# CONTRIBUTIONS

## FROM THE

# CUSHMAN FOUNDATION

## FOR

# FORAMINIFERAL RESEARCH

VOLUME XVII, Part 2

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## Contents



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# FRIEDA BILLINGS CUSHMAN

(October 20, 1880 - March 21, 1966)

The numerous students and paleontologists who have worked at the Cushman Laboratory for Foraminiferal Research, Sharon, Massachusetts, will be saddened to learn of the death of Mrs. Frieda Billings Cushman. Mrs. Cushman published no papers as an author, but she made numerous indirect and important contributions to the study of Foraminifera. As the wife of the late Joseph Augustine Cushman, the founder and director of the Cushman Laboratory, her unusual vitality was devoted daily to maintaining a schedule and to performing routine and odd duties that would have dissipated the energy of the Director.

Frieda Gerlach Billings was born in Roxbury, Massachusetts, the second and only living child of Frank S. Billings and Harriet M. (Roulstone) Billings. A son born earlier had died in infancy while Frieda's father was studying in Germany. In 1913 Frieda came as a bride to a new home in Sharon, and there she assumed the care of the three young children of Joseph A. Cushman—Robert Wilson, Alice Eleanor, and Ruth Allerton. For more than 50 years she lived in the house at 76 Brook Road and was the last to leave it after making generous dispositions of the various paintings, antiques, books and other personal treasures it contained. After a brief illness, she died in the adjoining town of Norwood.

In the home on Brook Road, Mrs. Cushman created an atmosphere of hospitality and maintained a schedule of her own numerous family and community activities as well as those of the Cushman Laboratory. Her extraordinary organizational ability facilitated two trips to Europe—in 1927 and 1932—for visits to scientific colleagues and to museums. Annual summertime schedules included moving both the family and much of the laboratory work to a summer place on Cape Cod in the early years and to a cottage in Randolph Valley north of the Presidential Range in New Hampshire in the later years.

At various times Mrs. Cushman and her cousin, Miss Susan Minns, donated considerable funds to bear the costs of monographic studies and publication. After Dr. Cushman's death, a large gift was instrumental in launching the Cushman Foundation for Foraminiferal Research whose *Contributions* series is now in its 17th volume and whose *Special Publications* series numbers seven, with others in process.

All paleontologists who use the extraordinary volume of publications that came from Sharon or have been published by the Cushman Foundation are in some way indebted to this splendid lady. Those who had the good fortune to study at the laboratory will recall with pleasure Mrs. Cushman's outgoing personality, her warm hospitality, and her interesting guided tours to New England's places of historic and literary significance.

Lloyd G. Henbest
Ruth Todd

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# 314. DEPTH AT WHICH FORAMINIFERA CAN SURVIVE IN SEDIMENTS[1,2]

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ABSTRACT

In numerous cores, protoplasm-containing specimens of several species of foraminifera are for the first time reported at depths to 16 centimeters beneath the surface of sediments on the sea floor.

## INTRODUCTION

The universally accepted opinion contained in the pertinent literature is that benthonic foraminifera live only on the surface of the sea floor and can survive only slight burial in bottom sediments. According to Myers (1943), a foraminifer buried in sandy sediments at a depth not exceeding five to seven times its own diameter can return to the surface of the sediments, and such larger forms as *Elphidium crispum* (Linné) can successfully emerge from a depth of one centimeter. If deeper burial occurs, they may survive for a short period (up to two or three months for *E. crispum*), but succumb with more prolonged burial. Myers further noted that after heavy storms as much as 80 per cent of the benthonic foraminifera in the vicinity of Plymouth, England, are buried and perish, being unable to exhume themselves. He considers the formation of pyrite within the shell to be an indication of death resulting from burial in oxygen-deficient sediments, conclusions reached by other workers as well.

Some observations made during recent years indicate the need for further critical examination of the problem. Richter (1961), for example, noted that *Nonion depressulus* (Walker and Jacob) can live buried under 4 centimeters of sediment, and in a more recent paper (1964) he recounted the discovery of the same species, as well as *Elphidium selseyense* (Heron-Allen and Earland), alive at a depth of 6 centimeters. Green (1960), in a core from the Arctic Sea, found specimens containing protoplasm at a depth 20 centimeters beneath the sediment surface, but, in the light of Myers' observations, rejected the possibility of the organisms being alive and suggested that the staining method (Walton's Rose Bengal) was at fault.

The usual explanation of the inability of foraminifera to live buried under a relatively great thickness of sediment is the lack of available oxygen, but the scarcity of food and the probable presence of toxic substances produced by bacteria must also play an inhibitory role.

In spite of conflicting conclusions in the literature, my studies on the foraminiferan fauna of Chile have led me to the conclusion (1963b) that the oxygen requirements of the foraminifera are not limiting factors for several benthonic species that happen to be so buried. *Bolivina,* for example, is one genus of which this is particularly true. These initial observations prompted me to examine further the role played by oxygen during the burial that so frequently befalls foraminifera in life.

## MATERIALS AND METHODS

Deseado Creek, running into the South Atlantic at latitude 47° 45′ S., longitude 65° 55′ W., was chosen for the study because (1) of the convenient proximity of essential research facilities at the Puerto Deseado Marine Biological Station; (2) of my familiarity with the foraminiferan fauna in the area (Boltovskoy, 1963a); and (3) the area, being several kilometers from the open coast, is relatively sheltered and experiences no heavy surf action, even during the most violent storms, although fairly strong tidal currents are developed there. The study was conducted during the month of February in 1964 and 1965, during the Chilean summer, when storms are unusual in the area. These circumstances gave reasonable assurance that important movement of the sediments and attendant burial of the foraminifera would not occur during the course of the experiment

The study is based upon 53 cores ranging to 27 centimeters in length, the majority, however, between 12 and 15 centimeters. The upper part of the sublittoral zone (first 1 to 2 meters below the level of the lowest ebb tide) was sampled, centering around the Ipas pier, Quinta island and the area between Zar inlet and Los Conejos island. The first two are 4 kilometers from the seacoast, the last 12. Other cores were taken at the outlet of the Paraguayo gorge, near Roca Foca and — 60 kilometers farther north — Cabo Blanco. The cores were obtained by means of a device designed by Lankford (Boltovskoy, 1965) that permits the recovery of undisturbed sediment cores having a diameter of 3.4 centimeters.

Immediately after collection, the core was returned to the laboratory, divided into segments 1

1 Contribution No. 25 of the Puerto Deseado Marine Biological Station.
2 Carrera del Investigador Cientifico, Consejo Nacional de las Investigaciones Científicas y Técnicas, Argentina.

to 3 centimeters in length, fixed in 5 to 10 per cent formalin, washed through a no. 250 screen (69-micron openings), treated with rose Bengal and washed to remove excess dye. The samples were then dried and all specimens of foraminifera bearing protoplasm were picked, identified, counted and their density per cubic centimeter calculated for the different depths. In some cases, time permitted the removal and treatment of only the top and bottom fractions of a core.

Throughout the study, every precaution was taken to eliminate contamination. A 2-millimeter thickness was scraped from the outside of some of the cores and discarded in an effort to avoid contamination by vertical displacement of specimens within the coring device, and only those specimens were considered alive that clearly revealed the presence of protoplasm in the inside or near the opening of the shell. It is of some interest to note that shells having pyrite within them were practically nonexistent in the samples.

## RESULTS AND CONCLUSIONS

The maximum depth at which specimens containing protoplasm were found was 16 centimeters. A specimen of *Elphidium macellum* (Fichtel and Moll) was found at this depth in one core, while a specimen of *Epistominella exigua* (Brady) and one of *Elphidium magellanicum* Heron-Allen and Earland were found in a second.

Both the number of cores containing such specimens and the number of species encountered increase at a depth of 15 centimeters, where specimens of the following were found: *Buccella frigida* (Cushman), *Cibicides aknerianus* (d'Orbigny), *Elphidium articulatum* (d'Orbigny), *Trochammina inflata* (Montagu) and *Bolivina pseudoplicata* Heron-Allen and Earland.

*Elphidium gunteri* Cole, *Buliminella elegantissima* (d'Orbigny), and *Trochammina* ex gr. *squamosa* Jones and Parker were new additions at 14 centimeters and *Rotalia beccarii* (Linné) at 13.

With further decrease in depth, the number of species and individuals increases. The progression was slow in the interval from 12 to 14 centimeters and from 8 to 10 centimeters, during which the number of specimens was restricted and only *Bulimina patagonica* d'Orbigny and *Trochammina ochracea* (Williamson) were added, but the number of species encountered between 4 and 6 centimeters was almost twice that between 12 and 14.

The values obtained are summarized in the following tabulation:

| *Depth in Centimeters* | *Number of Species* | *Specimens per cc.* |
|---|---|---|
| 0-2 | 28 | 1.06 |
| 4-6 | 22 | 0.36 |
| 8-10 | 14 | 0.26 |
| 12-14 | 12 | 0.23 |
| 16 | 3 | 0.08 |

Of the three principal collecting areas, specimens containing protoplasm occurred at greatest depth (16 centimeters) near Quinta island. In the Zar inlet and Los Conejos island areas, maximum penetration was about 11 centimeters, while near Ipas pier only a few specimens (*Elphidium*) penetrated as far as 7 to 8 centimeters. Such a pattern seems to be related to sediment size, to which, in turn, available oxygen is, of course, related. According to Mr. J. Remiro (Museo Argentino de Ciencias Naturales "B. Rivadavia") a granulometric analysis of the samples, based on the Wentworth scale, has shown the following:

1. Near Quinta island, the sediment is a medium-coarse sand, most particles between 250 and 1000 microns. Isolated fragments of gravel size (greater than 1 centimeter) occur.
2. Between Zar inlet and Los Conejos island, the sediment is a fine-medium sand, most particles between 125 and 500 microns. Some isolated fragments of gravel size occur.
3. Near Ipas pier, the sediment is a clayey silt, most particles from colloidal size to 62 microns. Approximately 10 percent sand and gravel occurs.

The penetration of sediments by the foraminifera is greatest in the coarser sediments, found near Quinta island. One can then conclude that the vertical penetration is related to, and probably dependent in large part upon, aeration; but at the same time it should be emphasized that the oxygen requirements might actually be less than generally believed. The observations at Deseado Creek suggest that protoplasm-containing foraminifera might well be encountered at still greater depths in sediment, that the presence of such noted at a depth of 20 centimeters by Green (op. cit.), for example, might well be valid and not an indication of a technical failure.

Some further light on oxygen requirements might be shed by the observation that I have kept a small vial (35 mm. high, 23 mm. in diameter) of *Allogromia laticollaris* Arnold closed for a period of 21 days during the course of travels between San Francisco and Buenos Aires and that upon arrival in Argentina all specimens were alive and well preserved, this in spite of admonitions to open the vial periodically in order to improve the aeration of the sample.

The limited scope of this and previous studies permits no conclusions concerning survival rates for species in different sediment types, but extensive studies in this direction should prove instructive.

## REFERENCES CITED

BOLTOVSKOY, E., 1963a, The littoral foraminiferal biocoenoses of Puerto Deseado (Patagonia): Cushman Found. for Foram. Research, v. 14, no. 2, p. 58-70, textfigs. 1, pls. 1-2.

———, 1963b, Foraminíferos y sus relaciones con el medio: Mus. Argentino Cienc. Nat., Rev., Hidrobiol., v. 1, no. 2, p. 21-109.

———, 1965, Recolección de Foraminíferos en las aguas someras y su preparación: Centro de Invest. Biolog. Marina, Contr. Tecn. no. 1, Buenos Aires.

GREEN, K. E., 1960, Ecology of some Arctic Foraminifera: Micropaleontology, v. 6, no. 1, p. 57-78, textfigs. 1-9, tab. 1-6, pl. 1.

MYERS, E., 1943, Life activities of Foraminifera in relation to marine ecology: Amer. Philos. Soc., Proc., v. 86, no. 3, p. 439-458, textfigs. 1-7, pl. 1.

RICHTER, G., 1961, Beobachtungen zur Oekologie einiger Foraminiferen des Jade-Gebietes: Natur und Volk, v. 91, no. 5, p. 163-170, textfigs. 1-7.

———, 1964, Zur Oekologie der Foraminiferen. II. Lebensraum und Lebensweise von *Nonion depressulum, Elphidium excavatum* und *Elphidium selseyense*: Natur und Museum, v. 94, no. 11, p. 421-430, textfigs. 1-4.

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# 315. ANNOTATED BIBLIOGRAPHY OF PALEOZOIC NONFUSULINID FORAMINIFERA, ADDENDUM 3

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ABSTRACT

This addendum includes 115 annotated references pertaining to Paleozoic nonfusulinid Foraminifer and can be considered reasonably complete through the year 1963. As in previous bibliographies, (Toomey, 1959, 1961, 1963, 1965)[1], the aims are unchanged: (1) to summarize briefly the pertinent data contained in each article, (2) to list all new genera and species described therein, and (3) to denote, by brackets, all taxonomic changes noted from subsequent publications, thus making the bibliography a more useful working tool. An attempt is also made to evaluate the literature to date and possibly to delineate trends.

## INTRODUCTION

This annotated bibliography consists of 24 references containing original descriptions of genera and species, and taxonomic nomenclature of Paleozoic nonfusulinid Foraminifera. An additional 91 references that utilized smaller foraminifers in stratigraphic subdivision, and that mention incidental occurrences, are also included for completeness.

The 115 references have been annotated by this compiler. These annotations include geologic age, geographic locality, type of illustrations, original language, new forms described, and comments in brackets on taxonomic changes noted from subsequent publications.

This bibliography may be considered to be reasonably complete through 1963, with the exception of Soviet references which, owing to their general unavailability to most American workers, may be assumed to be only partially complete.

Including this addendum, the total number of annotated Paleozoic nonfusulinid foraminiferal references has reached 665. This compiler would appreciate the effort and cooperation of all Paleozoic foraminiferal workers in keeping him up to date on all new works that appear by sending pertinent reprints and separates when available.

## LITERATURE EVALUATION AND APPARENT TRENDS

Text Figure 1 is an attempt to show chronologically the distribution of articles relating to Paleozoic nonfusulinid Foraminifera according to designated geographic provinces. The inclusion of the present 115 references points out a potential trend not shown in previous plots. This is the pronounced increase of foraminiferal literature from Europe, Africa, and the Middle East (Column C). This trend is significant in that it demonstrates a growing interest there in the potential value of Paleozoic smaller foraminiferal studies.

In Text Figure 2 the foraminiferal literature output has been plotted according to geologic age. Similarly, as noted in earlier bibliographies, the overall trend remains essentially unchanged.

Of especial note is the somewhat alarming trend in the reduction of articles containing original descriptions of genera and species of Paleozoic nonfusulinid Foraminifera. Addendum 1 carries 50 references containing original descriptions of genera and species, addendum 2 contains 40, and this present bibliography contains only 24. Perhaps, this trend can be best explained by the fact that most of the recent literature is related to the usage of foraminiferal data for stratigraphic age determinations utilizing previously described foraminiferal species. This trend may be good for the science. However, it should be borne in mind that the foundation of the science is the description of new genera and species, and from this we must continue to expand and develop.

[1] Contr. Cushman Found. Foram. Research, v. 10, p. 71-105; v. 12, p. 33-46; v. 14, p. 77-94; v. 16, p. 1-21.

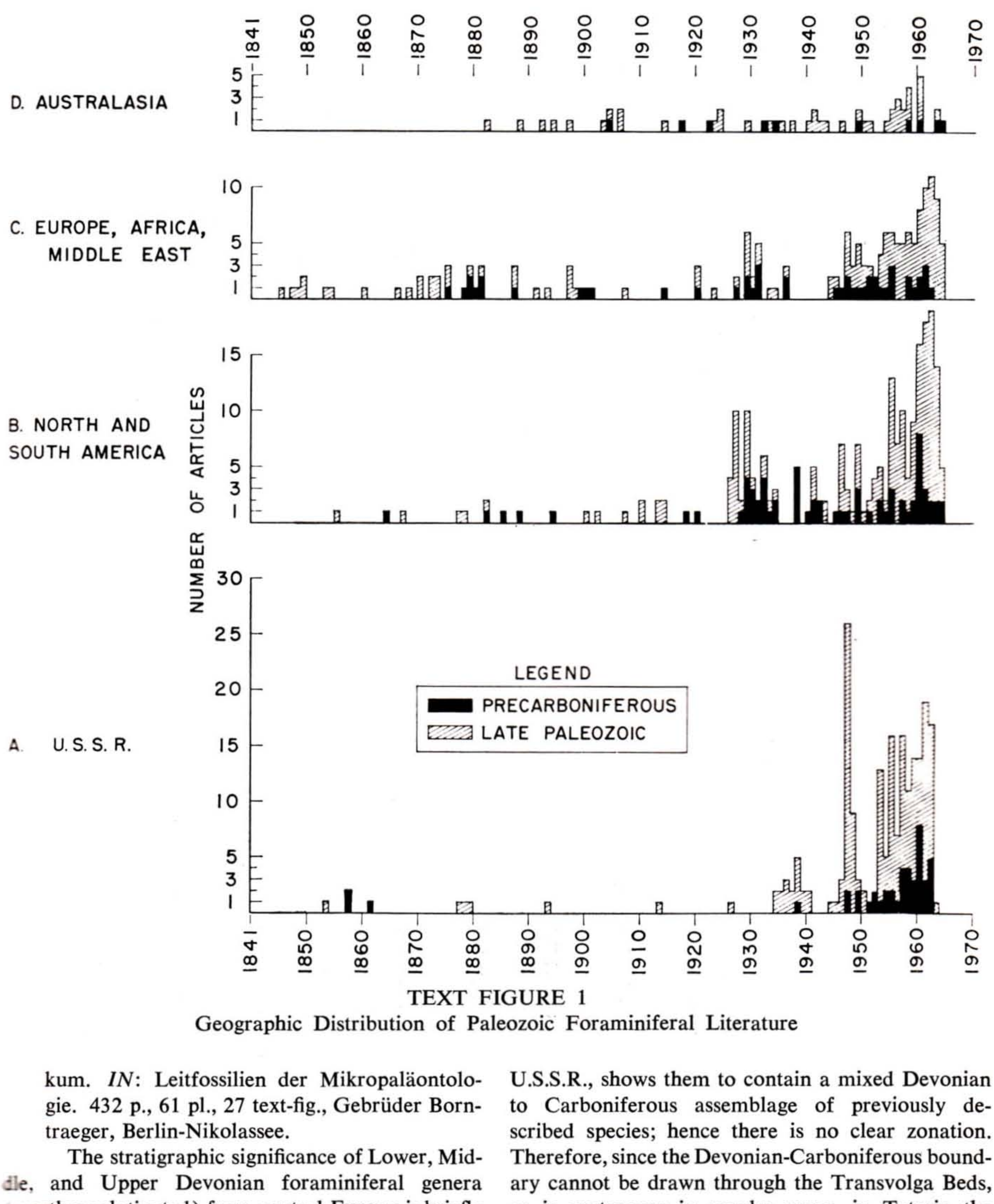
## ANNOTATED BIBLIOGRAPHY

### A. *PRECARBONIFEROUS FORAMINIFERA*

1. AFANAS'YEV, G. D., 1963, Devonian age of the phyllitic slates in the Urup River Basin (northern Caucasus): Akad. Nauk S.S.S.R., Doklady, v. 148, no. 2, p. 397-399, 3 text-fig., [in Russian].

   Metasedimentary phyllitic slates collected in the Urup River Basin (northern Caucasus) and formerly assigned to a Lower Devonian age, have, on the basis of fossils and absolute-age dating, been shown to be of Middle Devonian age. Present in the metasediments are a number of foraminifers whose skeletons have been largely recrystallized and replaced by minute tourmaline prisms, with the central portion filled by quartz. Identifiable foraminiferal genera include: *Eovolutina, Archaesphaera, Parathurammina, Irregularina, Paracaligella,* and *Vincinesphaera.* Thin-section photomicrographs of representative forms are included.

2. BARTENSTEIN, H., and BISCHOFF, G., 1962, Paläozoikum: Ausgewählte Beispiele aus dem deutschen und mitteleuropäischen Paläozoi-




TEXT FIGURE 1
Geographic Distribution of Paleozoic Foraminiferal Literature

kum. *IN*: Leitfossilien der Mikropaläontologie. 432 p., 61 pl., 27 text-fig., Gebrüder Borntraeger, Berlin-Nikolassee.

