CONTRIBUTIONS

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348. ANNOTATED BIBLIOGRAPHY OF PALEOZOIC NONFUSULINID FORAMINIFERA, ADDENDUM 5

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ABSTRACT

This addendum includes 150 annotated references pertaining to Paleozoic nonfusulinid Foraminifera, and can be considered reasonably complete through the year 1966. As in previous bibliographies, (Toomey, 1959, 1961, 1963, 1965, 1966, and Toomey and Mamet, 1967)[1], the aims are: (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 current and 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 39 references containing original descriptions of genera and species and taxonomic nomenclature of Paleozoic nonfusulinid Foraminifera. An additional 111 references that utilized smaller foraminifers in stratigraphic subdivision and that mention incidental occurrences are also included for completeness.

The 150 references have been annotated by the compilers. These annotations include geologic age, geographic locality, type of illustrations, original language, new forms described, and comments in brackets on taxonomic changes from the annotated article or noted from subsequent publications. It should be noted that Professor Mamet is actively engaged in research on the Lower Carboniferous smaller foraminifers of the world, hence, many of the notations enclosed within the brackets, especially in reference to Lower Carboniferous articles, are comments made by him and based upon his considerable experience working with these forms.

This bibliography may be considered to be reasonably complete through the year 1966. This includes the Soviet references, which, through the able assistance of Dr. Mamet, have been up-dated.

Including this addendum, the total number of annotated Paleozoic nonfusulinid foraminiferal references has reached 965. The compilers would greatly appreciate the effort and cooperation of all Paleozoic foraminiferal workers in keeping them current on all new works that appear by sending pertinent reprints and separates when available.

[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; v. 17, p. 46-66; v. 18, p. 55-83.

LITERATURE EVALUATION AND APPARENT TRENDS

Text fig. 1 is an attempt to show chronologically the distribution of articles relating to Paleozoic nonfusulinid Foraminifera within designated geographic provinces. The inclusion of the present 150 references continues to point out the pronounced increase of foraminiferal literature from Europe, Africa, and the Middle East (Column C), and the continued additions made by the Soviet Union. Both these gains are due primarily to the ever increased usage of the endothyroid-type smaller foraminifers in stratigraphically subdividing the Lower Carboniferous on a worldwide basis.

In text fig. 2 the output of foraminiferal literature has been plotted according to geologic age. The basic overall trend shown in previous bibliographies remains the same, and again is a reflection of the intense work on Lower Carboniferous microfaunas, as noted above.

COMMENTS

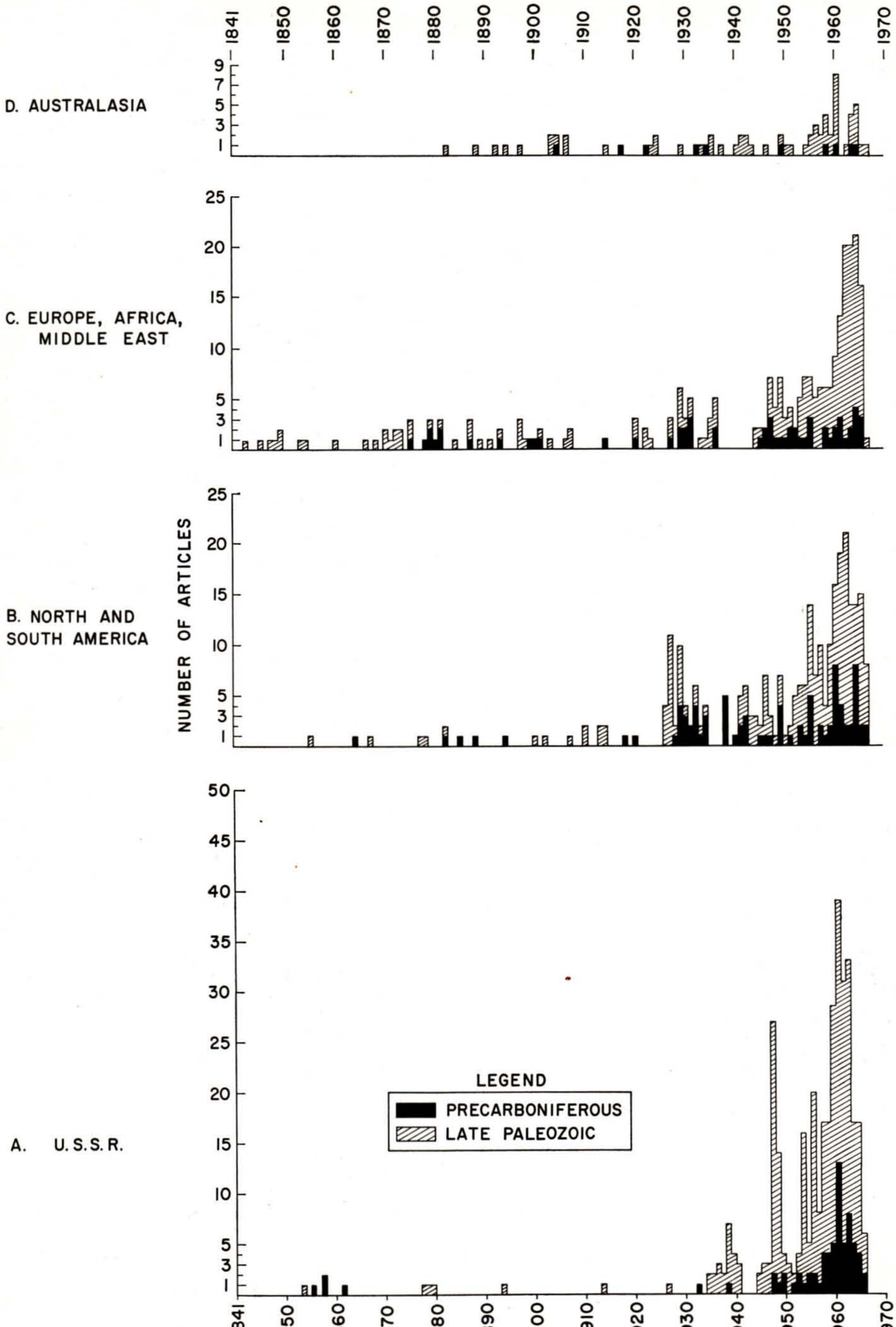
At this time it seems pertinent to call attention to the fact that although some workers, principally our Soviet colleagues, still make use of such infrasubspecific entities as "variety" and "form" in systematic descriptions, the International Code of Zoological Nomenclature specifically considers them invalid if erected after 1960 (see Articles 1, 15, 17 (9), 45(e), etc.). The compilers have in the past, and will in the future, continue to report new taxa as they are originally erected by their author(s); however, the judgments and opinions of the I.C.Z.N., as mentioned above, should be borne in mind and strictly adhered to.

