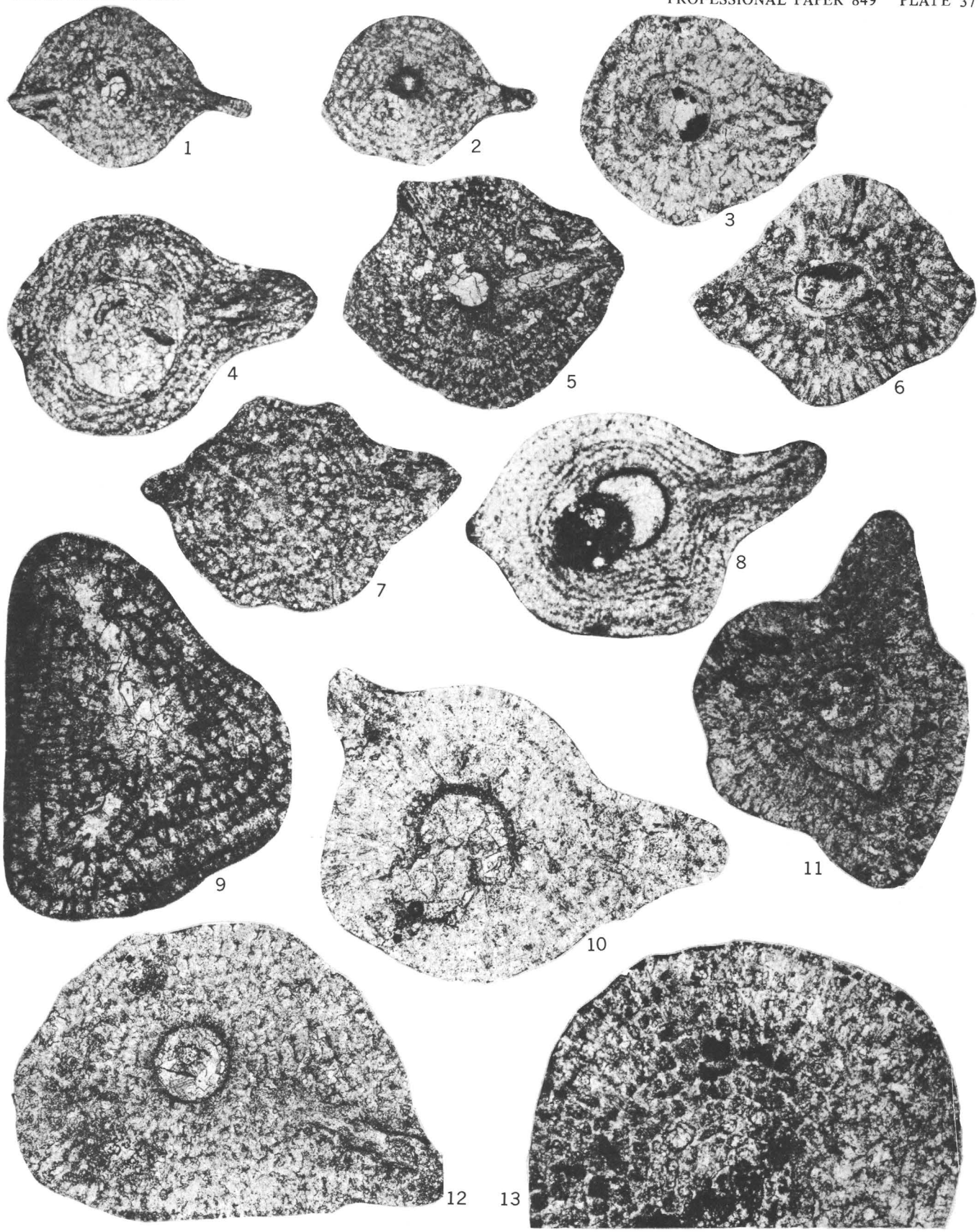

13

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

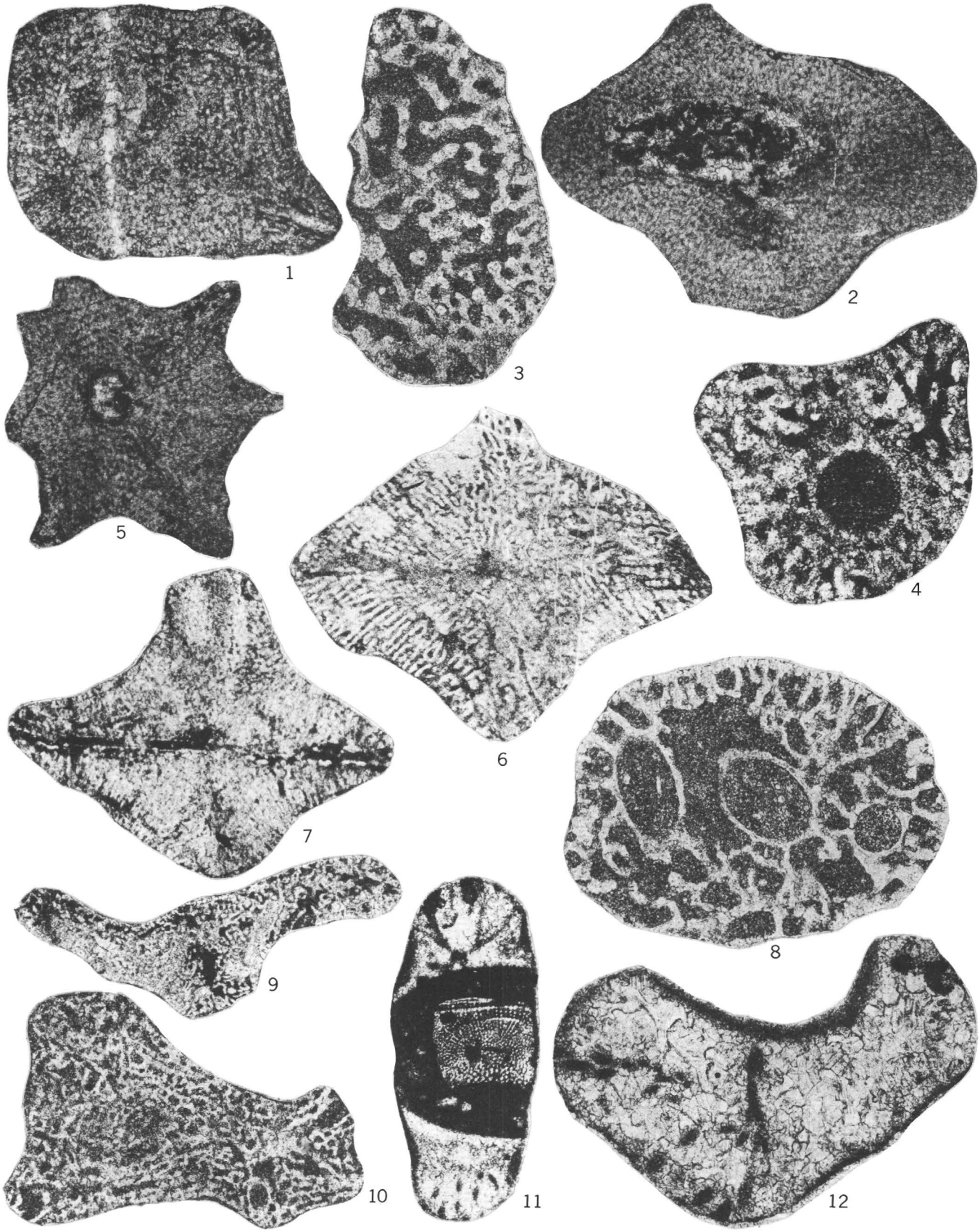
1. *Stacheia*? *skimoensis* Mamet and Rudloff (p. 105).
   USNM 179500, Skimo Creek section, 2,225 ft below the top of the section (× 30) Wachsmuth Limestone, Zone 12, Middle Viséan, Salem equivalent.
2. *Stacheia*? sp.
   USNM 179501, Skimo Creek section, 1,950 ft below the top of the section (× 30) 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.

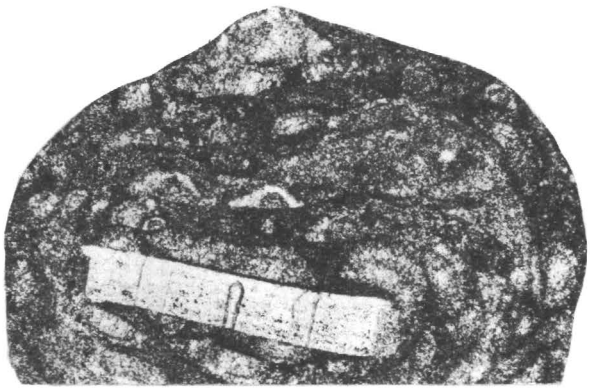
5–7. *Calcisphaera laevis* Williamson
   5. USNM 179944, Itkillik Lake section, 3,160 ft below the top of the section (× 119) Wachsmuth Limestone, Zone 8, Late Tournaisian, Osage equivalent.
   6. USNM 179945, Itkillik Lake section, 865 ft below the top of the section (× 97) Alapah Limestone, Zone 13, 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.