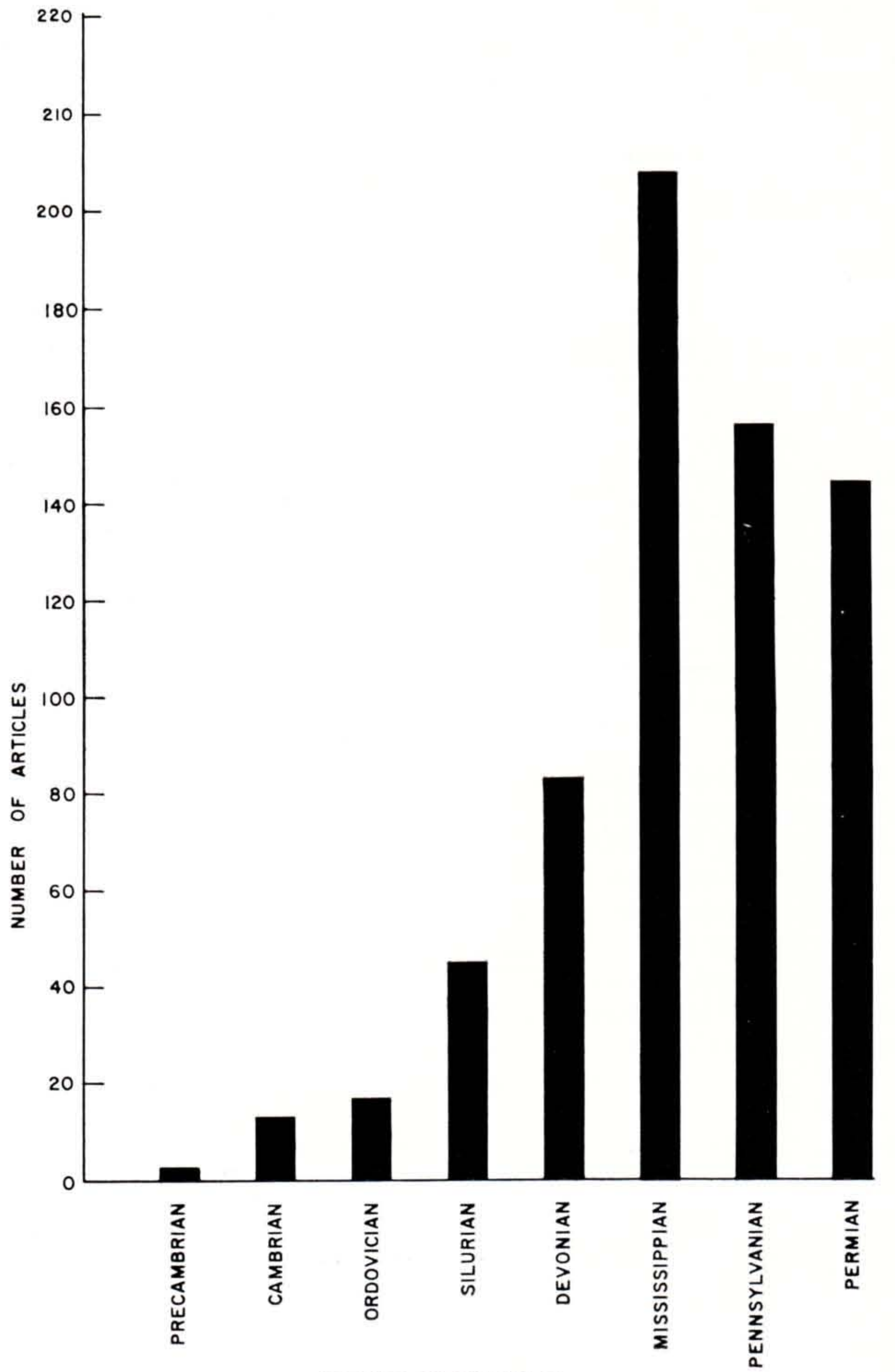
The stratigraphic significance of Lower, Middle, and Upper Devonian foraminiferal genera (mostly agglutinated) from central Europe is briefly discussed (p. 40-41), and evaluated in terms of present knowledge. Excellent whole-specimen photomicrographs of representative German Devonian forms are given on pl. 1.

3. BATANOVA, G. P., 1963, Stratigraphy of the Fammenian Stage of southeastern Tataria: Akad. Nauk S.S.S.R., Doklady, v. 150, no. 2, p. 365-368, [in Russian].

A study of the smaller Foraminifera and brachiopods of the Transvolga Beds, in Tataria, U.S.S.R., shows them to contain a mixed Devonian to Carboniferous assemblage of previously described species; hence there is no clear zonation. Therefore, since the Devonian-Carboniferous boundary cannot be drawn through the Transvolga Beds, as is customary in nearby areas, in Tataria the boundary must be placed either at the top or bottom of these beds.

4. BLUMENSTENGEL, H., 1963, Zur Mikrofauna des Thüringer Ockerkalkes (Silur): Geologie (Berlin), v. 12, no. 3, p. 349-354, 2 text-fig., [in German with English and Russian summary].

A fauna of three previously described species of agglutinated Foraminifera is described, along with silicified ostracodes and condonts, from the Silurian Ochre Limestone of Thuringer, East Ger-




TEXT FIGURE 2
Geological Distribution of Paleozoic Foraminiferal Literature

many. The described Foraminifera are: *Psammosphaera gracilis* Ireland, 1939 [now referred to *P. cava* Moreman, 1930; see Mound, 1961], *Lagenammina distorta* Ireland, 1939, and *Hyperammina* sp. cf. *H. harrisi* Ireland, 1939. All forms are illustrated by whole-specimen photomicrographs.

5. BROWNE, R. G., and SCHOTT, V. J., 1963, Arenaceous Foraminifera from the Osgood Formation at Osgood, Indiana: Bull. American Paleontology, v. 46, no. 209, p. 191-242, pl. 48-52, 2 text-fig., 1 table.

A large and diverse microfauna of agglutinated Foraminifera is described and illustrated by whole-specimen photomicrographs, from the Silurian (Niagaran) Osgood Formation exposed in the Southeastern Materials Corporation Quarry in Ripley County, Indiana. The microfauna consists of 24 genera and 63 species of which 1 genus and 12 species are new. The microfauna is represented by the following families: Astrorhizidae, Saccamminidae, Ammodiscidae, Hyperamminidae, and Trochamminidae. The microfauna comes from shale beds.

Of the Paleozoic foraminiferal studies made to date, the Chimneyhill Limesetone (Lower Silurian) of Oklahoma has the most species in common with this microfauna. The Brassfield Limestone (Lower Silurian) of Indiana is next.

The Osgood microfauna is associated with an abundant and varied macrofauna. All major phyla except Porifera are represented.

The new forms are: *Rhabdammina bifurcata, Ammodiscus biconvexus, A. compressus, A. moundi, Psammonyx campbelli, Lituotuba gallowayi, L. laticervis, Proteonina perryi, Tholosina acinaciforma, T. acuta, T. corniculata, T. rostrata,* and *Metamorphina* n. gen. with *Webbinella tholsus* (Moreman) as the type species.

Taxonomic changes include the following: *Psammosphaera gigantea* Dunn, 1942, is placed under *P. cava* Moreman [Mound, 1961, p. 27, placed *gigantea* under *P. laevigata* White]; *Webbinella gibbosa* Ireland 1939, is now placed under *Metamorphina gibbosa* (Ireland); *Sorosphaera geometrica* Eisenack, 1954, *Webbinella quadripartita* Moreman, 1933, and *W. tholsus* Moreman, 1933, are all placed under *Metamorphina tholsus* (Moreman); *Hyperammina casteri* Conkin, 1961, is placed under *H. conica* Gutschick, Weiner, and Young, 1961; and *Bathysiphon deminutionis* Moreman, 1930, and Stewart and Priddy, 1941, are placed under *Hyperammina deminutionis* (Moreman).

6. CHUVASHOV, B. I., 1963, Contribution to the ecology of late Frasnian Foraminifera and algae: Akad. Nauk S.S.S.R., Paleontol. Zh., No. 3, p. 3-9, 2 text-fig., [in Russian].

The facies distribution of Late Devonian (Frasnian) sediments of the Chusovaya Basin from the Volga-Ural Region and the western slope of the Urals, U.S.S.R., is briefly reviewed. Mega- and microfaunal characteristics for each facies, based upon previously described species, are given. The facies consist of the following: (1) amphiporoid-stromatoporid bioherms and biostromes, (2) brachiopod-algal bioherms, and (3) beds deposited in relatively deep-water basins and depressions. Foraminifera showed a definite correlation with distinct lithologic variation. They are divided into planktonic and benthonic forms, the latter subdivided into attached, free, and passive mobile. The latter category includes Foraminifera possessing tests of a regular spherical or oval form and with a thick wall that excludes them from a planktonic mode of life; they also have no visible means of attachment. Their movement along the bottom was accomplished by movements of the aqueous environment. The group of attached forms includes those possessing distinct organs of attachment, or an irregular large, thick-walled shell. The planktonic forms include Foraminifera with relatively symmetrical thin-walled tests. Employing such a subdivision, some representatives of one genus fall into several categories. Thus, the genus *Parathurammina* includes planktonic and benthonic forms; among the latter are attached, free, and passive-mobile forms.

The facies distribution of Foraminifera leading different modes of life show that the sessile and passive-mobile forms are most numerous in shallow-water facies.

The overwhelming majority of Foraminifera settled on sandy and locally hard, rocky bottoms. They are most abundant and diversified in calcareous sands and organic-detrital limestones. Environments in which fine carbonate muds accumulated were unfavorable for both Foraminifera and algae.

For convenience in analyzing distribution features of Foraminifera and algae in the different facies, the writer has classified these organisms according to their mode of life and illustrated them schematically in text-figure 2.

7. CONKIN, J. E., and CONKIN, B. M., 1964, Devonian Foraminifera: Pt. 1 The Louisiana Limestone of Missouri and Illinois: Bull. of American Paleontology, v. 47, no. 213, p. 53-105, pl. 12-15, 5 text-fig., 3 charts.

The agglutinated Foraminifera derived from the insoluble residues of the Louisiana Limestone of northeastern Missouri and western Illinois are described and illustrated by whole-specimen photomicrographs. From this uppermost Devonian (Fammenian) horizon, nine genera and eighteen species (of which six are new) are represented in the microfauna. The new forms are: *Crithionina psammosphaeraeformis, Amphitremoida eisenacki, A. huffmani, Thurammina adamsi, T. strickleri,* and *Aschemonella louisiana.*

Taxonomic assignments include the following: *Oxinoxis* Gutschick, 1962, *O. ligula* of Gutschick, Weiner, and Young, 1961, and *Tolypammina bulbosa* of Gutschick and Treckman, 1959, are emended. One species, *Saccammina ligula* Gutschick, Weiner and Young, 1961, is reallocated as the type species of the genus *Oxinoxis* Gutschick, 1962. Two species are placed in synonymy: *Tolypammina sperma* Gutschick, Weiner, and Young, 1961, is a junior subjective synonym of *T. jacobschapelensis* Conkin, 1961; *Tolypammina continuus* Gutschick, 1962, is a junior subjective synonym of *T. bulbosa* Gutschick and Treckman, 1959. *Hyperammina sappingtonensis* Gutschick, 1962, is probably a junior subjective synonym of *H. kahlleitensis* Blumenstengel, 1961, but the synonymy is not formalized. *Amphicervicis* Mound, 1961, is probably congeneric with *Amphitremoida* Eisenack, 1937.

Pertinent paleoecologic observations as to the environment of deposition are also given.

8. JOHNSON, J. H., 1964, Lower Devonian algae and encrusting Foraminifera from New South

Wales: Jour. Paleontology, v. 38, no. 1, p. 98-108, pl. 25-29, 1 text-fig.

The writer reports the occurrence of an encrusting foraminifer, associated with the algae *Girvanella* and *Rothpletzella*, from the Lower to Middle Devonian Nubrigyn Formation of New South Wales, Australia. It is noted that these forms are similar to those reported by Wood (1948) who referred them under the foraminiferal genus *Wetheredella*. Two thin-section photomicrographs are included on plate 28.

9. LYUBTSOV, V. V., 1962, Organic remains in the most ancient sedimentary and metamorphic sequences of the Kola Peninsula: Izv. AN S.S.S.R. Ser. Geol. No. 10, p. 69-73, 1 pl., 1 text-fig., [in Russian].

Questionable fossil remains assigned to the Foraminifera have been reported from undifferentiated Proterzoic (Precambrian) sediments of the Imadra-Varguza Formation, exposed on the Kola Peninsula of northern Russia. The un-named supposed foraminifer is illustrated by one rather poor, nondescript, thin-section photomicrograph.

10. MALAKHOVA, N. P., 1963, A new foraminiferal genus from the Lower Devonian of the Urals: Akad. Nauk S.S.S.R. Paleontol. Zh., No. 2, p. 141-144, 1 text-fig., [in Russian].

A new foraminiferal genus and species, *Ivdelina elongata*, is described from the Lower Devonian rocks of the Ural Mountains and illustrated by thin-section photomicrographs. This new calcareous encrusting foraminifer is morphologically similar to the younger foraminiferal genus *Tuberitina* Galloway and Harlton, described from the Pennsylvanian of Oklahoma.

11. MILON, Y., 1932, Étude préliminaire de la Microfaune des Calcaires frasniens de Cop-Choux (Loire-Infèrieure): Geol. Soc. France, C. R. Séances, no. 5, p. 68-69, [in French].

The writer reports the presence of rare smaller Foraminifera from the Upper Devonian (Frasnian) rocks of Cop-Choux (Loire-Inférieure) of the Massif Amoricain. The Devonian foraminifers are not formally named, but one form morphologically resembles the genus *Rotalia*, and another form with a thick fibrous wall is reminescent of the Permian foraminifers *Lingulina szechenyii* and *L. nankingensis* described by Lörenthey from China. The writer further notes that these lingulinids are similar to the nodosarids reported from the Carboniferous of western Europe. Blue-green alga of the genus *Girvanella* are also present in this foraminifer-bearing interval.

12. MOUND, M. C., 1963, Silurian arenaceous Foraminiferida from northern Indiana cores (Abstract): Program Geol. Soc. America Meeting, New York City, Nov. 17-20, p. 119A.

A microfauna of 82 agglutinated species is reported from 5 deep-well cores in northern Indiana. The microfauna represents the families Ammodiscidae, Astrorhizidae, Saccamminidae, and Aschemonellidae.

Foraminiferal species subdivide the section into 3 biostratigraphic zones: (1) the lower characterized by *Turritellella* and variably restricted to the Brassfield Limestone and/or the basal 20 feet of overlying lower Niagaran rocks in the area; (2) a middle zone characterized by *Ammodiscus* and *Thurammina*, which generally includes the remainder of pre-Waldron rocks; and (3) an uppermost zone characterized by *Ammodiscus* and *Lituotuba* and including the Louisville Limestone Mississinewa Shale, and Liston Creek Limestone. The Kokomo Limestone and associated rocks contain few foraminifers and are hence not zoned faunally.

Silurian foraminifers of northern Indiana are most abundant in granular, relatively pure, biofragmental carbonate rock, lithologically reflecting optimum ecological conditions for growth of marine invertebrates in shallow water.

13. PRONINA, T. V., 1963, Foraminifera and some associated microorganisms from the Silurian of the Ufa Amphitheatre: Akad. Nauk, S.S.S.R., Paleontol. Zh., No. 4, p. 3-13, 2 pl., 1 table, [in Russian].

The Middle and Upper Silurian rocks of the Ufa Amphitheatre, U.S.S.R., have yielded a foraminiferal microfauna of 14 species, of which 2 genera and 5 species are new. The new forms are described and illustrated by thin-section photomicrographs; they are: *Parathurammina polygona, Serginella scabruma* n. gen., *Cribrosphaeroides* (*Cribrosphaera* Reitlinger, 1954) *enormis, Arakaevella arakaica* n. gen., and *Archaelagena rotunda*.

14. REINHARD VON, W., 1961, Stratigraphie und Fauna des älteren Paläozoikums (Silur, Devon) in Paraguay: Geol. Jb., v. 78, p. 29-102, 6 pl., 10 text-fig., [in German with English, French, and Spanish abstracts].

The Silurian Lower Llandovery rocks (Vargas Peña Shales) of eastern Paraguay, South America, have yielded an agglutinated assemblage of four distinctive foraminifers. The Foraminifera, listed only, consist of: *Reophax* sp., *Hyperammina* sp., *Pelosina?* sp., and *Thurammina* sp.; foraminiferal identifications are by Hiltermann.

15. RICH, M., 1965, "Calcispheres" from the Duperow Formation (Upper Devonian) in western North America: Jour. Paleontology, v. 39, no. 1, p. 143-145, pl. 20.

Microscopic forms previously referred under "calcisphere de forme A" of Lombard and Monteyne (1952), and now thought to be foraminifers of the genus *Umbellina* (Maslov), are described from the subsurface Upper Devonian Duperow Formation of western North Dakota. The foraminifers are illustrated by random-cut thin-section photomicrographs. This marks the first published occurrence of this distinctive foraminifer from the Upper Devonian of North America. [See the following articles for previously reported foreign occurrences of Middle and Upper Devonian *Umbellina*: Maslov (1950), Lipina (1950), Reitlinger (1954), Bykova and Polenova (1955), Konolipina (1959), Illyina (1961), Menner (1961), Miklukho-Maklay (1961), Shevchenko (1961), and Ozonkowa (1962)].

16. SECRIST, M. H., 1934, Technique for the recovery of Paleozoic arenaceous Foraminifera: Jour. Paleontology, v. 8, no. 2, p. 245-246.

Briefly describes a method for recovering delicate agglutinated foraminifers from hydrochloric acid insoluble residues of lower and middle Paleozoic limestones.

17. SHEVTSOV, S. I., and MARTYNENKO, G. I., 1962, Data on the stratigraphy of the carbonate section of Devonian age in the Kama-Kinel Basin: Aca. Nauk U.S.S.R., Doklady, v. 144, no. 5, p. 1132-1135, [in Russian].

Recent drilling data show that the carbonate section of Devonian age of the Kama-Kinel Basin, U.S.S.R. (Tataria) comprises the Frasnian and Fammenian Stages. Previously described foraminiferal species of the genera *Quasiendothyra, Klubovella,* and *Parathurammina,* characterize the Fammenian Stage.

18. SONNENFELD, P., 1964, Fammenian reefs in Alberta, Canada (Abstract): Am. Assoc. Petroleum Geologists, Bull., v. 48, no. 4, p. 548.

The writer reports individual nodosarid foraminifers from the Devonian, (Fammenian) Wabamun Group, in the subsurface of northeastern Alberta, Canada. The foraminifers occur in the muds adjacent to stromatoporid mounds and are associated with dasyclad alga of the genus *"Mizzia."*

19. TOOMEY, D. F., 1965, Upper Devonian (Frasnian) Foraminifera from Redwater and South Sturgeon Lake Reefs, Alberta, Canada: Canadian Petroleum Geol., Bull., v. 13, no. 2, p. 252-270, 4 pl., 3 text-fig.

Calcareous Foraminifera found in well cores that penetrated the Upper Devonian (Frasnian) Leduc Member of the Woodbend Formation in the Redwater and South Sturgeon Lake Reefs, Alberta, Canada, have been studied from randomly oriented thin-sections. Tikhinellid foraminifers (*Paratikhinella* and *Tikhinella*) dominate the assemblage. However, distribution patterns of the tikhinellids and specimens described under the genus *Parathurammina* show an interesting relationship of biota to lithology in the Redwater Reef. The tikhinellids are restricted to the reef margin, where the characteristic rock type is grainstone. Conversely, the parathuramminids are distributed centerward two miles or more from the reef margin, in association with calcispheres, where pelletoidal wackestone is the dominant rock type. Rare occurrence of other foraminifers is noted; all forms are fully described and illustrated by thin-section photomicrographs. Foraminifera are rare from the South Sturgeon Lake cores, primarily due to dolomitization, hence no meaningful distribution pattern could be ascertained. No agglutinated foraminifers were present in the formic acid-insoluble residues from the entire interval.