ANNOTATED BIBLIOGRAPHY

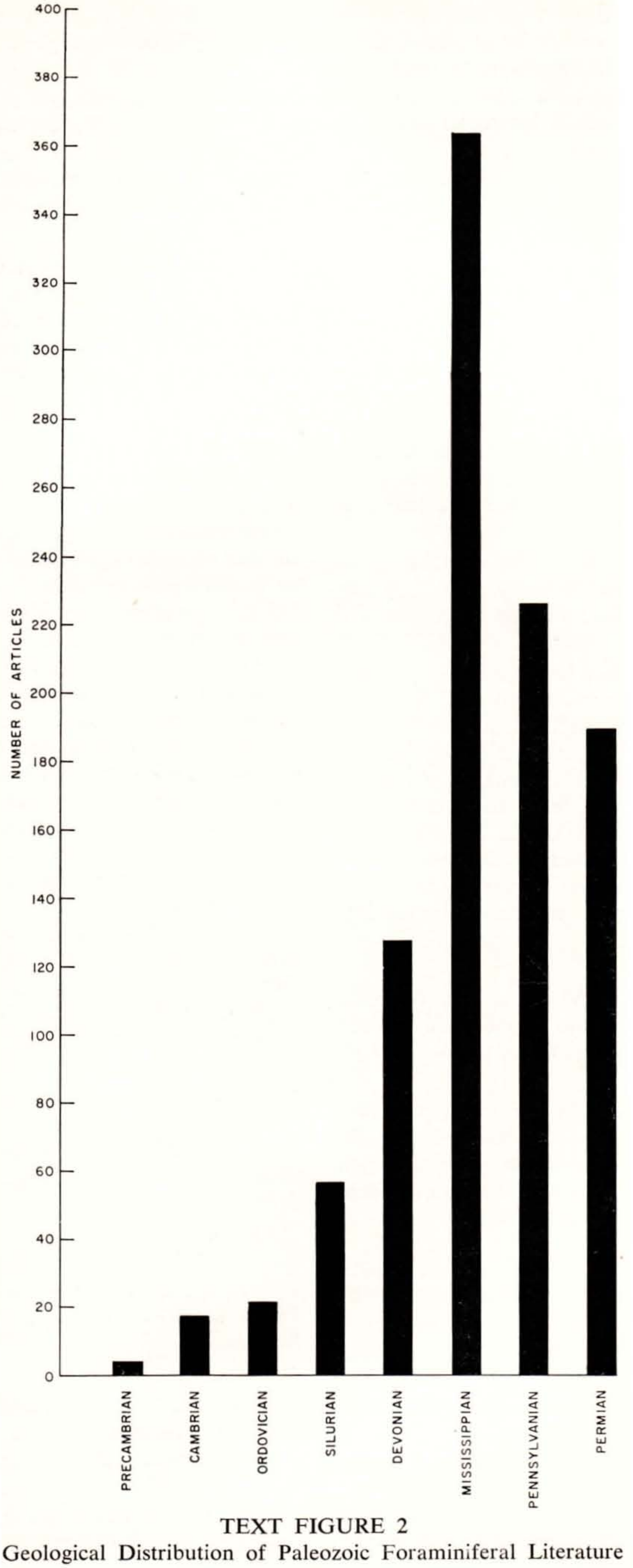
A. *PRECARBONIFEROUS FORAMINIFERA*

1. BECKMANN, H., 1965, Holothuriensklerite aus dem Givet der Paffrather Mulde (Rheinisches Schiefegebirge): Fortschr. Geol. Rheinld. u. Westf., v. 9, p. 195-208, 1 pl., 15 text-fig., [in German with English and French abstracts].

Primarily a paper describing a faunule of holothurian sclerites from the upper Middle Devonian (Givetian) limestone of the Paffroth Syncline, a



TEXT FIGURE 1
Geographic Distribution of Paleozoic Foraminiferal Literature



TEXT FIGURE 2
Geological Distribution of Paleozoic Foraminiferal Literature

few miles east of Cologne, West Germany. It is noted that the sclerites are associated with benthonic Foraminifera (rare *Palachemonella torleyi* and very rare *Rhenothyra refrathiensis*), ostracodes, sponge spicules, and various spheroidal bodies.

2. CHUVASHOV, B. I., 1963, On the Paleozoic stromatoporoids: Akad. Nauk S.S.S.R., Trudy, Ural Branch, Inst. Geol., Bull. 65, p. 77-90, 4 text-fig., [in Russian].

Primarily a discussion of the paleoecology of Soviet stromatoporoid-bearing beds of the Late Devonian. Four types of stromatoporoid facies are considered. It is noted that the "sulfato-carbonate facies" is considered the most favorable to smaller foraminiferal occurrence. Turbulent stromatoporoid environments of growth appear to be characterized by an abundance of relatively thick-walled, bilayered forms such as *Eonodosaria* and *Eogeinitzina.*

3. CHUVASHOV, B. I., 1965, *Katavella*, a new genus of fossil red algae: Paleont. Zhur., No. 2, p. 144-146, pl. 12, [in Russian; English translation *IN*: Internat. Geol. Rev., v. 8, no. 1, p. 89-93, 1 pl.].