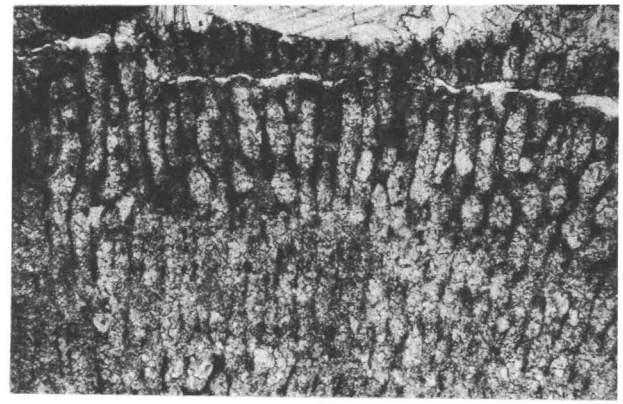
10, 11. *Paracaligelloides*? *obicus* Bogush *in* Bogush, Bushmina, and Domnikova (p. 112).
   10. USNM 179949, Itkillik Lake section, about 840 ft below the top of the section (× 25) Alapah Limestone, Zone 13, Middle Viséan, St. Louis equivalent.
   11. USNM 179950, Shainin Lake section, 801 ft below 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.

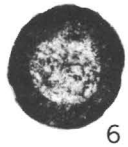

1

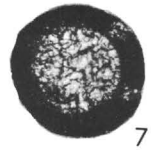
2


3

4

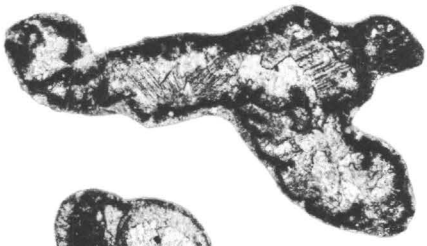
5

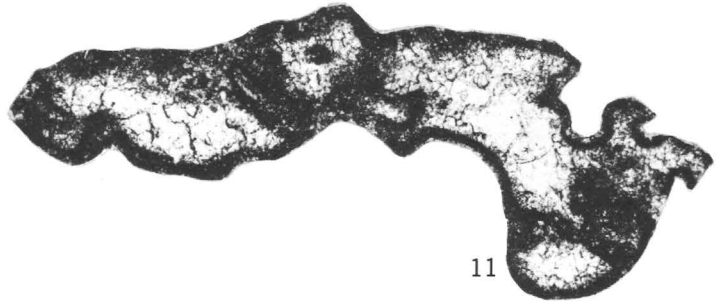

6

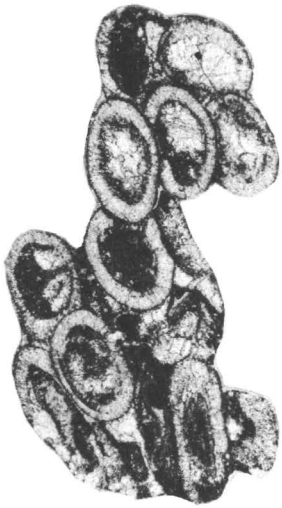

7

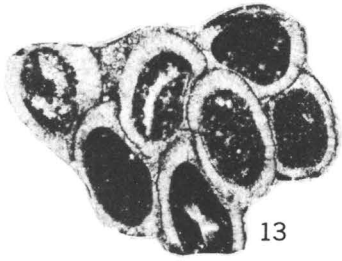
8

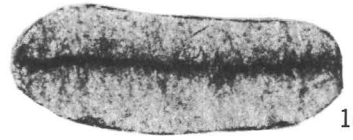
9


10

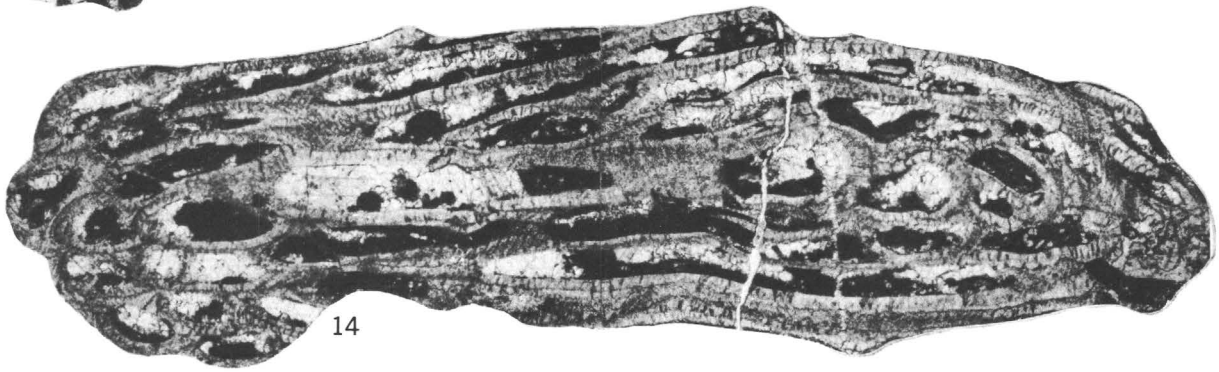

11


12


13


15

16


14

STYLOCODIUM, *GIRVANELLA*, *SOLENOPORA*, *EOVOLUTINA*, *CALCISPHAERA*, *PARACALIGELLOIDES*?, *ASPHALTINA*, AND CORAL WALL DEBRIS