A brief discussion of all known Devonian foraminifera horizons in North America is given, and future stratigraphic and ecologic potentiality of Devonian Foraminifera is briefly discussed.

20. VARSANOF'EVA, V. A., and REITLINGER, E. A., 1962, Characteristics of the Upper Devonian and Tournaisian deposits of the Lesser Pechora: Byul. Mosk. Obshchestva Ispytatelei Prirody, Otd. Geol., v. 37, no. 5, p. 36-60, 2 pl., 2 tables, [in Russian].

From the basin of the Lesser Pechora River, west of the Urals in northern Russia, the transitional boundary beds from the Upper Devonian to Lower Carboniferous have yielded a distinctive microfauna. The Devonian portion contains the following new forms: *Parathurammina breviradiosa, P. paracushmani petschorica* n. subsp., *P. praetuberculata ramosa* n. subsp., *Petchorina schezhimovensis* n. gen. (all Frasnian), *Evolutina* (?) *mirabilis* (Frasnian and Fammenian), and *Caligella multiseptata* (Fammenian). Excellent thin-section photomicrographs of all forms are included.

21. WOLF, K. H., 1965, Petrogenesis and paleoenvironment of Devonian algal limestones of New South Wales: Sedimentology, v. 4, no. 1/2, p. 113-178, 40 text-figs., 7 tables.

The writer reports the presence of the encrusting foraminifer *Wetherdella* in the Tolga Calcarenite and Red Hill Limestone of the Lower Devonian algal reef complex of western Australia (New South Wales). [See Johnson 1964, for a formal description of *Wetherdella* from the overlying Nubrigyn Formation.]

## B. *LATE PALEOZOIC FORAMINIFERA*

22. ANDERSON, F. W., 1964, *Aschemonella longicaudata* sp. nov. from the Permian of Derby-

shire, England: Geol. Mag., v. 101, no. 1, p. 44-47, pl. 1, 1 text-fig.

Core samples from the Lower Permian Grey Marls of the Lowpit Lane Borehole, Derbyshire, included numerous examples of a new species of the genus *Aschemonella* at two stratigraphic horizons (107 ft., and 124 ft. 10 in.). This new agglutinated foraminifer is described as *A. longicaudata,* and is illustrated by camera lucida drawings.

The writer notes that at the 107 ft. level associated Foraminifera included: *Agathammina pusilla* (Geinitz) (dominant) - accompanied by *Ammodiscus roessleri* (Schmid), *Dentalina perminana* King, *Nodosaria jonesi* Richter, *Stacheia polytrematoides* Brady *non* Schwellwien, and *Textularia multilocularis* Reuss, together with numerous examples of a small undescribed species of *Aschemonella.* At the lower level (124 ft. 10 in.) the microfauna consisted almost entirely of *Ammodiscus roessleri* and the new species.

The writer suggests that it is possible that in *Aschemonella* species the chambers were in life joined together in a linear series. Text fig. 1 shows a possible growth form of *A. longicaudata* in which three individuals are serially connected.

23. ANSARI, H. J., 1965, Geology of southern Meyaneh Basin in Azarbayzan, Iran: Am. Assoc. Petroleum Geologists, Bull., v. 49, no. 1, p. 88-97, 1 text-fig.

In the northwestern section of Iran (southern Meyaneh Basin in Azarbayzan), from the Qazi Kand Locality, a 378 foot interval of dolomitic limestone, designated as Carboniferous in age, has yielded the following representative smaller foraminiferal genera: *Geinitzina, Palaeotextularia, Climacammina,* and *Cribrogenerina.*

24. AYZEBVERG, D. YE., BRAZHNIKOVA, N. YE., and POTIYEVSKAYA, P. D., 1963, Stratigraphy of the Middle Carboniferous of the south side of the Voronezh Massif: Akad. Nauk S.S.S.R. Doklady, v. 151, no. 5, p. 1153-1155, [in Russian].

Six biostratigraphic horizons, based upon previously described Middle Carboniferous smaller foraminifers, have been delineated as a result of studying well cores taken on the south side of the Voronezh Massif, near Strel'tsovka and Markovka, U.S.S.R.

25. BARTENSTEIN, H., 1948, Mikrofaunistische Gliederungsversuche im Ruhrkarbon: Glückauf, v. 84, pt. 25/26, p. 429-433, 7 text-fig., [in German].

A study of 800 samples from the Upper Carboniferous (Nammrian C-Westphalian A) of the Ruhr District of West Germany, has allowed the writer to delineate a number of marine intervals containing foraminifers. Only agglutinated foraminifers have been found. It is suggested that if calcareous forms did occur they have been destroyed by groundwater solution. It is alternately suggested that perhaps the depositional environment may have been inhospitable to calcareous foraminifers (i.e. substrate with pronounced reducing conditions). Within the marine horizons foraminifers are relatively abundant, with ostracodes next in abundance. No generic or specific identifications are given, but line drawings of representative forms are included.

26. BARTENSTEIN, H., and BISCHOFF, G., 1962, Paläozoikum: Ausgewählte Beispiele aus dem deutschen und mitteleuropäischen Paläozoikum. *IN*: Leitfossilien der Mikropaläontologie. 432 p., 61 pl., 27 text-fig., Gebrüder Borntraeger, Berlin-Nikolassee.

Briefly discusses the stratigraphic value of Permo-Carboniferous Foraminifera (mainly agglutinated forms) found in central Europe. Representative specimens are illustrated by excellent whole-specimen photomicrographs. Of especial interest are the specimens of *Textularia* sp. (pl. 3, fig. 1-7) from the Lower Carboniferous (Viséan) Erdbacher Kalk at the Iberg Quarry, Harz Mountains, West Germany.

27. BASS, N. W., and NORTHROP, S. A., 1963, Geology of Glenwood Springs quadrangle and vicinity northwestern Colorado: U. S. Geol. Survey Bull. 1142-J, 74 p., 2 pl., 1 text-fig., 2 tables.

Contains a list (table 2, p. 36) of previously described genera and species of common Lower Pennsylvanian Foraminifera from the Belden and Paradox Formations of the Glenwood Springs, Colorado area [Foraminifera identified by Henbest and Roberts].

28. BLUDOROV, A. P., 1962, New data on the age of the Sarayl strata of the lower Kama: Acad. Nauk S.S.S.R., Doklady, v. 144, no. 4, p. 871-874, [in Russian].

Recent paleontological data show that the Sarayl strata in the lower Kama Area are transitional between Tournaisian and Viséan in age. Previously described foraminiferal species in association with spores and brachiopods have aided in dating this sequence.

29. BÖGER, H., 1964, Paläkologische Untersuchungen an Cyclothemen im Ruhrkarbon: Paläontol. Zeit., v. 38, no. 3-4, p. 142-157, 7 text-fig., [in German].

The distribution of the marine Schieferbank Zone of the Upper Namurian C (Upper Mississippian) and the marine Sarnsbank Zone of the basal Westphalian A (Lower Pennsylvanian) throughout the entire Ruhr Region of West Germany permits an analysis of the relationship between sediment cycles and faunal rhythms. This relationship allows an interpretation of the biofacies. The evidence discloses that the faunal rhythms indicate less the changes in salinity, and more the shift of infaunas, epifaunas, and the associated nektonic faunas of a dynamically changing habitat.

Significantly, it is postulated that the smaller Foraminifera, all agglutinated forms in this instance, are an integral constitutent of the infaunal element that is associated with the *Lebenspuren* (*Planolites ophthalmoides* Jessen), and the inarticulate brachiopod *Lingula*. This association is characteristic of rhythm II of the biozones and thought to be indicative of relatively shallow near-shore waters.

30. Bogush, O. I., and Yuferev, O. V., 1962, Discovery of the Bashkir *Archaediscus* complex of Foraminifera in the central part of the west Siberian Depression: Akad. Nauk S.S.S.R., Doklady, v. 146, no. 5, p. 1150-1152, [in Russian].

Paleoclimatologic inferences relating to the west Siberian Depression are drawn from the inferred ecology of the Bashkir (Lower Pennsylvanian) *Archaediscus* foraminiferal complex. Abrupt changes in the foraminiferal assemblages on transition from the Urals-Tien-Shan Province to the west Siberian Depression and Taymir may be evidence of a former landmass which intensified the influence of climatic zones. All of the listed foraminifers have been previously described, and are from a well core taken in the central part of the west Siberian Depression near the village of Malo-Muromok. Significantly, it is noted that Rauser-Chernoussova's (1948) observation that the substitution of archaediscid foraminifers for a complex of other forms usually occurs on transition to a facies less favorable for the majority of Foraminifera. The present writers find that this overall change of the microfaunal aspect is accompanied by a reduction in the size and a pronounced increase in the numbers of the archaediscids.

31. Branson, C. C., 1964, Sessile Foraminifera in the Pennsylvanian of Oklahoma: Oklahoma Geol. Notes, v. 24, no. 8, p. 188-190, 1 text-fig.

The writer contends that Girty's genus *Serpulopsis* is based upon a presently unrecognizable fossil from rocks of medial Desmoinesian age in western Indiana; that Girty's Oklahoma specimens from the Wewoka are best classified, as Henbest (1963) did, as a new species, and that the Henbest name, *Minammodytes,* is actually a new genus (not merely a new name). It is further believed that Henbest intended only to place the identification of the Oklahoma specimens in synonymy, and that if types of *Serpulopsis insita* from Indiana be found, or should neotypes be described, and these prove to be like the Wewoka specimens, then the generic name *Minammodytes* would be a junior synonym, and if the Indiana form is specifically the same, *M. girtyi* would then be a junior specific synonym.

A list of some Pennsylvanian fossils from Oklahoma on which *Minammodytes* has been found is appended. [see Henbest (1963) and Loeblich and Tappan (1964) for additional comment.]

32. Brause, H., Hirschmann, G., and Tröger, K. A., 1962, Einige neue Ergebnisse aus dem Paläozoikum der Lausitz: Geologie, v. 6, p. 792-817, 2 pl., 4 text-fig., [in German with English and Russian summaries].

From Lausatia, East Germany, at the Camina-Berg, Lower Carboniferous (Viséan) rocks have been encountered by seven drillings during the geological mapping of the area. The Viséan rocks contained the following previously described Foraminifera: *Cornuspira prisca* (Rauser), *Glomospirella* sp., *Tetrataxis* sp. cf. *T. conica* Ehrenberg, and *Endothyra* sp. cf. *E. crassa* Brady. In addition, fusulinids of the genus *Parastaffella* were also recorded. The microfauna is described and illustrated by drawings and thin-section photomicrographs.

33. Bridges, L. W., 1964, Stratigraphy of Mina Plomosas-Placer de Guadalupe Area. *IN*: Geology of Mina Plomosas-Placer de Guadalupe Area, Chihuahua, Mexico: Guidebook West Texas Geol. Soc., Publ. No. 64-50, p. 50-59, 3 text-fig.

The writer reports the smaller foraminifer *Geinitzina* sp. from the Permian (Wolfcampian-Leonardian?) Plomosas Formation exposed at Cerro de Enmedio, Chihauhua, Mexico. The foraminifer is reported from the reef facies in association with fusulinids, sponges, and the problematical form *Tubiphytes*.

34. Conil, R., and Pirlet, H., 1963, Sur quelques Foraminifères Caractéristiques du Viséen supérieur de la Belgique (Bassins de Namur et de Dinant): Soc. Géol. Belgique, Bull., v. 72, pt. 2, p. 183-197, 3 pl., 1 text-fig., [in French].

A study of the smaller Foraminifera from a series of Lower Carboniferous (Viséan) sections in the Namur and Dinant Basins of Belgium has demonstrated the feasability of utilizing smaller foraminifers in subdividing a relatively thick carbonate section into a number of correlative faunal zones. In general, the foraminiferal sequence present in the Belgian Viséan may be characterized as follows: V2b = *Archaediscus krestovnikovi* Rauser; V3a = *Archaediscus convexus* Grozdilova and Lebedeva in association with *Plectogyra omphalota minima*

(Rauser and Reitlinger), *P. exelikta* Conil and Lys, and *P. foeda* Conil and Lys; V3b = *Howchinia* sp., *Archaediscus gigas* Rauser, and *A. mölleri* Rauser; V3bα = *Planoarchaediscus spirillinoides* (Rauser); V3b = *Cribrostomum mölleri* Conil and Lys, *Neoarchaediscus incertus* (Grozdilova and Lededeva), *Archaediscus approximatus Ganelina, Globoendothyra magna* (Grozdilova and Lededeva), *Bradyina rotula* (Eichwald), and *"Saccammina carteri."*

All of the characteristic forms are illustrated by excellent thin-section photomicrographs.

35. CONKIN, J. E., and CONKIN, B. M., 1964, Mississippian Foraminifera of the United States. Part 1 - The Northview Formation of Missouri: Micropaleontology, v. 10, no. 1, p. 19-47, pl. 1-2, 17 text-fig., 27 tables.

The Mississippian Northview Formation of southwestern Missouri contains abundant agglutinated Foraminifera consisting of 15 identifiable species (6 new) and 3 unidentifiable species, belonging to 10 genera. The contained Foraminifera and the absence of the definitive Osagian species *Hyperammina kentuckyensis* (present in the overlying Pierson Formation) indicate a late Kinderhookian age for the Northview Formation.

The new species are: *Reophax northviewensis, Tolypammina frizzelli, T. gersterensis* [the tolypaminids should probably be referred under the genus *Minammodytes;* see Henbest, 1964], *Ammovertella pikei, Ammobaculites beveridgei,* and *Trochammina mehli.*

Representative foraminiferal specimens are illustrated by whole-specimen photomicrographs.

It is suggested that the Northview and Hannibal Formations are largely contemporaneous shale-siltstone facies of the Compton-Sedalia-Chouteau Limestones.

36. CONKIN, J. E., and CONKIN, B. M., 1965, Pre-Pennsylvanian arenaceous Foraminifera of North America (Abstract): 22nd Int. Geol. Congr. Prog. p. 114-115.

A review of the North American occurrences of Pre-Pennsylvanian agglutinated foraminiferal faunas with emphasis upon stratigraphic occurences, possibly exclusiveness, evolutionary lineages useful in age determination, regional zonation, and inter-regional correlation, indicates that the Mississippian agglutinated Foraminifera have the greatest potential of those of any Paleozoic System.

Studies to date show that 4 species range from Upper Devonian to Upper Osagean; 2 species are found only in the Upper Devonian and Kinderhookian; 8 species are restricted to the Kinderhookian and 11 species to the Kinderhookian and lowermost Osagean; and that 6 species are found only in the Osagean.

The writers believe that the rate of evolution in agglutinated Foraminifera is fast enough, and their geographic distribution cosmopolitan enough, to permit their use in regional zonation and inter-regional correlations.

37. COOGAN, A. H., 1964, Early Pennsylvanian history of Ely Basin, Nevada: Am. Assoc. Petroleum Geologists, Bull., v. 48, no. 4, p. 487-495, 6 text-fig.

From the Pennsylvanian upper Morrowan strata (Ely Limestone and Bird Spring Formation *pars*) of the Ely Basin, Nevada, the writer reports *Climacammina, Tetrataxis,* and abundant ammovertellids. Abundant ammovertellid and paleotextularid foraminifers are also reported from the lower Derryan zone of *Profusulinella,* and from the upper Derryan zone of *Fusulinella* paleotextularid foraminifers are also common.

38. CRESPIN, I., 1961, Foraminifera in Australian Permian stratigraphy (Abstract): Proc. 9th Pacific Sci. Congr., Pacific Sci. Assoc. 1957, v. 12, Geol. and Geophy., p. 254.

A brief résumé noting the presence of significant Permian smaller foraminiferal horizons in Australia. It is further noted that the foraminiferal assemblages in the subsurface are characterized by numerous calcareous tests of the family Lagenidae, whereas agglutinated forms dominate most of the outcrop occurrences. Eight foraminiferal assemblages have been recognized in the Australian Permian; these should be useful in stratigraphic studies. [See Crespin, 1958, for systematic descriptions of the above microfauna.]

39. CRESPIN, I., 1964, Catalogue of fossil type and figured specimens in western Australia: Bur. Min. Res., Geol. and Geophys., Rept. No. 71, 113 p., 1 text-fig.

Under the section on Foraminifera (p. 22-34), 17 Lower Permian foraminifers from Western Australia are listed as primary and secondary types that are deposited at the University of Western Australia. The types are: *Ammobaculites woolnoughi* Crespin and Parr, 1941; Parr, 1942; Crespin, 1958 (Hypotype), *Ammodiscus nitidus* Parr, 1942; Crespin, 1958 (holotype), *A. wandageeensis* Parr, 1942; Crespin, 1958 (holotype), *Calcitornella stephensi* (Howchin), 1894; (Chapman and Howchin) 1905; Chapman, Howchin, and Parr, 1934; Crespin, 1945; Crespin, 1958 (hypotype), *Crithionina teicherti* Parr, 1942 (holotype), *Glomospira adhaerens* Parr, 1942 (holotype), *Hyperammina coleyi* Parr, 1942; Crespin, 1958 (holotype), *H. ? rudis* Parr, 1943 (holotype), *Hyperamminoides acicula* Parr, 1942 (holotype), *Psammosphaera pusilla* Parr, 1942; Crespin, 1958 (holotype), *Reophax tricameratus* Parr, 1942; Crespin, 1958 (holotype), *R. subasper* Parr, 1942; Crespin, 1958 (holotype), *Streblospira australae* Crespin and Belford, 1957; Crespin, 1958, *Thurammina papillata* Brady, 1879; Parr, 1942 (hypotype), *Tolypammina undulata* Parr, 1942; Crespin, 1958 (holotype), *Trepeilopsis australiensis* Crespin, 1958 (paratype), and *Trochammina subobtusa* Parr, 1942; Crespin, 1958 (holotype).

40. CRESSMAN, E. R., and SWANSON, R. W., 1964, Stratigraphy and petrology of the Permian rocks of southwestern Montana: U. S. Geol. Survey Prof. Paper 313-C, p. 275-569, pl. 14-25, fig. 87-156, 2 tables.

Primarily a monograph on the stratigraphy and petrology of the Permian rocks of southwestern Montana. However, Figure 110 (p. 309) shows a thin-section photomicrograph of the cherty phosphorite lithology, common in the Phosphoria Formation, and containing abundant foraminiferal tests which form the nuclei of many of the phosphorite pellets. The illustrated phosphorite lithology is from the Madison Range. It is noted in the text that a few pellets contain silt inclusions arranged in loops and swirls that may be tests of agglutinated Foraminifera.

41. CRONEIS, C., and TOOMEY, D. F., 1965, Gunsight (Virgilian) wewokellid sponges and their depositional environment: Jour. Paleontology, v. 39, no. 1, p. 1-16, pl. 1-7, 2 text-fig.

Primarily a paper dealing with Pennsylvanian (Virgilian) calcareous sponges from the Graham Formation of northcentral Texas. Paleoecological data based principally on a thorough study of the smaller foraminifers (calcareous forms observed in thin-section, agglutinated whole-specimens derived from formic acid residues, and agglutinated and calcareous whole-specimens derived from shale disintegration) has led the writers to postulate a relatively shallow-water depositional environment for the sponge-bearing shale, and the underlying and overlying carbonate units. All of the smaller foraminifers have been previously described, and all are illustrated by either thin-section or whole-specimen photomicrographs. The suggestion is made that *Globivalvulina* was probably an early pelagic form, and that its occurrence within the sponge-horizon is due principally to movement and segregation by ocean currents, and may be illustrative of a pelagic death assemblage. In addition, the occurrence of the agglutinated foraminifer *Textularia sensu stricto* in the Pennsylvanian of North America is corroborated.

42. CUMMINGS, R. H., 1961, Limestones of the Terbat Formation, West Sarawak: Ann. Rept. Geol. Survey Dept., British Territories in Borneo, p. 36-48, pl. 8-12, 1 text-fig., 2 tables.

A study of the Foraminifera (fusulinids and smaller foraminifers) from the Terbat Formation of West Sarawak, indicates that the forms are of the Wolfcampian Stage (Zone of *Pseudoschwagerina*), and hence of Lower Permian age. Foraminifers are rather scarce and in a poor state of preservation owing to a complex series of diagenetic effects, including compaction, recrystallization, brecciation, re-cementation, and silicification. All of the smaller foraminifers have been previously described from other regions and supply supporting evidence of and suggest local correlation with that of Sumatra and Malaya. Three plates of foraminiferal thin-section photomicrographs are included.

43. DANET, N., 1964, Carboniferous microfauna in the Calarasi Well: Petrol. Si Gaze., v. 15, no. 11, p. 581-585, 1 pl., 1 table, [in Rumanian].

The Carboniferous sequence present in test well 35 near Calarasi, Rumania, has a thickness of 1500 meters, and consists primarily of limestones. Microfossils (ostracodes and foraminifers) were recovered from cored intervals. The described foraminifers are: *Ammodiscus planus, Hyperammina kentuckyensis, Endothyra excentralis, Endothyranella cracoviensis, Hemigordius harltoni, Tetrataxis conica* and *Valvulinella youngi*. The writer notes that the microfossils suggest that most of the samples belong to the Lower Carboniferous (Tournaisian-Viséan), in spite of the fact that some of the forms noted above have been previously reported from the Namurian and Westphalian (Upper Carboniferous).

44. DERVILLE, P. H., 1931, Les Marbres du Calcaire Carbonifère en Bas-Boulonnais: Ph.D. Dissertation, Inst. Geol. Sci. Strasbourg, Foraminifera, p. 115-130, pl. 16-17, text-fig. 16-20, [in French].

The writer reports numerous smaller Foraminifera from the Lower Carboniferous rocks of the Bas-Boulonnais Region of northeastern France. The following forms are noted: *Endothyra, Ammodiscus,* Textilaridae [Palaeotextulariidae], and *Archaediscus*. Excellent thin-section photomicrographs and drawings are included. A brief discussion of the microstructure of the test wall is also given.

45. DESSAUVAGIE, T. F. J., and DAGER, Z., 1963, Occurrences of Lasiodiscidae in Anatolia: Bull. Min. Res. and Expl. Inst. of Turkey, No. 60, p. 76-84, 4 pl., 12 text-fig.

From West Anatolia, Turkey, one new species, *Lasiodiscus sellieri*, is described from rocks of Middle Carboniferous age. Associated with this new species are the following previously described Foraminifera: *Permodiscus rotundus* Chernysheva, *Tetrataxis* sp., *Bradyina* sp. cf. *B. samarica* Reitlinger, and *Tuberitina bulbacea* Galloway and Harlton. In addition, other species of *Lasiodiscus* and

*Lasiotrochus* from the Permian of this region are compared to previously described forms.

From the Ankara Region of Turkey three previously described species of *Lasiodiscus* are reported from the Middle Permian.

All forms are illustrated by both thin-section photomicrographs and drawings.

46. DOLUDA, M. YE., LITVIN, S. W., and POGREBNYAK, V. A., 1962, Contribution to the lithology and stratigraphy of the Upper Carboniferous province transitional between the Donbas and the Dneiper-Donets Basin: Akad. Nauk S.S.S.R., Doklady, v. 145, no. 6, p. 1356-1359, 2 tables [in Russian].

Three Upper Carboniferous suites, lithologically and paleontologically similar to the Carboniferous of the Donbas, are distinguished in the transitional province between the Donbas and the Dneiper-Donets Basin of the Soviet Union. Microfaunal data is principally furnished by the Fusulinidae, although a few previously described smaller foraminifers are mentioned. All faunal data is derived from well samples.

47. FOURMARIER, P., and CONIL, R., 1964, Le Lambeau de Tournaisian inférieur au Nord de Polleur: Soc. Géol. Belgique, Annales, v. 87, no. 8/9, p. 295-303, 4 text-fig., [in French].

The writers report that north of Polleur, Belgium, a Lower Carboniferous (Tournaisian) structural block containing crinoidal limestones, has yielded an interesting smaller foraminifer assemblage consisting of: *Bisphaera* sp., *Paracaligella antropovi* Lipina, representative Tournayellidae, and *Quasiendothyra.*

48. FREEMAN, T., 1964, Algal limestones of the Marble Falls Formation (Lower Pennsylvanian), central Texas: Geol. Soc. America, Bull., v. 75, no. 7, p. 669-676, 3 pl., 3 text-fig.

The writer briefly notes the occurrence of smaller foraminifers ("calcitornellids," paleotextulariids, *Bradyina,* and fusulinids) from the middle member of the Pennsylvanian (Atokan), Marble Falls Formation, of central Texas.

49. GERKE, A. A., 1957, Some important features of the internal structure of Foraminifera of the lagenid family in material of Permian, Triassic, and Liassic deposits of the Soviet Arctic: Sbornik Statei po Paleont. i Biostrat., Publ. Inst. Geol. Arktiki, Leningrad, No. 4, p. 11-26, 5 text-fig., [in Russian].

A discussion of the internal structures of representative forms of the family Lagenidae from rocks of Permian-Jurassic age from the Soviet arctic provinces. Of especial note is the résumé on lagenid apertures, overall morphology, and test-wall microstructure. Line drawings of pertinent foraminiferal internal structures are included.

50. GERKE, A. A., 1959, A new series of *Nodosaria*-like Foraminifera and a definition of characteristics of the genus *Nodosaria*: Leningrad, Nauchno. Issledov., Inst. Geol. Arktiki, Sbornik (Trudy), No. 17, p. 41-59, 3 pl., [in Russian].

In the process of emending the Late Paleozoic nodosarid-like Foraminifera the writer has erected one new genus, *Protonodosaria,* with *Nodosaria proceraformis* Gerke, 1952, as the genotype. The form *Nodosaria procera* Rauser-Chernoussova, 1949, is herein placed under *Protonodosaria rauserae* Gerke, and the form *Nodosaria praecursor* Rauser-Chernoussova, 1949, is placed under *Protonodosaria praecursor* (Rauser). Drawings and thin-section photomicrographs are also included.

51. GLAUS, M., 1964, Trias und Oberperm im zentralen Elburs (Persien): Eclogae Geol. Helvetiae, v. 57, no. 2, p. 497-508, 3 pl., 3 text-fig., [in German].

The writer reports the occurrence of the smaller foraminifers *Pachyphloia* sp. *Geinitzina* sp., nodosarids, and palaeotextularids from the Upper Permian Nesen Formation of central Iran.

52. GOLUBTSOV, V. K., 1962, Sediments of the Myachkov Horizon of the Moscovian Stage in the Pripyat Depression: Akad. Nauk S.S.S.R., Doklady, v. 145, no. 2, p. 377-380, [in Russian].

Three Moscovian (Middle Pennsylvanian) suites in the Pripyat Depression of the Soviet Union are described on the basis of their characteristic foraminiferal elements. The foraminiferal microfaunas, both fusulinids and smaller foraminifers, have all been previously described. The microfauna in the topmost suite suggests a link with the Moscow Basin in Moscovian times.

53. GROZDILOVA, L. P., 1960, Methods for the studies of Paleozoic Foraminifera. *IN*: Results of the first seminar on the microfauna. N. N. Subbotina, Editor, Vses. Neft. Nauk-Issl., Geol. Inst., Trudy, Leningrad, p. 22-47, 5 pl., 10 text-fig., [in Russian].

A concise compendium describing the thin-section methods employed in the study of Paleozoic Foraminifera (fusulinid and non-fusulinid Foraminifera). Drawings and thin-section photomicrographs of pertinent forms are given.

54. HAYNES, J., 1965, Symbiosis, wall structure and habitat in Foraminifera: Contr. Cushman Found. Foram. Research, v. 16, pt. 1, p. 40-43.

The writer notes that while it is true that foraminiferal wall structure is a character of taxonomic significance, it does not follow that it is not an adaptive characteristic. Recent work on living Foraminifera suggests that algal symbiosis and radial hyaline wall structure may be related. Significantly, this provides a clue towards an understanding of the reasons for the rise of radial wall structure and perhaps, also the reasons for the striking modifications seen in the chamber shape and arrangement of some Foraminifera.

It is concluded that the varied types of foraminiferal test wall structure suggest that evolution has sometime followed curiously devious routes. This is to be expected if changes in wall structure are strongly adaptive and a feature of groups which adopted symbiotic life in shallow water at different times, to be replaced by others later. It is suggested that in a situation where rhythmic transgressions onto continental margins bring shallow water and lagoonal environments to a maximum, as may be postulated for the Late Paleozoic, these conditions would undoubtedly favor the evolution of Foraminifera with algal symbionts. The writer notes that granular genera, including the fusulinids and the first radial genera, *Archaediscus* and *Rastidiscus,* arose in the Lower Carboniferous, possibly under somewhat similar circumstances.

55. HOWE, W. B., 1956, Stratigraphy of pre-Marmaton Desmoinesian (Cherokee) rocks in southeastern Kansas: Kansas Geol. Survey, Bull. 123, 132 p., 10 pl., 8 text-fig.

In a study of the Pennsylvanian pre-Marmaton (Desmoinesian) rocks exposed in southeastern Kansas, the writer notes the occurrence of the encrusting foraminifer *Ptychocladia* sp. undet. in the Mulky, Lagonda, Verdigris, Fleming, Seville, and Rowe Formations. *Tetrataxis* sp. undet. is reported from the Verdigris, Fleming, and Seville Formations. Other smaller Foraminifera (forms identified as *Plectogyra, Cribrostoma (sic), Rectocornuspira, Ammodiscus,* and *Climacammina*) occur in the Fleming and Seville Formations.

56. KNAUFF, W., 1963, Die ersten *Reophax* (Foram.) im Namur C des Ruhrkarbons: N. Jb. Geol. Paläont. Abh., v. 118, no. 1, p. 27-29, pl. 2, [in German].

This paper marks the first reported occurrence of the agglutinated foraminifer *Reophax* from rocks of Namurian C (Lower Pennsylvanian) age in the Ruhr District of West Germany. The described form, *Reophax* cf. *R. tumidulus* Plummer, is illustrated by a series of whole-specimen photomicrographs and one thin-section photomicrograph. Associated with *Reophax* are silicified gastropods and pelecypods.

57. KNAUFF, W., 1963, Zur Mikrofauna im Oberkarbon der Bohrung Münsterland 1 und den Möglichkeiten ihrer stratigraphischen Auswertung: Fortschr. Geol. Rheinld. u. Westf., v. 11, p. 113-122, 1 pl., 1 table, [in German].

The writer reports the occurrence of a suite of smaller Foraminifera from a borehole that penetrated the Upper Carboniferous rocks in the Ruhr District of West Germany. None of the foraminifers have been formally described, but the following genera have been designated: *Ammodiscus, Glomospira, Glomospirella, Hyperammina, Reophax,* and *Agathammina.* The associated ostracode microfauna and the small invertebrates and conodonts appear to demonstrate that the penetrated interval has facies representative of non-marine, brackish, and marine environments. The foraminifers are illustrated by whole-specimen photomicrographs, and one group of photomicrographs shows forms embedded in xylol to increase the transparency of the specimens.

58. KNYAZEV, S. A., 1963, Microfossil complex in *Liorhynchus ursus* Nal. limestone of Chernyshev Ridge: Akad. Nauk S.S.S.R., Doklady, v. 150, no. 5, p. 1112-1115, 2 text-fig., [in Russian].

Previously described Lower Carboniferous-type multilocular foraminifers appear in Late Devonian (Fammenian) horizons on Chernyshev Ridge and in Chernov, Pay-Khor and Vaygach Island Uplifts earlier than in the western slope of the southern Urals and the eastern part of the Russian Platform; hence, the boundary problem in this region is complex. It is suggested that the boundary between the Devonian and Carboniferous sediments here should be drawn neither at the base of the *Quasiendothyra kobeitusana* (Raus.) Zone nor from the flood appearance of *Q. communis* (Raus.), but considerably higher up in the section. It is thought that wherever the Devonian-Carboniferous transitional beds are most fully represented the boundary should be placed at the base of the *Bisphaera* beds, which also carry the brachiopod *Spirifer (Paulonia)* cf. *S. medius* Leb.

59. KOCHANSKY-DEVIDÉ, V., 1954, Unterpermische Fusuliniden von Sustasi bei Bar in Crna Gora (Montenegro): Geol. Vjesnik, Zagreb, v. 8, p. 7-17, 2 pl., [in Serbian with German abstract].

Primarily a paper describing the Lower Permian fusulinid microfauna from Yugoslavia (Montenegro). The smaller foraminifers *Climacammina* sp. and *Tetrataxis maxima* Schellwien are reported from the fusulinid horizon.

60. KOCHANSKY-DEVIDÉ, V., 1957, Die Fundorte der Neoschwagerinenfaunen in Südlicher Crna Gora: Geol. Vjesnik, Zagreb, v. 11, p. 21-44, 1 pl., 2 text-fig., [in Serbian with German abstract].

Primarily a fusulinid paper which reports the occurrence of the Permian (Leonardian Guadalupian) neoschwagerinid fauna from southern Montenegro (Yugoslavia). Described species of the following smaller foraminifer genera are reported from the fusulinid horizons: *Agathammina, Hemigordius, Pachyphloia, Climacammina, Cribrogenerina, Padangia, Geinitzina, Textularia, Globivalvulina, Ammodiscus, Glomospira, Nodosinella, Hemigordiopsis, Tetrataxis, Lasiotrochus, Bradyina, Endothyra, Bigenerina,* and *Colaniella.*

61. KOCHANSKY-DEVIDÉ, V., 1964, Die Mikrofossilien des jugoslawischen Perms: Paläont. Zeitschr., v. 38, no. 3/4, p. 180-188, pl. 18-19, 1 text-fig., [in German].

The writer presents a series of faunal lists of microfossils (algae, smaller foraminifers, and fusulinids) found to date in the Permian rocks of Yugoslavia. The following smaller foraminiferal genera are reported from Croatia, Slovenia, and Montenegro: *Endothyra, Bradyina, Tetrataxis, Palaeonubecularia* [probably a junior synonym of *Apterrinella*; see Henbest, 1963, p. 31], *Climacammina, Globivalvulina, Geinitzina, Lasiodiscus, Pachyphloia, Hemigordius, Glomospira, Lasiotrochus, Olympina, Valvulinella, Colaniella, Hemigordiopsis,* and *Frondicularia.*

62. KONISHI, K., 1959, Notes on some Japanese Permian and Cretaceous algae and their stratigraphic setting: Jour. Fac. Sci. Univ. Tokyo, v. 11, pt. 4, p. 441-456, pl. 29-31, 5 text-fig.

The writer reports the occurrence of the encrusting foraminifera *Tetrataxis* emeshed between the laminae of pyncnostroma-type Spongiostromata (oncolites) from the Permian Nabeyama Formation of central Honshu, Japan. The form is illustrated by one thin-section photomicrograph.

63. KREMP, G., 1951, Foraminiferen-und Ostracoden-Horizonte im produktiven Karbon des Ruhrgebeites: Glückauf, v. 87, no. 25/26, p. 596-600, 1 text-fig., [in German].

The writer describes and illustrates (text-fig. 1) the stratigraphic horizons which carry agglutinated Foraminifera (*Ammodiscus, Glomospira, Glomospirella,* and *Hyperammina*) in the Upper Carboniferous (Namurian C to Westphalian C) of the Ruhr Valley region of West Germany.

64. KRISTAN-TOLLMANN, E., 1963, Entwicklungsreihen der Trias-Foraminiferen: Paläont. Zeitschr., v. 37, p. 147-154, pl. 8-9, [in German].

In a brief outline of the salient features pertaining to the evolution of certain Triassic Foraminifera, mention is made of the ancestral Paleozoic generic stock, i.e., *Ammodiscus, Hemigordius, Archaediscus, Permodiscus,* and *Cornuspira.* An idealized evolutionary and stratigraphic diagram (pl. 8) shows the development of the Archaediscidae, Trocholinidae, and Cornuspirinae from Silurian to Upper Cretaceous time.

65. KUZNETSOV, YU. I., 1962, New deep drilling data (1959-1961) on the stratigraphy of the Lower Carboniferous of the Tatar A.S.S.R.: Akad. Nauk S.S.S.R., Doklady, v. 147, no. 2, p. 438-441 [in Russian].

This article presents new data on deep drilling and electric logging relating to the stratigraphy of the Lower Carboniferous (Tournaisian and Viséan Stages) in the Tatar A.S.S.R. (Soviet Union), mainly within the Kama-Kinel Basin. Fossil assemblages, including previously described foraminiferal species, from which stratigraphic determinations have been made, are listed and the thicknesses of stratigraphic units given.

66. LANE, N. G., 1964, Paleoecology of the Council Grove Group (Lower Permian) in Kansas, based upon microfossil assemblages: Kansas Geol. Survey Bull. 170, pt. 5, 23 p., 1 pl., 5 text-fig.

Shale samples were obtained at 1-foot intervals throughout a composite section of the Council Grove Group (Lower Permian) in northcentral Kansas. All samples were disaggregated and thoroughly searched for microfossils. All available microfossils were utilized. Eleven kinds of Foraminifera (calcareous and agglutinated genera) and 21 genera of ostracodes, as well as conodonts, holothurian sclerites, fish remains, inarticulate brachiopods, and charophytes were identified and their abundance plotted. Distinct microfaunal assemblages were recognized which reflect cyclothemic position of the beds and show a regular alternation that is judged to have paleoecologic significance. Paleoecology of the microfossils is interpreted by comparisons with living representatives, fossil associations, and type of shale matrix. A salinity gradient is postulated from fresh water through brackish to marine water, each category being represented by a distinctive suite of microfossils. Within beds laid down under marine conditions, different assemblages of microfossils are judged to have been controlled either by depth of water, salinity, or other ecologic factors.

It is noted that among the microfossils that most likely represent brackish-water depositional environments the agglutinated form *Ammodiscus* is perhaps the most characteristic.

67. LAPINA, N. N., 1963, Stratigraphy of the Lower Carboniferous sequence on the Siberian Platform: Akad. Nauk S.S.S.R., Doklady, v. 148, no. 5, p. 1168-1171, 1 table, [in Russian].

The stratigraphy of the Lower Carboniferous sequence of the Siberian Platform is described and classified by means of a correlation chart (Table 1). The Upper Tournaisian (Taydon Horizon or the *Spirifer ussiensis* Tolm. Zone) is characterized by a number of previously described endothyroid foraminifers identified for this study by Ganelina and Lebedeva.

68. LAPPARENT, DE. A. F., ET. AL., 1965, Sur les gisements à Fusulines de l'Afghanistan central: C. R. Acad. Sci., Paris, v. 260, No. 19, p. 5073-5075, [in French].

The writers report the occurrence of a typical Lower to Upper Permian fusulinid sequence from the rocks of central Afghanistan. Associated with the fusulinids is a rich assemblage of smaller foraminifers, for the most part previously described species, of which the following genera are represented: *Climacammina, Glomospira, Globivalvulina, Robuloides, Pachyphloia, Tetrataxis, Plectogyra, Spiroplectammina, Lunucammina, Ammodiscus, Hemigordius, Tuberitina,* and *Capidulina.* The algae *Mizzia* and *Permocalculus* are commonly found with the smaller foraminifers.

69. LIPINA, O. A., 1962, Comparison of some Tournaisian Foraminifera of the U.S.S.R. with those of West Germany: Akad. Nauk S.S.S.R., Doklady, v. 145, no. 1, p. 164-165 [in Russian].

From a comparison with the Lower Carboniferous (Tournaisian) smaller foraminifers of the U.S.S.R., doubt is cast on the assumed Viséan age of the Comblain-au-Pont beds at Hatenrat near Stolberg, West Germany. These limestones contain Foraminifera similar to those in the Cherepet Horizon (Tournaisian) of the Soviet Union. It is noted that the Lower Carboniferous and Etrenne Zone of western Europe have Foraminifera very similar to those of the eastern part of the Russian Platform and the western side of the Urals. It is believed that both parts of Europe formed a single zoogeographic province in the Early Carboniferous.

70. LISZKA, S., 1962, Stratigraphic importance of the Foraminifera of the Carboniferous System of Poland: Acad. Mining and Metallurgy in Cracow, Sci. Bull. No. 63, Trans., Bull. 13, 50 p., 1 pl., 1 table [in Polish with English summary].

From a borehole at Chelm I in the regions of Krakow and Walbrzych, Poland, numerous Carboniferous (Upper Viséan to Lower Westphalian) foraminifers have been obtained and identified. The foraminiferal assemblages are stratigraphically comparable with those described from the Soviet Union and North America. Such types as *Endothyranopsis* and *Loeblichia* are characteristic of the Viséan Stage. and the fusulinids *Staffella* and *Profusulinella* of the Westphalian Stage. It is noted that the genera *Paraendothyra* or *Quasiendothyra* disappear at the end of the Tournaisian Stage and are replaced by the *Endothyranopsis-Loeblichia* assemblage; at the end of the Viséan Stage the genera *Loeblichia, Forschiella,* and numerous representatives of *Plectogyra, Tetrataxis,* and *Valvulinella* disappear. In the Westphalian Stage new types, mainly fusulinids (*Ozawainella* and *Profusulinella*) appear. The statement is made that only agglutinated foraminifers are found in the clastic rocks, whereas in some shales such forms as *Loeblichia ammonoides* and *Tetrataxis conica* appear in great numbers.

One plate contains rather crude line-drawings of some of the more abundant foraminifers.

71. LISZKA, S., 1964, Occurrence of Lower Permian foraminifers in the Treskelodden Beds of Hornsund, Vestspitsbergen: Polish Acad. Sci., Stud. Geol. Polonica, v. 11, pt. 3, p. 169-172, [in English with Polish abstract].

Thin units of nodular limestone with abundant intercalated rugose coral horizons in the Late Paleozoic Treskelodden Beds of Hornsund, Vestspitsbergen, have been examined for foraminifers. The 3rd, 4th, and 5th coral horizons yielded a poor microfauna, with most forms specifically undeterminable. Most common within this interval are foraminifers belonging to the agglutinated genera *Glomospira, Tolypammina,* and *Ammovertella.* Those forms belonging to the calcareous genera *Nodosaria, Geinitzina,* and *Globivalvulina* are rarer. Fusulinid foraminifers (*Pseudofusulina* and *Schubertella*) are extremely rare. This assemblage most closely resembles that from the Sakmarian Stage in the Bashkirian Peri-Ural.

72. LOEBLICH, A. R., JR., and TAPPAN, H., 1963, Comments and counter proposal on the type-species of *Ammodiscus* Reuss, 1862 (Foraminifera). Z.N. (S.) 1087: Bull. Zoological Nomenclature, v. 20, pt. 2, p. 88-92.

In regards to the proposal of Macfadyen (1962) on the type-species of *Ammodiscus* Reuss, 1862, the above authors have petitioned the International Commission and has asked them,

(1) to use its plenary powers:

(a) to recognize the type designation as cited by Gerke, 1960, and by Loeblich and Tappan, 1961, for the nominal genus **Ammodiscus** Reuss, 1862, as **Ammodiscus infimus** Bornemann, 1874 (non **Orbis infimus** Strikland, 1846) = **Involutina silicea** Terquem, 1862; fixed by subsequent designation by Loeblich and Tappan, 1954, p. 306, emended Gerke, 1960, p. 7; Loeblich and Tappan, 1961, p. 191.

(2) to place the following generic names on the Official List of Generic Names in Zoology:

(a) **Ammodiscus** Reuss, 1862 (gender : masculine), type-species, by subsequent designation, Loeblich and Tappan, 1954, 1961 : **Ammodiscus infimus** Bornemann, 1874.

(b) **Involutina** Terquem, 1862 (gender : feminine), type-species, by subsequent designation of Bornemann, 1874, p. 711 : **Involutina jonesi** Terquem and Piette in Terquem, 1862, p. 461 = **Nummulites? liassicus** Jones in Brodie, 1853, p. 275.

(3) to place the following specific names on the Official List of Specific Names in Zoology:

(a) **silicea** Terquem, 1862, as published in the binomen **Involutina silicea** (senior synonym of **Ammodiscus infimus**, type-species of **Ammodiscus**);

(b) **arenacea** Williamson, 1858, as published in the binomen **Spirillina arenacea**, subsequently referred to **Ammodiscus** by Macfadyen, 1962, herein referred to **Glomospirella** Plummer, 1945;

(c) **liassicus** Jones, 1853, as published in the binomen **Nummulites? liassicus** (senior synonym of **Involutina jonesi**, the type-species of **Involutina**);

(d) **infimus** Strickland, 1846, as published in the binomen **Orbis infimus**, and as defined by the lectotype selected for the species by Barnard, 1954, subsequently referred to the genus **Spirillina** Ehrenberg, 1843.

(4) to place the following family-group names on the Official List of Family-Group Names in Zoology:

(a) AMMODISCIDAE Reuss, 1862 (nom. correct. Rhumbler, 1895, p. 83, pro family AMMODISCINEA Reuss, 1862, p. 365).

Additional comments supporting the Loeblich-Tappan point of view by H. C. Skinner, F. L. Parker, and D. L. Frizzell are included; one dissenting opinion, by J. Hofker, is also added.

73. LOEBLICH, A. R., JR., and TAPPAN, H., 1963, Comments on *Endothyra bowmani* Phillips, 1846, vs. *Endothyra bowmani* Brown, 1843 (Foraminifera), Z.N. (S.) 768: Bull. Zoological Nomenclature, v. 20, pt. 4, p. 286-291.

In essence, the writers agree with the Henbest (1962) proposal to the Commission in which it was proposed that the type-species of *Endothyra* should be retained in Brady's sense.

Of especial note is the statement by the writers that "the specific name *lobata*, Brady, 1870, would thus have priority over *bradyi* Mikhailov, 1939, if *bowmani* were not an available name." This in reality invalidates the Rosovskaya (1962) counter-proposal to Henbest's original petition.

Comments are also given on the unfortunate choice of a neotype, plus the totally inadequate description, by D. N. Zeller (1963) in view of the fact that the writers had already chosen a neotype in conjunction with their work on the Treatise on Invert. Paleontol.

A brief comment by Malakhova, supporting the Rosovskaya proposal is also given.

Finally, a lucid statement pointing out some concrete flaws in the Rosovskaya proposal and favoring the Henbest proposal is presented by Betty Skipp.

74. LOEBLICH, A. R., JR., and TAPPAN, H., 1964, Stability of foraminiferal nomenclature: Cushman Found. Foram. Research, Contr., v. 15, pt. 1, p. 30-33.

In a discussion of the Pennsylvanian foraminifer *Serpulopsis* Girty, 1911 vs. *Minnamodytes* Henbest, 1963, the writers state that *Minammodytes* Henbest, 1963, is a junior synonym of *Serpulopsis* Girty, 1911, and *Minammodytes girtyi* Henbest, 1963, a junior synonym of *Serpulopsis insita* (White) Girty.

75. LUPERTO, E., 1963, Nuovo genere di Foraminifero nel Permiano di Abriola (Potenza): Boll. Soc. Paleontologica Italiana, v. 2, no. 2, p. 83-88, pl. 6-8, 1 text-fig., [in Italian with English and French abstracts].

From the Upper Permian Abriola Limestone, near Potenza in southern Italy, one new genus and species, *Abriolina mediterranea*, (family Nodosaridae), is described and illustrated by rather poor thin-section photomicrographs. Associated smaller foraminifers are previously described species of the following genera: *Pachyphloia, Geinitzina, Colaniella,* and *Robuloides.*

76. MCCRONE, A. W., 1963, Paleoecology and biostratigraphy of the Red Eagle Cyclothem (Lower Permian) in Kansas: Kansas Geol. Survey, Bull. 164, 114 p., 7 pl., 23 text-fig., 7 tables.

In a paleoecologic and biostratigraphic study of the sediments of the Lower Permian (Wolfcampian) Red Eagle cyclothem of Kansas, Oklahoma, and Nebraska, 16 foraminifera genera are listed (*Ammobaculites, Ammodiscella, Ammodiscina, Ammodiscus, Ammovertella, Bigenerina, Cornuspira, Globivalvulina, Glomospira, Glyphostomella, Hyperammina, Nodosinella, Nummulostegina, Tetrataxis, Tolypammina,* and *Trochammina*); their stratigraphic range and abundance within the cyclothem is shown on text-figure 4 (p. 38-39). It is noted that smaller Foraminifera are common in the Red Eagle Limestone, rare in the Johnson Shale, and extremely rare in the Roca Shale. The tolerance of the smaller foraminifers for a variety of marine conditions is suggested by their occurrence in lithologies ranging from nearly pure limestone to moderately calcareous shale and mudstone. Although *Tetrataxis* and *Ammodiscus* are present in various Red Eagle cyclothem lithologies, they occur most commonly in rocks containing less than 40% calcium carbonate. *Glyphostomella* is found in lithologies containing about 75% clastic insoluble residue. Conversely, *Ammovertella* and *Tolypammina* seem to favor the calcareous environments represented by lithologies containing less than 10% insoluble residue.

Few definite opinions about the paleoecology of the smaller foraminifers are forthcoming from the available evidence. The writer believes that the presence of these animals in a variety of lithologies suggests that they could tolerate a moderately wide range of environmental conditions and, thus, are of little use as environmental indicators in paleoecological interpretations.

77. MALAKHOVA, N. P., 1963, Age of the Baymak-Burebayevka suite on the east side of the southern Urals: Akad. Nauk S.S.S.R., Doklady, v. 151, no. 4, p. 923-925, 1 pl., [in Russian].

Discovery of Foraminifera in the metasediments of the Baymak-Burebayevka suite, on the east side of the southern Urals, U.S.S.R., indicates that the Gay chalcopyrite deposit is probably Permian in age, and not Silurian as hitherto supposed. It is noted that the foraminifers have lost the primary carbonate composition of their shells. Some of them have been replaced by quartz, chlorite, epidote, and feldspar, yet they retain enough of their morphology to be identifiable.

78. MALAKHOVA, N. P., 1963, Marine Permian sequence of the eastern slope of the Urals: Akad. Nauk S.S.S.R., Doklady, v. 148, no. 5, p. 1172-1174, [in Russian].

Lower to Upper Permian sedimentary rocks of marine and continental origin have been identified on the eastern slope of the Urals and have been dated by previously described species of smaller Foraminifera and a Permian flora and spore-pollen complex. Of especial interest is the reported occurrence of a form similar to the genus *Streblospira* Crespin, previously known only from the Permian of Australia.

79. MALAKHOVA, N. P., 1963, A new foraminiferal genus from the Lower Viséan of the Urals: Akad. Nauk S.S.S.R., Paleontol. Zh., No. 4, p. 111-112, 1 text-fig., [in Russian].

A new calcareous foraminiferal genus and species of the family Reophacidae, is described from the Lower Carboniferous (Viséan) rocks of the Ural Mountains. The new form is *Darjella monilis,* and is illustrated by thin-section photomicrographs.

80. MIKLUKHO-MAKLAI, A. D., 1949, The genetic interrelations between Foraminifera of the Paleozoic and Mesozoic: Vestn. Leningrad Gos. Univ., No. 4, p. 99-103, 1 table, [in Russian].

The writer briefiy describes the relationships of some Paleozoic Foraminifera to their Mesozoic counterparts. One range chart is included.

81. MIKLUKHO-MAKLAI, A. D., 1956, The systematics of Paleozoic Foraminifera: Vestn. Leningrad Gos. Univ., No. 6, p. 57-66, [in Russian].

The writer briefly describes the salient features of 12 foraminiferal families which have Paleozoic representatives. Brief consideration is also given to Paleozoic foraminiferal evolutionary trends.

82. MIKLUKHO-MAKLAI, A. D., 1963, Stratigraphy of the Upper Paleozoic and the systematics and phylogeny of Foraminifera. *IN*: Upper Paleozoic of central Asia: Izdateldstvo Leningrad Univ., 328 p., 18 text-fig., 8 colored maps, 14 tables, [in Russian].

The writer presents a comprehensive review and analysis of the systematics and phylogeny of the Paleozoic Foraminifera (both smaller foraminifers and fusulinids). Of especial interest are the diagrams detailing phylogenetic lineages of the various major smaller foraminiferal groups (e. g., Archaediscidae, Palaeotextulariidae etc.) as shown on text-fig. 7-13. In addition, 8 colored maps showing the world-wide distribution of certain foraminiferal groups of limited stratigraphic range are also given.

The following pertinent taxonomic changes are included: (1) the establishment of the new subfamily Usloniinae to contain the genera *Raibosammina* Moreman, 1930; *Thecammina* Dunna, 1942; *Certammina* Ireland, 1939; Shiderella Dunn, 1942; and *Uslonia* Antropov, 1959; (2) the description of the new genus *Bithurammina* with *Parathurammina*? aff. *dagmarae* Grozdilova and Lebedeva, 1954, as the type species; and (3) the establishment of the new subfamily Lituotubellinae to contain the genera *Lituotubella* Rauser-Chernoussova, 1948, and *Septammina* Meunier, 1888.

83. MIKLUKHO-MAKLAY, A. D., and SAVCHENKO, A. I., 1962, Contribution to the stratigraphy of Carboniferous and Permian sequence in the Khabarovsk Territory: Akad. Nauk S.S.S.R., Doklady, v. 145, no. 2, p. 390-393, 2 tables, [in Russian].

The stratigraphy of the Khabarovsk section of Carboniferous and Permian age in the Soviet Union is discussed and revised in the light of new fossil finds. Abundant mention is made of previously described Late Paleozoic smaller Foraminifera.

84. MILLER, J. P., MONTGOMERY, A., and SUTHERLAND, P. K., 1963, Geology of part of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Bur. Min. and Min. Res., Mem. 11, 106 p., 13 pl., 22 text-fig.

In the chapter on Paleozoic rocks, Sutherland notes (p. 29) that specimens of *Endothyra* occur in all three members of the Mississippian Tererro Formation, southern Sangre de Cristo Mountains, New Mexico. The endothyroid assemblages were studied by Zimmerman (Sun Oil). He states that the endothyroids from all three members are definitely of Meramecian age, and he further notes that forms from both the Macho and Manuelitas Members are similar to species in the Salem Limestone of the Midcontinent.

85. MONTY, C., 1964, Recherches Paléoécologiques dans le V2a de la Région-Huy Moha: Soc. Géol. de Belgique, v. 86, Bull. No. 8, p. 407-431, 2 pl., 6 text-fig., [in French].

The writer describes the lower part of the middle Viséan (Lower Meramecian) from the eastern margin of the Namurian Basin of Belgium. This interval is characterized by a non-rhythmic deposit of carbonates which can be divided into three phases, from base to top: (1) an oolitic phase and (2) a bioclastic phase, both rich in dasyclad algal debris; and (3) a poorly sorted carbonate phase with fragments and nodules of blue-green algae.

Smaller Foraminifera occur in all three phases, the principal types are: *Plectogyra* sp., *Archaediscus* sp., *Elomospira* sp. (*sic*), *Glomospirella* sp., *Earlandia* sp., and *Parathurammina* sp.

After discussing the organisms' distribution and its significance, the writer attempts to present an overall paleoecological interpretation for the entire unit.

86. OMARA, S., and VANGEROW, E. F., 1965, Carboniferous (Westphalian) Foraminifera from Abu Darag, eastern desert, Egypt: Geol. en Mijnbouw, v. 44, no. 3, p. 87-93, pl. 1, 4 text-fig., 1 table.

Foraminifera from marine shales intercalating the Nubian-type sandstones at Abu Darag, eastern desert, Egypt, fix the age of this sequence as Carboniferous (Westphalian). The microfauna is composed entirely of agglutinated forms of previously described species of the genera *Ammodiscus, Glomospirella, Agathamminoides,* and *Hyperammina.* This microfaunal assemblage corresponds to that described by Vangerow (1964) from the Westphalian of the Ruhr district (Western Germany). A few Pennsylvanian conodonts (species of *Streptognathodus*) are found in association with the foraminifers.

87. POGREBIAK, V. A., 1964, The foraminiferal genera *Monotaxinoides* and *Eolasiodiscus*: Akad. Nauk S.S.S.R., Paleontol. Zh., No. 1, p. 3-9, 1 pl., 1 text-fig., [in Russian].

The Middle Carboniferous foraminiferal genus *Monotaxinoides,* originally described by Brazhnikova and Jarzeva 1956, is now regarded as invalid and is placed under the genus *Eolasiodiscus* Reitlinger, 1956. The stratigraphic range of this genus is discussed and shown on text fig. 1.

One new subspecies, *Eolasiodiscus transitorius maximus,* is fully described, and this and other previously known forms are illustrated by excellent thin-section photomicrographs. The following taxonomic changes are also included: *Monotaxinoides transitorius* Brazhnikova and Jarzeva, 1956, and *Eolasiodiscus galinae* Reitlinger, 1956 = *Eolasiodiscus transitorius* (Brazhnikova and Jarzeva); and *Monotaxinoides priscus* Brazhnikova and Jarzeva, 1956 = *Eolasiodiscus priscus* (Brazhnikova and Jarzeva).

88. POPOVA, Z. G., 1963, Some new information on the Lower Carboniferous of the Magnitogorsk Synclinorium: Akad. Nauk S.S.S.R., Doklady, v. 150, no. 1, p. 152-154 [in Russian].

Typical Lower Carboniferous smaller foraminiferal assemblages (containing previously described species) from the Magnitogorsk Synclinorium of the Soviet Union permit a stratigraphic subdivision between the Tournaisian and Viséan sequences.

89. PRONINA, T. V., 1963, 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: Akad. Nauk S.S.S.R., Ural Branch, Inst. Geol., Trans., Sverdlovsk. No. 65, p. 119-176, 7 pl., [in Russian].

A microfauna of 47 species of smaller Foraminifera, of which 9 species are new, is described from the Carboniferous Berezovo Series of the eastern slope of the southern Ural Mountains of the Soviet Union. All described forms are illustrated by thin-section photomicrographs. The new forms are: *Earlandia aspera, Archaesphaera? pachisphaerica, Parathurammina clivosa, Brunsiina dainae, Tournayella immodica, Endothyrina? separata, Palaeotextularia illina, Spiroplectammina otorja,* and *Permodiscus? primaevus.* Included in this paper are also newly described species of fusulinids, and one new species of *Calcisphaera.* The following taxonomic modifications are also included: *Hyperammina vulgaris minor* Rauser 1948, and Lebedeva 1954 = *Earlandia vulgaris* var. *minor* (Raus.); *Hyperammina moderata* Malakhova 1954 = *Earlandia moderata* (Malkhova); *Hyperammina elegans* Rauser and Reitlinger, 1937 and 1940 = *Earlandia elegans* (Raus. and Reitlinger); *Brunsiella ovalis* Malakhova 1956 = *Glomospirella ovalis* (Malakhova); *Ammobaculites pygmaeius* Malakhova 1954 = *Chernyshinellina pigmea* (Malakhova); *Brunsia? pulchra* Reitlinger 1940, Rauser and Reitlinger 1948, Malakhova 1954, *Glomospirella pseudopulchra* Lipina 1955, and *Glomospira pulchra* Malakhova 1956 = *Glomospirella pseudopulchra* (Lipina); and *Spirillina irregularis* Moeller 1886, *Brunsia irregularis* Mikhailov 1939 and Malakhova 1954, *Glomospirella irregularis* Lipina 1955, and *Glomospira irregularis* Malakhova, 1956 = *Glomospirella irregularis* (Moeller).

90. RAUSER-CHERNOUSOVA, D. M., MOROSOVA, V. G., and KRASHENINNIKOV, V. A., 1963, Comments on the type-species of *Ammodiscus* Reuss, 1862, Z. N. (S.) 1087: Bull. Zoological Nomenclature, v. 20, pt. 4, p. 250.

A lucid endorsement of the Loeblich-Tappan proposal concerning the type-species of *Ammodiscus* Reuss, 1862. Rauser-Chernousova *et al.* believe that Loeblich and Tappan (1961) conclusively proved that *Involutina silicea* Terquem, 1862, was the type-species of the genus *Ammodiscus.*

91. REISS, Z., 1963, Reclassification of perforate Foraminifera: Geol. Survey of Israel, Bull., No. 35, 111 p., 8 pl.

This paper is primarily concerned with post-Paleozoic taxanomic features of perforate Foraminifera; however, a number of pertinent genera (mainly Late Paleozoic) are discussed and analyzed in some detail.

92. ROSS, C. A., 1965, Fusulinids from the *Cyathophyllum* Limestone, central Vestspitsbergen: Contr. Cushman Found. Foram. Research, v. 16, pt. 2, p. 74-86, pl. 10-12, 1 text-fig., 5 tables.

Primarily a paper describing the fusulinid microfaunas of the Upper Carboniferous-Permian *Cyathophyllum* Limestones of central Vestspitsbergen; however, the writer notes that in many of the fossil collections smaller Foraminifera such as *Tetrataxis, Globivalvulina, Geinitzina, Neogeinitzina*?, *Bradyina*, and *Climacammina* are common constituents.

93. SACAL, V., 1963, Microfaciès du Paléozoique Saharien.—Notes et Mémoires, No. 6, Compagnie Française des Pétroles, Paris, 30 p., 100 photos, 4 text-fig., correlated columnar sections, map, [in French].

Primarily a collection of superb microfacies photomicrographs of representative rock types from the Paleozoic of the Sahara Region of north Africa. Photographs 91-96 contain assemblages of smaller Foraminifera from Namurian rocks; identified foraminifers include: *Archaediscus, Tetrataxis,* endothyroids, and palaeotextularids. Photographs 97-100 illustrate smaller foraminiferal assemblages belonging to the Moscovian interval and containing: *Climacammina, Bradyina, Globivalvulina,* and *Hemigordius.*

94. SANDERSON, G. A., and KING, W. E., 1964, Paleontological evidence for the age of the Dimple Limestone. *IN*: The filling of the Marathon Geosyncline: Permian Basin Section S.E.P.M., Publ. 64-9, p. 31-34, 5 text-fig.

The writers state that fusulinid genera and species referable to the Zone of *Fusulinella* and Zone of *Profusulinella* are present in the Dimple Limestone and indicate a Pennsylvanian (Atokan) age for much of the formation. In addition, they noted that among the smaller Foraminifera are species of the genera *Climacammina, Tetrataxis, Globivalvulina, Endothyra, Tuberitina, Ammodiscus,* and *Calcitornella* [the last named genus would now probably be placed under the genus *Hedraites;* see Henbest, 1963].

95. SILINA, YE. N., and KURBEZHEKOVA, A. N., 1962, Permian strata on the east side of the Urals: Akad. Nauk S.S.S.R., Doklady, v. 146, no. 4, p. 887-889 [in Russian].

Of the three sequences of red beds that occur on the east side of the Urals, two (Middle Carboniferous and Lower Permian) occur together in the Bagaryak section. T. V. Pronina and N. P. Malakhova identified previously described Middle Carboniferous foraminiferal assemblages (including fusulinids) from the East Sugoyak Area.

96. SKIPP, B. A. L., 1963, Zonation of Mississippian rocks in the North American Cordillera using Tournayellinae, calcareous Foraminifera (Abstract): Program Geol. Soc. America, Meeting, New York City, Nov. 17-20, p. 152A-153A.

Tournayellinae occur with endothyrid Foraminifera and, except for *Brunsiina* Lipina, 1953, are restricted in North America to Kinderhook, Osage, and Meramec rocks. They are common and zonally distinctive in most Cordilleran faunas studied but are rare in the Midcontinent. The remarkable similarity between the tournayellid and endothyrid faunas of the Cordillera and these of the western slope of the Urals suggests coeval development and like environments, possibly connecting seaways.

97. SMIRNOV, G. A., ET AL., 1963, Tournasian-Viséan boundary beds on the west side of the central Urals: Akad. Nauk S.S.S.R., Doklady, v. 149, no. 2, p. 395-398, [in Russian].

A detailed study of the smaller Foraminifera, corals and brachiopods (all previously described) from the Siniy Kamen' Series suggests that they may correspond to the lower part of the terrigenous coal measures overlying the Kizelovka horizon. Although geologists working on the west side of the central Urals have traditionally placed the Tournaisian-Viséan boundary at the base of the coal measures, the boundary actually crosses formations of diverse lithology.

98. SOSNINA, M. I., 1960, Studies of the lagenids by the method of sequential grinding. *IN*: Results of the first seminar on the microfauna. N. N. Subbotina, Editor, Vses. Neft. Nauk-

Issl., Geol. Inst., Trudy, Leningrad, p. 88-119, 29 text-fig., [in Russian].

Discusses at length the advantages of utilizing sequential thin-sections in the study of Late Paleozoic lagenid Foraminifera. Numerous excellent drawings are included.

99. STARK, P. H., 1963, Distribution and significance of Foraminifera in the Atoka Formation in the central Ouachita Mountains of Oklahoma: Shale Shaker, v. 14, no. 2, p. 4-5, Abstracts of the A.A.P.G. Midcontinent Regional Meeting, Oklahoma City, Nov. 6-8.

Foraminifera in the Atoka Formation were studied to demonstrate their usefulness in stratigraphic zonation and to attempt interpretation of the environment of deposition and paleoecology of the Atoka beds in which Foraminifera occur.

The Atoka microfauna is composed of a few conodont specimens, abundant monaxonid and hexactinellid sponge spicules, Radiolaria, and a rich assemblage of agglutinated Foraminifera consisting of 20 genera and 42 species. The typical flysch assemblage is dominated by species of four genera: *Thuramminoides, Ammodiscus, Hyperammina,* and a new species of *Agathammina*. No Foraminifera were found in Atoka sandstones.

100. STEVENS, C. H., 1965, Pre-Kaibab Permian stratigraphy and history of Butte Basin, Nevada and Utah: Am. Assoc. Petroleum Geologists, Bull., v. 49, no. 2, p. 139-156, 15 text-fig.

The writer reports the following smaller foraminifers from the pre-Kaibab Permian formations of Butte Basin, Nevada and Utah: Riepe Spring Limestone - textulariids; Rib Hill Sandstone - textulariids; Pequop Formation - textulariids and *Orthovertella;* Arcturus Formation - *Orthovertella;* and the Loray Formation - *Orthovertella*.

101. STEVENS, C. H., 1965, Faunal trends in near-shore Pennsylvanian deposits near McCoy Colorado: The Mountain Geologists, v. 2, no. 2, p. 71-77, 9 text-fig.

Fossils in marine and paralic Middle Pennsylvanian rocks exposed near McCoy, Colorado, represent six major faunal assemblages. These assemblages bear a consistent relationship to one another and tend to lie in bands which appear to be more or less parallel to the ancient shorelines. The major faunas, named for important constituents, are, from the shoreline seaward: *Euphemites,* productoid-*Composita,* chonetoid, coral, fusulinid, and textulariid faunas. It is noted that fusulinids probably lived in depths ranging from 20-50 meters, while the textulariid fauna (which also contains fusulinids) apparently lived in deeper water—perhaps 50-70 meters.

102. TEODOROVICH, G. I., 1962, The stratigraphy of the upper Tournaisian and the base of the Viséan in the southern Urals: Akad. Nauk S.S.S.R., Izvestiya, Geol. Ser. No. 12, p. 32-45, [in Russian].

Principally a work dealing with the stratigraphic subdivision of the Lower Carboniferous (upper Tournaisian-lower Viséan) rocks of the southern Ural Mountains (Usuyli River section) of the Soviet Union. Reference is made to numerous lists of previously described species of smaller foraminifers and brachiopods that were utilized in erecting the stratigraphic subdivisions.

103. TEODOROVICH, G. I., ET AL., 1963, Stratigraphy of the Upper Tournaisian and Lower Viséan on the west side of the southern Urals (Usuyla River section): Akad. Nauk S.S.S.R., Doklady, v. 149, no. 1, p. 166-169, [in Russian].

The Lower Carboniferous (Upper Tournaisian-Lower Viséan) rocks of the Usuyla River section, on the west side of the southern Urals, U.S.S.R., have been subdivided by means of assemblages of previously described smaller Foraminifera and brachiopods into three stratigraphical and paleontological complexes.

104. TIKHVINSKIY, I. N., 1962, Lower Kazanian beds between the Bol'shoy Cheremshan and the Malyy Cheremshan: Akad. Nauk S.S.S.R., Doklady, v. 147, no. 5, p. 1164-1167, 1 text-fig., [in Russian].

In the Kazan Area of the Soviet Union, Early Kazanian (Late Permian) time was one of transgression by a shallow sea in which clayey carbonates, clays and siltstone were deposited in three main cycles. The basin later silted up, became part of the coast, and was the site of deposition of continental clastics. The upper horizon contains a smaller foraminiferal assemblage of previously described species identified by N. A. Valeyeva.

105. URUSOV, A. V., 1962, On the age and lithologic complexes of the sulfate-carbonate Lower Permian strata in the Volgograd Area: Akad. Nauk S.S.S.R., Doklady, v. 145, no. 2, p. 396-399, 1 text-fig., [in Russian].

New data indicate that the Lower Permian sulfate-carbonate deposits in the Volgograd Area of the Soviet Union consist partly of Skamarian and Artinskian deposits, which are described in detail. Numerous previously described foraminiferal species, both fusulinids and smaller foraminifers, are utilized in stratigraphically subdividing the sequence.

106. VANGEROW, E. F., 1962, Untersuchungen über die Windungsverhältnisse der Foraminifere *Agathammina pusilla* (Geinitz 1848): Geol. Mitteil. v. 3, pt. 1, p. 33-38, 2 text-fig., [in German with French and English summary].

Methods used in the preparation of foraminiferal thin-sections are discussed with the aid of sections of the Permian (Zechstein) foraminifer *Agathammina pusilla* (Geinitz) as an example. From this study methods have been developed which allowed the writer to construct a model illustrating the coiling habits of this form. Whole-specimen photomicrographs, thin-section photomicrographs, and thin-section drawings are included.

107. VANGEROW, E. F., 1964, Die Foraminiferen des westdeutschen Oberkarbons: Palaeontographica, v. 124, 32 p., 5 pl., 7 text-fig., 2 tables [in German].

A systematic study of 20 marine horizons between Namurian C and Westphalian C (Upper Carboniferous) of West Germany (Ruhr district) yielded 700 samples containing smaller foraminifers. From the marine horizons, 22 species, of which 4 species and 1 genus are new, are described in detail and illustrated by whole-specimen and thin-section photomicrographs. The new forms are: *Ammodiscus hiltermanni, A. ovalis, Glomospirella unangularis,* and *Agathamminoides gracilis* (new genus). The microfauna is composed entirely of agglutinated forms. Of especial interest is the table illustrating all previously described Permo-Carboniferous species of the genus *Hyperammina* with a brief diagnosis of their characteristics and stratigraphic potential. Comparison of the German section with that of the Belgian Carboniferous, as described by Pastiels (1956), is discussed in some detail. The following taxonomic changes are also included: *Ammodiscus semiconstrictus* Waters-Pastiels, 1956, and *A.* cf. *A. hiltermanni* Pastiels, 1956, are placed under *A. roessleri* (Schmid, 1867); *A. obscurus Dain* (*pars*) Bykova, 1958, is placed under *A. hiltermanni; Glomospira milioloides* Paalzow, 1935, and *Agathammina* sp. Pastiels, 1956, are placed under *Ammodiscus ovalis; Glomospirella irregularis* Crespin, 1958, is placed under *G. umbilicata* (Cushman and Waters, 1927); *Ammodiscus labilatus* Kremp and Johst, 1950, is placed under *Glomospirella unangularis; Trochammina milioloides* Jones, Parker, and Kirkby, 1869, and Brady, 1876, and *Agathammina milioloides* (Jones, Parker, and Kirkby, 1869); *Agathammina mississippiana* Conkin, 1961, is placed under *Agathamminoides* cf. *A. mississippiana* (Conkin, 1961); and *Hyperammina elongata clavatula* Harlton, 1933, is placed under *H. gracilis* Waters, 1927.

108. VARSANOF'EVA, V. A., and REITLINGER, E. A., 1962, Characteristics of the Upper Devonian and Tournaisian deposits of the Less Pechora: Byul. Mosk. Obshchestva Ispytatelei Prirody, Otd. Geol., v. 37, no. 5, p. 36-60, 2 pl., 2 tables, [in Russian].

From the basin of the Lesser Pechora River, west of the Urals in northern Russia, the transitional boundary beds from the Upper Devonian to Lower Carboniferous have yielded a distinctive microfauna. The Lower Carboniferous beds have yielded the following previously described forms: *Rectoseptaglomospiranella* sp., *Septaglomospiranella* (*S.*) *primaeva* (Rauser), *Septatournayella lacera* Durkina, and *Quasiendothyra communis* (Rauser) var. *turbida* Durkina. All of the above are illustrated by thin-section photomicrographs and completely described.

109. VORONOV, P. S., 1957, Some new representatives of Permian Foraminifera from the Syndasko Area on the southeastern coast of Khatanga Gulf: Sbornik Statei po Paleontol. i Biostratigr. No. 5, Publ. Inst. Geol. Arktiki, Leningrad, p. 23-47, 3 pl., 2 text-fig., [in Russian].

Eleven new species and three new varieties of Permian Foraminifera are described from the Syndasko Area of northern Siberia, U.S.S.R. All forms are illustrated by rather crude drawings. The new forms are: *Saccammina? discoidea, Psammosphaera? bulla, Hyperammina borealis* Gerke var. *subtilensis, H. affectus, Reophax gerkei* var. *parva, R. syndascoensis, R. compositus* var. *venusta, Nodosaria monile, Dentalina unguis, Frondicularia sectorialis, F. proparia,* and *Eoguttulina? permiana.*

110. VORONOV, P. S., 1958, Biostratigraphic characteristics of a section of Permian deposits of the Syndasko Area (southeastern coast of the Gulf of Khatanga): Sbornik Statei po Paleont. i Biostrat., Publ. Inst. Geol. Arktiki, Leningrad, v. 9-12, p. 21-53, 5 text-fig., 3 tables, [in Russian].

A résumé of the Permian biostratigraphic sequence from the Syndasko Area (northwestern portion of the Soviet Union) utilizing previously described foraminiferal species.

111. WEST, R. R., 1964, A middle Pennsylvanian tabulate coral: Jour. Paleontology, v. 38, no. 1, p. 151-153, 2 text-fig.

The writer briefly mentions that the Pennsylvanian (Desmoinesian) Holdenville Shale carries a rich microfauna in which *Ammodiscus* is the most common genus, but *Tolypammina* [probably should be referred to *Minammodytes;* see Henbest, 1963] and *Ammobaculites* are also present.

112. WINSTON, D., 1964, Chaetetes biostromes: Pennsylvanian surfaces of bypassing and scour (Abstract); Geol. Soc. America, Program Annual Meetings, Miami Beach, Florida, p. 227.

The writer notes that the Lower Pennsylvanian *Chaetetes* biostromes of central Texas, extend

for at least 10 miles across the middle part of a carbonate shelf. The biostromes consist of scattered clumps of *Chaetetes* heads separated by beds of matalga biolithite and fragmental biomicrites and biosparites containing fusulinids and smaller Foraminifera (*Braydina* (*sic*), paleotextulariids (*sic*), and *Calcitornella* [probably should be referred to *Hedraites;* see Henbest, 1963]).

113. YOLE, R. W., 1963, An early Permian fauna from Vancouver Island, British Columbia: Bull. Canadian Petroleum Geology, v. 11, no. 2, p. 138-149, 2 pl., 3 text-fig.

The writer reports the occurrence of *Tetrataxis* sp. from an early Permian formation of the Buttle Lake Area in central Vancouver Island, British Columbia.

114. ZAKOWA, H., GLOWACKI, E., and JURKIEWICZ, H., 1963, Results of a reconsideration of the Carboniferous Series from the bore-hole Zalucze 1: Kwartalnik Geologiczny, Inst. Geol., Warsaw, v. 7, no. 2, p. 215-227, 6 pl., [in Polish with Russian and English summaries].

The writers report the occurrence of the foraminifers *Endothyra crassa, E. globulus, E. bradyi* and *Bradyina spherica* from a Lower Carboniferous sequence in a bore-hole drilled south of the Swiety Krzyz Mountains (foreland of the Middle Carpathians), Poland. Plate 4, fig. 2, and plate 5, fig. 2, carry unrecognizable thin-section photomicrographs of supposed *Bradyina* and *Endothyra.*

115. ZELLER, D. E. N., and ZELLER, E. J., 1963, *Endothyra bowmani*: proposed rejection of applications of Henbest and Rosovskaya. Z. N. (S.) 768: Bull. Zoological Nomenclature, v. 20, pt. 4, p. 285-286.

The writers express their objections to both Z. N. (S.) 768, Henbest, 1962, and the alternative proposal by Rosovskaya, 1962. They recommend strict application of the Law of Priority and feel that none of the evidence presented in either of these proposals is adequate to warrant the use of the plenary powers of the Commission. Hence, they believe that no action of the Commission is required in this case and that by refusing to act the Commission will uphold the Law of Priority and effectively reject the proposals. [See Loeblich and Tappan (1963, p. 286-290) for pertinent comments and criticisms].

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CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
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# 316. ON SOME RECENT FORAMINIFERA FROM THE FAEROE ISLANDS, DENMARK

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ABSTRACT

Ten equal volume (10 ml. dry measure) littoral surface sediment samples from two small fjords in the Faeroe Islands were studied for foraminiferal content. Twelve species of foraminifera, one new, were obtained, and two environmental areas are provisionally delimited.

## INTRODUCTION

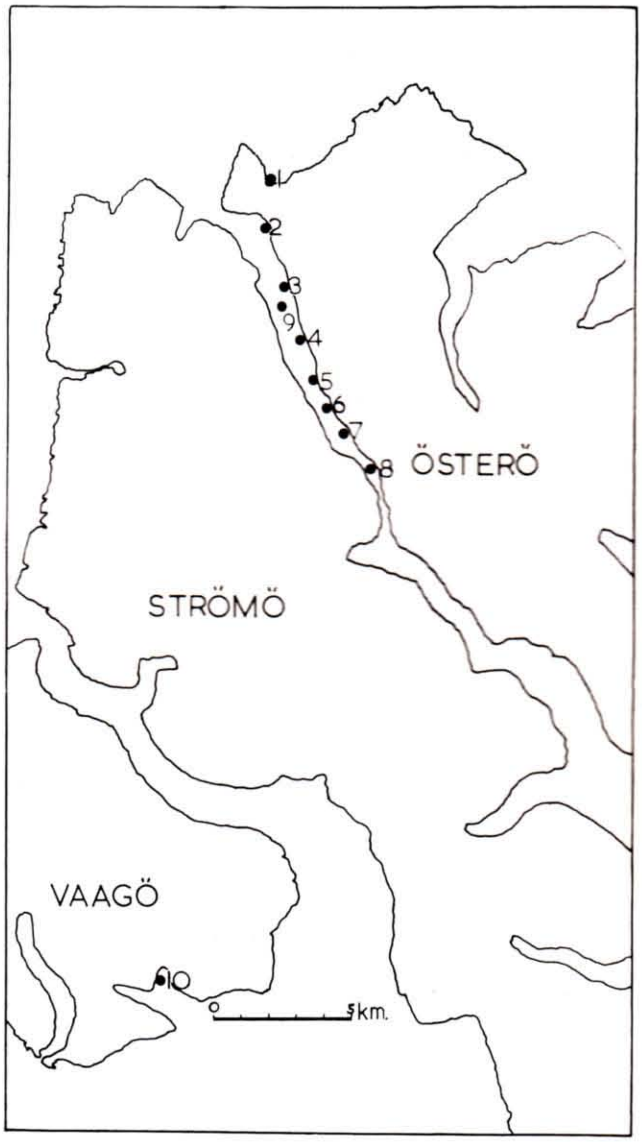
During the summer of 1963 ten surface sediment samples were collected from the fjord between the islands of Strömö and Österö and from a small fjord on the South coast of the adjacent island of Vaagö, in the Faeroe Islands (text fig. 1). A 10 ml. dry standard measure of each sample was seived at 500, 250, 152 and 75 microns, (corresponding to the sand size fractions of the Wentworth scale of sediments), and studied for foraminiferal content and associated fauna content. Six samples were found to be barren of foraminifera whilst varying numbers of twelve species of foraminifera were retrieved from the remaining samples. The samples were collected as part of the U.C.W. Geography Department Expedition to the Faeroes 1963.

## DISCUSSION

The following species were obtained:

- *Technitella legumen* Norman 1758
- *Quinqueloculina agglutinata* Cushman 1917
- *Quinqueloculina seminulum* (Linné) 1758
- *Miliolinella subrotunda* (Montagu) 1803
- *Fissurina lucida* (Williamson) 1848
- *Oolina patannae* Haman sp. nov.
- *Discorbis bradyi* Cushman 1915
- *Ammonia beccarii* (Linné) 1758
- *Elphidium crispum* (Linné) 1758
- *Cibicides fletcheri* Galloway and Wissler 1927
- *Cibicides lobatulus* (Walker and Jacob) 1798
- *Cibicides refulgens* Montford 1808

All the above are generally regarded as nearshore cold water species except for *Cibicides fletcheri* Galloway and Wissler which has only been recorded from the cold waters of Iceland. *Oolina patannae* is a form specifically close to *Oolina borealis* Loeblich and Tappan, a cold water species. During studies by the author, *Oolina patannae* has also been retrieved from Tremadoc Bay, North Wales. It is noticeable that the inshore fauna is composed of the more robust forms such as *Cibicides lobatulus* (Walker and Jacob), *Ammonia beccarii* (Linné) and *Quinqueloculina seminulum* (Linné), whereas the central fjord fauna had, in addition to the above mentioned species, more fragile foraminifera, such as *Technitella legumen* Norman, *Fissurina lucida* (Williamson) and *Oolina patannae*. This difference is associated with a difference in sediment size, the shore samples being composed of fine to coarse sand (.135 mm. - .500. Wentworth), whereas the sediment from the centre of the fjord was silt/mud to very fine sand (.006 mm. - .066 mm. Wentworth).




TEXT-FIGURE 1
Sample collecting localities, Faeroe Islands

The associated fauna, obtained from six samples, is dominated by ostracods followed by gastropods and mussels.

## SYSTEMATIC DESCRIPTIONS

Superfamily AMMODISCACEA
Family SACCAMMINIDAE
Subfamily SACCAMMININAE
Genus **Technitella** Norman
**Technitella legumen** Norman, 1878

Plate 7, figure 1

*Technitella legumen* NORMAN, A. M., 1878, Ann. Mag. Nat. Hist. London, Ser. 5, vol. 1, p. 279, pl. 16, figs. 3, 4.

*Remarks.*—This fragile form, regarded as occurring typically in cold water, has been recorded from west of Ireland and from the North Sea. It constitutes 4% of sample 9 in the area studied.

Superfamily MILIOLACEA
Family MILIOLIDAE
Subfamily QUINQUELOCULININAE
Genus **Quinqueloculina** d'Orbigny
**Quinqueloculina agglutinata** Cushman, 1917

Plate 7, figures 2, 3, 4

*Quinqueloculina agglutinata* CUSHMAN, J. A., 1917, U. S. Nat. Mus. Bull. 71, p. 43, pl. 9, fig. 2.

*Quinqueloculina agglutinata* Cushman. CUSHMAN, J. A. and TODD, R., 1947, Contr. Cush. Labor. For. Res. Sp. Pub. no. 21, p. 61, pl. 14, figs. 12, 13.

*Quinqueloculina agglutinata* Cushman. CUSHMAN, J. A., 1948, Contr. Cush. Labor. For. Res. Sp. Pub. no. 23, p. 33, pl. 3, fig. 13.

*Quinqueloculina agglutinata* Cushman. LOEBLICH, A. R. and TAPPAN, H., 1953, Smith. Miscell. Coll., vol. 121, no. 7, p. 39, pl. 5, figs. 1-4.

*Remarks.*—This form, recorded throughout the Arctic region and from off the Washington coast, is stated to have a depth range of 3-24 fathoms. Only one specimen was obtained in the area, at a depth of 15 metres.

**Quinqueloculina seminulum** (Linné), 1758

Plate 7, figures 5, 6, 7

*Serpula seminulum* LINNAEUS, 1758, Syst. Nat. Ed. 10, p. 1264.

*Miliolina seminulum* (Linné). WILLIAMSON, W. C., 1858, Rec. For. Gt. Brit. Ray Soc. London, p. 85, pl. 7, figs. 183-185.

*Miliolina seminulum* (Linné). BRADY, H. B., 1884, Chall. Rep. Zool., p. 157, pl. 5, fig. 6.

*Quinqueloculina seminulum* (Linné). CUSHMAN, J. A., 1948, Contr. Cush. Labor. For. Res. Sp. Pub. No. 23, p. 34, pl. 3, figs. 14, 15.

*Remarks.*—Cushman has stated that the synonymy of this species is voluminous and very difficult to unravel, inasmuch as the name has been used for almost all types of smooth quinqueloculine forms. It is a common species and has been widely recorded from the Arctic to the Antarctic, a cosmopolitan distribution. This species occurs in two samples and comprises 1.7% to 4.2% of the fauna.

Subfamily MILIOLINELLINAE
Genus **Miliolinella** Wiesner
**Miliolinella subrotunda** (Montagu), 1803

Plate 7, figures 8, 9, 10

*Vermiculum subrotundum* MONTAGU, 1803, Test. Brit. p. 521.

*Miliolina subrotunda* (Montagu). HERON-ALLEN, E. and EARLAND, A., 1916, Journ. Roy. Micro. Soc., p. 35, pl. 5, figs. 6-8.

*Quinqueloculina subrotunda* (Montagu). CUSHMAN, J. A., 1948, Contr. Cush. Labor. For. Res. Sp. Pub. no. 23, p. 35, pl. 3, figs. 20-22, pl. 4, fig. 1.

*Miliolinella subrotunda* (Montagu). ADAMS, T. D. and FRAMPTON, J., 1965, Contr. Cush. Found. For. Res., vol. 16, pt. 2, p. 57, pl. 5, fig. 15.

*Remarks.*—This highly variable species is characteristic of shallow water regions throughout the world and has been recorded from the Arctic to the Antarctic. Forms of this species obtained from more temperate latitudes appear to be more robust, better developed, and occasionally hauerine in type. Three individuals were obtained from two samples.

Superfamily NODOSARIACEA
Family GLANDULINIDAE
Subfamily OOLININAE
Genus **Fissurina** Reuss
**Fissurina lucida** (Williamson), 1848

Plate 7, figure 11

*Entosolenia marginata* (Montagu) var. *lucida* WILLIAMSON, W. C., 1848, Ann. Mag. Nat. Hist., London, Ser. 2, vol. 1, p. 17, pl. 2, fig. 17.

*Entosolenia marginata* (Montagu) var. *lucida* WILLIAMSON, 1858, Rec. For. Gt. Brit. Ray Soc. London, p. 10, pl. 1, figs. 20-23.

*Lagena lucida* (Williamson). CUSHMAN, 1923, U. S. Nat. Mus. Bull. 104, p. 33, pl. 6, figs. 1, 2.

*Fissurina lucida* (Williamson). FEYLING-HANSSEN, R. W., 1964, Norges Geol. Undersökelse, Nr. 223, p. 315, pl. 15, fig. 21.

*Remarks.*—The test outline of this species is very variable as is the amount of test thickening. This species has a cosmopolitan distribution but appears to become rarer towards the latitude extremities. Occurred in one station in the area studied.

Genus **Oolina** d'Orbigny
**Oolina patannae** Haman, sp. nov.

Plate 7, figures 12, 13, 14

*Description.*—Test free, small, unilocular, circular in outline, round in cross section. Test has a small, flat, unornamented base and a short, stout, cylindrical neck, with a low transverse rib at the base of the neck. Body ornamented with about 22 longitudinal ribs, originating adjacent to the clear basal area and extending from the base into the top one-third of the test where they coalesce to form the smooth, thick, upper portion of the test. Ribs are flat topped, wide and separated by grooves of a similar width. Aperture small, circular, terminal, central, at the end of the neck. Faint indication of a short, stout, entosolenian tube, extending only a very short distance into the test. Wall calcareous, translucent, perforate.

*Dimensions.*—Length 0.36 mm., Diameter 0.30 mm.

*Remarks.*—This species differs markedly from the related species *Oolina borealis* Loeblich and Tappan in general shape, nature of the costae, and also in the nature of the apertural collar and neck. Two specimens of this species were obtained from sample 9. Identical forms have been retrieved from Tremadoc Bay, North Wales, as mentioned previously.

Superfamily DISCORBACEA
Family DISCORBIDAE
Subfamily DISCORBINAE
Genus **Discorbis** Lamarck
**Discorbis bradyi** Cushman, 1915
Plate 7, figures 15, 16

*Discorbis globularis* (d'Orbigny) var. *bradyi* CUSHMAN, J. A., 1915, U. S. Nat. Mus. Bull. 71, p. 12, pl. 8, fig. 1, t. fig. 12.

*Rosalina globularis bradyi* (Cushman). PARKER, F. L., 1958, Red. Swed. Deep Sea Exped., vol. 8, fasc. 2, no. 4, p. 268, pl. 3, figs. 37, 38.

*Rosalina bradyi* (Cushman). BARKER, R. W., 1960, Soc. Econ. Pal. and Min., Sp. Pub. no. 9, p. 178, pl. 86, fig. 8.

*Remarks.*—This species is subject to great variation according to development and mode of growth, sessile forms being quite flat and scale-like, while free types are often inflated and dome shaped. A typical shallow water form from all latitudes including the Arctic and Antarctic especially where rocks afford shelter. Occurs in one sample where it constitutes over 9% of the fauna.

Superfamily ROTALIACEA
Family ROTALIIDAE
Subfamily ROTALIINAE
Genus **Ammonia** Brunnich
**Ammonia beccarii** (Linné), 1758
Plate 7, figures 17, 18, 19

*Nautilus beccarii* LINNAEUS, 1758, Syst. Nat. Ed. 10, p. 710.

*Rotalina beccarii* (Linné). WILLIAMSON, W. C., 1858, Rec. For. Gt. Brit. Ray Soc. London, p. 48, pl. 4, figs. 90-92.

*Ammonia beccarii* (Linné). HUANG, T., 1964, Micropaleontology, vol. 10, no. 1, p. 52, pl. 2, fig. 6.

*Remarks.*—This highly controversial and variable species is widespread throughout the world, and although it is cosmopolitan, is especially common in shallow water areas with considerable size and ornament variations. It has been found in sample 10 where it constitutes 40% of the fauna.

Family ELPHIDIDAE
Subfamily ELPHIDIINAE
Genus **Elphidium** de Montford
**Elphidium crispum** (Linné), 1758
Plate 7, figures 20, 21

*Nautilus crispus* LINNAEUS, 1758, Syst. Nat. Ed. 10, p. 709.

*Polystomella crispa* (Linné). WILLIAMSON, W. C., 1858, Rec. For. Gt. Brit. Ray Soc. London, p. 41, pl. 3, fig. 80.

*Polystomella crispa* (Linné). BRADY, H. B., 1884, Chall. Rep. Zool., p. 736, pl. 110, figs. 6-8, 11.

*Polystomella crispa* (Linné). JEPPS, M. W., 1956, The Protozoa Sarcodina, p. 73, t. fig. 34.

*Elphidium crispum* (Linné). BARKER, R. W., 1960, Soc. Econ. Pal. and Min., Sp. Pub. no. 9, p. 226, pl. 110, figs. 6, 7.

*Remarks.*—Brady (1884) comments that this is one of the most abundant shallow water Foraminifera. It is typically cosmopolitan, the main limiting factor appearing to be that of salinity (Murray 1963). Present in one sample in the area studied.

Superfamily ORBITOIDACEA
Family CIBICIDINAE
Subfamily CIBICIDINAE
Genus **Cibicides** de Montford
**Cibicides fletcheri** Galloway and Wissler, 1927
Plate 7, figures 22, 23

*Cibicides fletcheri* GALLOWAY and WISSLER, 1927, Journ. Pal. vol. 1, no. 1, p. 64, pl. 10, figs. 8a-c.

*Cibicides fletcheri* Galloway and Wissler. UCHIO, T., 1960, Contr. Cush. Found. For. Res. Sp. Pub. no. 5, pl. 10, figs. 1-3.

*Cibicides fletcheri* Galloway and Wissler. ADAMS, T. D. and FRAMPTON, J., 1965, Contr. Cush. Found. For. Res., vol. 16, pt. 2, p. 58, pl. 5, fig. 11.

*Remarks.*—The only cold water record for this species is from Iceland, and cool water record from Hudson Bay. It comprises 4% of the fauna of sample 3.

**Cibicides lobatulus** (Walker and Jacob), 1798
Plate 7, figures 24, 25, 26

*Nautilus lobatulus* WALKER and JACOB, 1798, p. 642, pl. 14, fig. 36.

*Truncatulina lobatulus* (Walker and Jacob). WILLIAMSON, W. C., 1858, For. Gt. Brit. Ray Soc. London, p. 59, pl. 5, figs. 122-123.

*Cibicides lobatulus* (Walker and Jacob). PHLEGER,

F. B, Parker, F. L., and Peirson, J. P., 1953, Rep. Swed. Deep Sea Exped., vol. 7, fasc. 1, p. 49, pl. 11, figs. 9, 14.

*Remarks.*—Brady states that this species is common at every latitude from the most northerly points of the Arctic Ocean to the Antarctic Ice Barrier. It is generally acknowledged that the high degree of variation in the form of the test of this species is attributed to method and substance of attachment as each individual tends to conform to the substrate configuration. Abundant at all depths but common in shallow water, and in all types of sediment but with highest frequencies in pebbly, gravelly substrates. It is for the above reason that it is extremely difficult to separate *Cibicides lobatulus* and *Cibicides refulgens* with any degree of certainty as it is possible that these two forms are the ends of a bioseries.

This species is the dominant form in the area studied comprising between 60% to 100% of the fauna in four samples, most abundant in the shore sands.

**Cibicides refulgens** Montford, 1808

Plate 7, figures 27, 28

*Cibicides refulgens* Montford, 1808, Conch. Syst. vol. 1, pt. 22.

*Truncatulina refulgens* Montford. Brady, H. B., 1884, Chall. Rep. Zool., p. 659, pl. 92, figs. 7-9.

*Cibicides refulgens* Montford. Barker, R. W., 1960, Soc. Econ. Pal. and Min., Sp. Pub. no. 9, p. 190, pl. 92, figs. 7-9.

*Remarks.*—As stated above, this species is very difficult to separate from *Cibicides lobatulus* but in this study the factor for differentiation is the height of the test, namely *Cibicides refulgens* being the high conical form. Occurs in one sample where it constitutes 4% of the fauna.

## CONCLUSION

The Faeroe fjords appear to provide a fairly hospitable environment for a number of different foraminifera types, both fragile and robust forms. As stated in the introduction, the area studied can, on foraminiferal evidence, be provisionally divided into two environmental areas:

a) the central fjord
b) lateral shore (inter-tidal)

with distinct faunal associations and sediment types.

## ACKNOWLEDGMENTS

The author is indebted to Dr. J. Frampton for providing study material and to Dr. J. R. Haynes for critically reading this manuscript.

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Uchio, T., 1960, Ecology of living benthonic Foraminifera from San Diego, California. Contr. Cush. Found. For. Res., Sp. Pub. No. 5.

Williamson, W. C., 1858, On the Recent Foraminifera of Great Britain. Ray Soc., London.

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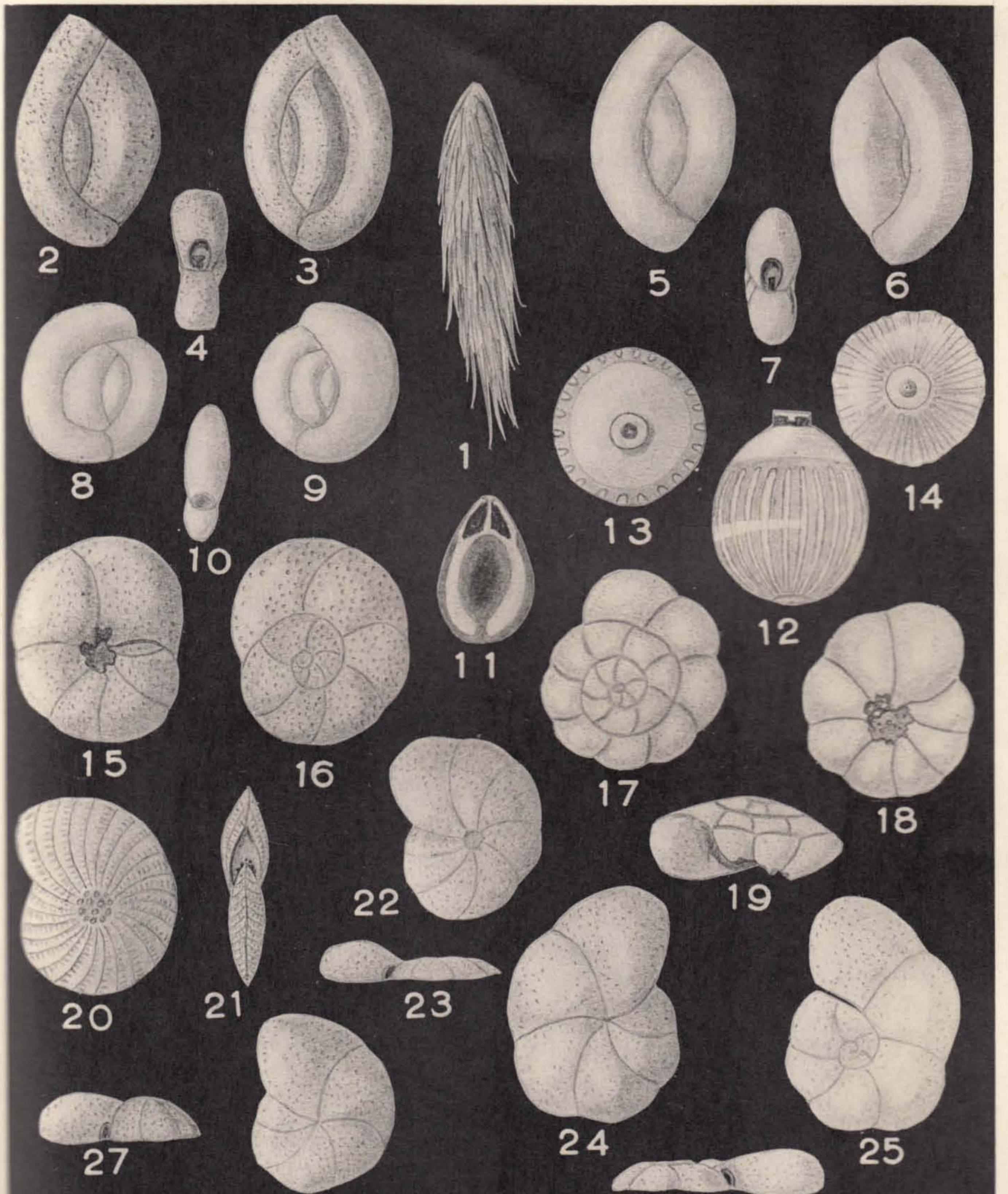


Haman: Recent Foraminifera from the Faeroe Islands, Denmark

CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME XVII, PART 2, APRIL, 1966

# 317. *QUINQUELOCULINA NEOSIGMOILINOIDES*, NEW NAME FOR *QUINQUELOCULINA SIGMOILINOIDES* VELLA, PREOCCUPIED[1]

JAMES P. KENNETT
New Zealand Oceanographic Institute,
Department of Scientific and Industrial Research, Wellington

While carrying out a study of Foraminifera from the Ross Sea, Antarctica, it was discovered that *Quinqueloculina sigmoilinoides* Vella (1957, p. 24, pl. 6, figs. 115-117) from the Recent of New Zealand is preoccupied by *Q. sigmoilinoides* Gianotti (1953, p. 43, pl. 4, fig. 1) from the middle Miocene of Italy.

On indicating this to Dr. Paul Vella (pers. comm.) he authorized me to rename his form. The new name *Quinqueloculina neosigmoilinoides* is proposed for *Q. sigmoilinoides* Vella.

[1] New Zealand Oceanographic Institute, Contribution No. 192.

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CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME XVII, PART 2, APRIL, 1966

# RECENT LITERATURE ON THE FORAMINIFERA

Below are given some of the more recent works on the Foraminifera that have come to hand.

ALFIREVIC, SLOBODAN. Contribution a la connaissance de l'appartenance systematique des foraminifères Adriatiques (French résumé of Jugoslavian text).—Acta Adriatica, Instit. Oceanogr. Ribarstvo, Split, SFR Jugoslav., v. 11, No. 2, Simpozij Jugoslav. Oceanogr., Split, Oct. 16, 17, 1962, 1964, p. 19-28, text fig. 1.—Equivalence between old and present-day generic and specific names shown for about 30 species.

AMATO, FRANCIS L. Stratigraphic paleontology in the Philippines.—The Philippine Geologist, v. 19, no. 1, March 1965, p. 1-24, pls. 1-7, text figs. 1-9 (correl. chart, maps, correl. diagram, photos, range chart).—Adaptation of West Indian planktonic zonation for use as "Basic Zonation" in the Philippines.

AUDLEY-CHARLES, M. G. A Miocene gravity slide deposit from eastern Timor.—Geol. Mag., v. 102, No. 3, 1965, p. 267-276, pls. 8, 9, text fig. 1 (map).—Age determined by upper Miocene Foraminifera mixed with others as old as Permian.

BANDY, ORVILLE L., INGLE, JAMES C., JR., and RESIG, JOHANNA M. Modification of foraminiferal distribution by the Orange County outfall, California.—Ocean Science and Ocean Engineering, Washington, D.C., June 1965, p. 55-76, text figs. 1-10 (loc. map, distrib. maps, fence diagrams).—This moderate-sized sewage outfall shows abundance aureoles of living Foraminifera, and a small depressed zone at the outfall point, with the same species as those previously reported at larger and smaller outfalls along the southern California coast. Study is based on live and dead populations from 65 stations. Greater prominence of arenaceous forms in the dead than in the living assemblages suggests post-depositional solution of calcareous forms.

BOLLI, HANS M., and BERMUDEZ, PEDRO J. Zonation based on planktonic Foraminifera of middle Miocene to Pliocene warm-water sediments.—Bol. Informativo, Asoc. Venez. Geol., Min. Petrol., v. 8, No. 5, May 1965, p. 121-149, pl. 1, tables 1, 2.—An important paper proposing 6 new planktonic zones: 1 in the middle Miocene (above the *Globorotalia menardii* zone), 3 in the upper Miocene, and 2 in the Pliocene. The study is based on 4 sections: coastal northeastern Venezuela, coastal northwestern Venezuela, Jamaica, and cores from Bodjonegoro-1 well in Java. The occurrence and range of 10 critical species in these 4 sections are indicated graphically. Four new species and a new subspecies are described. The probable effects of ecologic factors (temperature, depth, and salinity) on viability of planktonic species are shown, using *Globorotalia tumida, G. truncatulinoides, Sphaeroidinella seminulina* and *S. dehiscens* as examples.

BOLTOVSKOY, ESTEBAN. Recolección de Foraminíferos en las aguas someras y su preparación.—Centro Invest, Biol. Marina, Contrib. Técnica No. 1, June 1965, p. 1-11, text figs. 1-5 (diagrams).—Regarding collecting equipment and methods suitable for bottom faunas in shallow water.

Beitrag zur Kenntnis der Jahreszyklen der Foraminiferen.—Int. Revue ges. Hydrobiol., Band 50, heft 2, 1965, p. 293-296, text fig. 1 (graph). —January (summertime) maxima.

The subtropical/subantarctic zone of convergence (Atlantic Ocean, western part) (in Spanish with English Summary).—Argentina Serv. Hidro. Naval, Publ. H640, 1966, p. 1-69, pl. 1, maps I-IV, graphs 1-3, tables 1-5.—By study of 320 planktonic samples obtained during 3 expeditions (summer, early autumn, and late winter) off the southeastern coast of South America (between 27° and 55° S), the zone of convergence is recognized through the relative abundances of species characteristic of subtropical and those characteristic of subantarctic water. The zone of convergence extends through about 18° of latitude and consists of alternating patches of subtropical water, subantarctic water, and mixed water with either subtropical or subantarctic predominance of species. Of the 22 species present, 5 are useful as indicators of subantarctic water and 3 of subtropical water; the remainder are either too rare in the present collections or occur in both water types. Data are included on coiling direction, number of specimens per volume of water, variation in size, vertical migration, benthonic specimens in planktonic hauls, and changes in temperature and salinity across the patches of alternating water types within the zone of convergence.

BRODIE, J. W. Capricorn Seamount, South-West Pacific Ocean.—Trans. Roy. Soc. New Zealand, Geol., v. 3, No. 10, Aug. 6, 1965, p. 151-158, pls. 1, 2, text figs. 1, 2 (maps).—In limestone dredged from the summit are 2 generations of *Cycloclypeus;* Miocene ones within fragments and Pliocene to Recent ones within the matrix.

BÜRGL, HANS. El limite Oligo-Mioceno en el Terciario Marino de Colombia.—Rev. Acad. Colombiana Ciencias Exactas, Fisicas y Naturales, v. 12, No. 47, Aug. 1965, p. 245-258, text figs. 1-7 (correl. charts, maps, geol. sections), tables 1-3.—*Globigerina oligocaenica* zone recognized in Colombia.

CHIJI, MANZO. Foraminiferal faunules from the Uemati Formation, Osaka City.—Bull. Osaka Mus. Nat. Hist., No. 16, March 1963, p. 53-67, pls. 5-7, text figs. 1, 2 (map, columnar section), tables 1, 2.—Illustrated catalog of 37 species and varieties (9 indeterminate) from a late Pleistocene terrace deposit.

DOUGLAS, ROBERT. An occurrence of *Shepheardella* Siddal (Foraminiferida) from the West Coast of North America.—Jour. Protozoology, v. 11, No. 4, Nov. 1964, p. 484-486, text figs. 1-3.—*Shepheardella taeniformis* Siddal living in tide pools near Malibu, California.

ERHARDT, GY. Geological informations of the basic drilling at Füzérkajata (English summary).—Ann. Rept. Hungarian Geol. Inst. of 1962, Budapest, Dec. 1964, p. 391-425, pls. 1-7, text figs. 1-5 (map, core section, cores), 2 tables. —Includes illustrations of several Sarmatian and Tortonian assemblages of Foraminifera.

GRAHAM, J. J., DE KLASZ, I., and RÉRAT, D. Quelques importants Foraminifères du Tertiare du Gabon (Afrique Équatoriale).—Revue de Micropaléontologie, v. 8, No. 2, September 1965, p. 71-84, pls. 1, 2, text fig. 1 (map).—Nineteen species (13 new) and 6 subspecies (all new) from Paleocene to lower Miocene.

GUHA, D. K., and MOHAN, MADAN. A note on Upper Cretaceous microfauna from the Middle Andaman Island.—Bull. Geol., Min. and Metall. Soc. India, No. 33, April 1965, p. 1-4, pl. 1, text fig. 1 (map).

HAMAOUI, M. On a new subgenus of *Hedbergella* (Foraminiferida).—Israel Jour. Earth-Sciences, v. 13, No. 3-4, March 1965, p. 133-142, pls. 1, 2.—*Asterohedbergella* (type species *H.* (*A.*) *asterospinosa* n. sp.) from the upper Cenomanian of Israel.

HANZLIKOVA, EVA and MENCIK, EDUARD. Foraminiferal plankton in the Jaslo claystone of the Carpathian Flysch in Poland (in Czeck with German summary).—Vestnik Ustred. Ustavu Geol., roc. 40, cis. 5, 1965, p. 345-350, pls. 1-4.—Eocene-Oligocene globigerinids in thin section.

HAUSMANN, HELLMUT E. Foraminiferenfauna und Feinstratigraphie des mitteloligozänen Septarientones im Raum zwischen Magdeburg und Dessau. Teil II: Feinstratigraphie und Ökologie.—Hercynia, Leipsig, v. 2, heft 3, 1965, p. 267-290, text figs. 1, 2 (correl. chart, diagram), diagrams 1-5 (check lists, abundance graphs). —Six Foraminifera horizons present in two borings. Correlation by fluctuating abundance of a few selected species.

HILTERMANN, HEINRICH. Fortschritte der Mikropaläontologie in Deutschland mit einer Bibliographie für das Jahr 1964.—Paläont. Zeitschr., Stuttgart, Band 39, Heft 3/4, Oct. 1965, p. 249-262.

Zur Geschichte der angewandten Mikropaläontologie.—Ber. Naturhist. Ges., Hannover, Band 109, 1965, p. 23-47, text fig. 1 (diagrams).—History of applied micropaleontology, beginning in the late 1600's up to the present.

HORNIBROOK, N. DE B., and SHU, YEOH KHOON. Fusuline Limestone in the Torlesse Group near Benmore Dam, Waitaki Valley.—Trans. Roy. Soc. New Zealand, Geol., v. 3, No. 8, July 21, 1965, p. 136, 137, pl. 5.—An indeterminate form, belonging in Verbeekinidae or Neoschwagerinidae, in Permian beds.

JANNIN, FRANÇOISE. Contribution à l'étude du stratotype de l'Albien: variations des microfaunes dans la partie inférieure des argiles tégulines.—Revue de Micropaléontologie, v. 8, No. 2, September 1965, p. 106-117, text figs. 1-4 (map, graphs), diagrams 1-7 (pie diagrams, frequency diagram).—Quantitative analysis of species of Foraminifera in 6 samples from 3 different outcrops of the Albian.

KELLOUGH, GENE ROSS. Paleoecology of the Foraminiferida of the Wills Point Formation (Midway Group) in northeast Texas.—Trans. Gulf Coast Assoc. Geol. Soc., v. 15, 1965, p. 73-153, pls. 1-15, text figs. 1-27 (maps, profiles, correl. chart, columnar section, geol. sections, electric logs, check lists, graphs, outcrop photographs).—Basing paleoecology on numbers of species and of specimens and on benthonic or planktonic dominance, transgression and regression, with fluctuating depth and open marine to intertidal or brackish conditions, are interpreted. An illustrated systematic catalog of about 185 species (1 subspecies new) is included.

KORECZ-LAKY, I. Foraminiferen-Fauna der Bildungen von "Leitha"-Fazies des Östlichen Mecsek (German summary of Hungarian text).—Ann. Rept. Hungarian Geol. Inst. of 1962, Budapest, Dec. 1964, p. 57-69, pls. 1-3.—Tortonian Foraminifera.

KRISTAN-TOLLMANN, EDITH. Zwei charakteristische Foraminiferengemeinschaften aus Rhätkalken.—Mitt. Ges. Geol. Bergbaustud., Band 14, 1963 (Sept. 1964), p. 135-147, pls. 2-4.—Twelve species, 4 new, from 2 localities in the Upper Triassic of Austria.

KRISTAN-TOLLMANN, EDITH, and TOLLMANN, ALEXANDER. Das mittelostalpine Rhät-Standardprofil aus dem Stangalm-Mesozoikum (Kärnten) mit Vergleich zum unter- und oberostalpinen Rhät.—Mitteil. Geol. Gesellschaft Wien, Band 56, 1963, Heft 2, 1964, p. 539-589, pls. 1-8.—Thirteen Rhaetian species of Foraminifera, 3 new.

KU, TEH-LUNG, and BROECKER, WALLACE S. Atlantic deep-sea stratigraphy: extension of absolute chronology to 320,000 years.—Science, v. 151, No. 3709, Jan. 28, 1966, p. 448-450, text figs. 1-3 (graphs), table 1.—Th-230 measurements on a Caribbean core, in which a complete climatic record has been shown to exist, confirm the predicted age of the U-V boundary (Sangamon-Illinoian) as 320,000 years. As this age had been derived from extrapolation of sedimentation rates, the result also confirms the uniformity of past sedimentation rates in the Caribbean.

LEVEN, E. YA. Systematics of the family Verbeekinidae (Fusulinida) (translation).—Internat. Geol. Rev., v. 7, No. 11, Nov. 1965, p. 2066-2073, pl. 1, text fig. 1 (phylogenetic diagram).

MARIE, PIERRE, and COUSIN, MICHEL. Données micropaléontologiques sur les couches inférieures du flysch dans le Val Cellina (Alpes méridionales, Udine, Italie).—Bull. Soc. Géol. France, ser. 7, tome VI, No. 4, 1964 (Nov. 1965), p. 456-460, text figs. 1, 2 (map, columnar section), check list.—Planktonic and both larger and smaller Foraminifera from a Paleocene section.

MASPERONI BASTIANUTTI, CORNELIA. Studio micropaleontologico della serie di terreni Priaboniano-Langhiani del Trevigiano Occidentale (with English abstract).—Mem. Istit. Geol. e Mineral. Univ. Padova, v. 24, 1963-64 (1964), p. 1-65, pls. 1-4, text figs. 1-3 (drawings), distrib. and abund. tables.—Middle Eocene to Langhian Foraminifera, most of them illustrated in thin section.

MCGOWRAN, BRIAN. Two Paleocene foraminiferal faunas from the Wangerrip Group, Pebble Point coastal section, Western Victoria.—Proc. Roy. Soc. Victoria, v. 79, pt. 1, Dec. 10, 1965, p. 9-74, pls. 1-6, text figs. 1-14 (drawings), table 1.—About 120 species (1 described as new and 13 others indeterminate) recorded and illustrated from two faunas, one middle Paleocene and one upper Paleocene. Correlation is by planktonics.

MCGUGAN, A. Liassic Foraminifera from Whitepark Bay, County Antrim.—Irish Naturalists' Jour., v. 15, No. 4, Oct. 1965, p. 85-87, pl. 1.—Eleven species (4 indeterminate), none new; all but one lagenids.

MEGURO, HIROSHI, YOSHIDA, YOSHIO, UCHIO, TAKAYASU, KIGOSHI, KUNIHIKO, and SUGAWARA, KEN. Quaternary marine sediments and their geological dates with reference to the geomorphology of Kronprins Olav Kyst.—Antarctic Geology, SCAR Proc., 1963, p. 73-80, text figs. 1-2 (map, profiles), tables 1-3.—Along Prince Olav Coast of Antarctica, Foraminifera from marine sediments of Pleistocene age, raised up to 20 meters above sea level, are dated by radio-carbon as 23,000 years or older.

DE MEUTER, F. Etude paléo-écologique des Foraminifères des Sables d'Edegem (Miocène Moyen) à Terhagen (prov. d'Anvers).—Bull. Soc. Belge Géol., Tome 74, fasc. 1, 1965, p. 53-59, text figs. 1, 2 (map, graphs).—Middle Miocene Edegem Sands subdivided on the basis of quantitative analysis of 15 species into 3 ecologic members, the lower and upper ones deposited under littoral conditions and the middle member indicating influence of a northern open sea.

NAGY-GELLAI, Á. Oligozäne Foraminiferen des Süd-Doroger Gebietes (German summary).—Ann. Rept. Hungarian Geol. Inst. of 1962, Budapest, Dec. 1964, p. 227-236, pls. 1-3, text fig. 1 (columnar sections).

NEUMANN, M. Contribution à l'étude de quelques Lituolidés du Cénomanien d'île Madame (Charente-Maritime).—Revue de Micropaléontologie, v. 8, No. 2, September 1965, p. 90-95, pls. 1, 2.—Three genera discussed, 2 new: *Mayncina* (type species *Daxia d'orbignyi* Cuvillier and Szakall) and *Charentia* (type species *Charentia cuvillieri* n. sp.).

PANTIC, SMILJKA. *Pilammina densa* n. gen., n. sp. and other Ammodiscidae from the Middle Triassic in the Crmnica (Montenegro).—Bull. Geol., Instit. Recherches Geol. Zagreb et Soc.

Geol. Croate, tome 18, No. 1 (1964), Zagreb, 1965, p. 189-194, pls. 1-4.

POIGNANT, ARMELLE. Deux nouvelles espèces de Foraminifères d'Aquitaine méridionale.—Revue de Micropaléontologie, v. 8, No. 2, September 1965, p. 103-105, pl. 1.—*Rotalia cuvillieri* from the upper Oligocene and *Queraltina abrardi* from Eocene-Oligocene passage beds.

PREMOLI SILVA, ISABELLA. Permian Foraminifera from the Upper Hunza Valley.—Ital. Exped. to the Karakorum ($K^2$) and Hindu Kush, Sci. Repts., IV, 1965, p. 89-125, pls. 10-18 (on p. 364-381), text fig. 1 (drawings).—From rock studied in thin section, 27 species (1 new and 15 indeterminate).

RAMOVS, ANTON, and KOCHANSKY-DEVIDÉ, VANDA. Die Entwicklung des Jungpaläozoikums in der Umgebung von Ortnek in Unterkrain (German summary of Jugoslavian text).—Slovenska Akad. Znanosti in Umetnosti, Ljubljana, Razred za Prirod. in Medicin. Vede, Class. IV: Hist. Nat. et Medicina, Razprave, Dissert., No. 8, 1965, p. 319-416, pls. 1-18, 1 map.—Includes descriptions and illustrations of 23 fusulinid species (2 new and 9 indeterminate) and 1 new subspecies.

RAUZER-CHERNOUSOVA, D. M. Dating the emergence of new species in the geologic past (translation).—Internat. Geol. Rev., v. 7, No. 11, Nov. 1965, p. 2049-2053.—There may be a considerable time lag following the initial stage of formation of new forms, through mutations at different times and in different parts of a habitat, before the more easily recognizable stage of rapid dispersal of a viable new species.

ROCHA, A. TAVARES, and UBALDO, M. LOURDES. Contribution for the study of Foraminifera from sands of Diu, Gogolá and Simbor.—Garcia de Orta, Lisboa, v. 12, No. 3, 1964, p. 407-420, pls. 1-5, text fig. 1 (map), distrib. and abund. chart.—Fifty-two species (none new) recorded and illustrated from 10 samples of beach and dune sands along the southern Kathiawar peninsula, India.

ROSENBERG-HERMAN, YVONNE. Étude des sédiments quaternaires de la Mer Rouge.—Ann. Instit. Océanographique, v. 42, No. 3, 1965, p. 339-415, pls. 1-12, text figs. 1-15 (map, graphs), tables A-K.—A sequence of Quaternary climatic fluctuations.—Postglacial, Last Glacial, Last Interglacial, and the upper part of the Penultimate Glaciation—is established through the study of micropaleontology and lithology in 14 deep-sea cores and comparison with living Foraminifera in 6 plankton tows.

ROSS, CHARLES A. Late Pennsylvanian Fusulinidae from the Gaptank Formation, west Texas. Jour. Paleontology, v. 39, No. 6, Nov. 1965, p. 1151-1176, pls. 141-145, text figs. 1-8 (map, columnar sections, diagrams, range chart, correl. chart), tables 1, 2.—Sixteen species; 10 species of *Triticites* are new.

ROSS, CHARLES A., and SABINS, FLOYD F., JR. Permian fusulinids from El Paso Mountains, California.—Jour. Paleontology, v. 40, No. 1, Jan. 1966, p. 155-161, pls. 19, 20, text fig. 1 (map, columnar section), table 1.—Eight species, 3 new and 5 indeterminate.

SAMANTA, BIMAL K. *Discocyclina* from the upper Eocene of Assam, India.—Micropaleontology, v. 11, No. 4, Oct. 6, 1965, p. 415-430, pls. 1-4, text figs. 1-3 (maps), tables 1-3.—Eleven species, none new.

TAPPAN, HELEN, and LOEBLICH, ALFRED R., JR. Foraminiferal remains in palynological preparations.—Revue de Micropaléontologie, v. 8, No. 2, Sept. 1965, p. 61-63.—Examples of generic names given to pseudochitinous remains and inner linings of specimens already having names.

THOMPSON, M. L., and SHAVER, R. H. Early Pennsylvanian microfaunas of the Illinois Basin.—Trans. Illinois Acad. Sci., v. 57, No. 1, March 1964, p. 3-23, pl. 1, text figs. 1, 2 (map, stratig. sections), tables 1, 2.—*Profusulinella burrensis* n. sp.

TOOMEY, DONALD FRANCIS, and SANDERSON, G. A. A bibliography of the family Fusulinidae, addendum 2.—Jour. Paleontology, v. 39, No. 6, Nov. 1965, p. 1192-1206.

VANGEROW, E. F. Die Foraminiferen des Westdeutschen Oberkarbons.—Palaeontographica, Stuttgart, Band 124, Abt. A, lief. 1-3, Aug. 1964, p. 1-32, pls. 1-5, text figs. 1-7 (maps, chart, graphs), tables 1, 2.—Illustrated systematic catalog includes 18 species (4 new and 2 indeterminate) mostly in the Ammodiscoidea. *Agathamminoides* n. gen. (generotype *A. gracilis* n. sp.) is erected in the Ammodiscidae.

ZHELUBOVSKAYA, K. V., and BRAYNINA, B. I. Separational method of removing microfauna from Quaternary rocks using heavy liquid PD-3 (translation).—Internat. Geol. Rev., v. 7, No. 11, Nov. 1965, p. 2063-2065.—Non-toxic.

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