The most complete and best preserved specimens of a newly described genus of red alga, *Katavella*, came from deposits of the Ust-katav layers of the Upper Devonian (Frasnian) rocks on the left bank of the Katav River, near the village of Orlovka (south Urals), U.S.S.R. Here, abundant foraminifers (*Nodosaria evlanensis* Lipina, *N. solida* Konolipina, *N. rauserae* (N. Tchern.), *Geinitzina devonica* Lipina, and *Frondilina sorosis* Bykova) were found in association with the newly described alga *Katavella.*

4. EHRENBERG, C. G., 1856, Über dem Grünsand und seine Erläuterung des organischen Lebens: Abh. Preuss. Akad. Wiss., Berlin, p. 85-176, 7 pl., [in German].

Mentions the occurrence of the foraminifers *Textilaria* [*sic*] *globulosa*?, *Guttulina* sp. and *Rotalia* sp. in the Lower Silurian shales near St. Petersburg [Leningrad], Russia. [The reported forms are probably inorganic concretions.]

5. EISENACK, A., 1966, Symbionten in fossilen Protisten: Paläont. Zeit., v. 40, no. 1/2, p. 103-107, pl. 8, [in German].

The writer notes the presence in some fossil protists (dinoflagellates, hystrichs, and foraminifers) of small globular structures which he interprets to be fossil symbionts and which he believes are similar to and may even correspond to Recent zoochlorellae and/or zooxanthellae. It is shown that some Silurian (Gotland) foraminifers (*Archaeochitosa clausa* and *Amphitremoidea robusta, nom. nud.*) from the Visby Marl contain these symbionts. Excellent photomicrographs are included.

6. EISENACK, A., 1966, Zur Biologie primitiver Foraminiferen aus baltischen Ordovizium und Gotlandium: Neues Jahrb. f. Geol. u. Paläont. Abh., v. 125, Festband Schindewolfe, p. 382-400, pl. 29-32, 4 text-fig., [in German with very brief English abstract].

The present paper supplements former and recent reports by the writer on the Foraminifera of the Ordovician and Silurian from the Baltic region of Europe. Several lines of observational evidence concerning their biology are discussed in detail. Representative forms are illustrated by excellent photomicrographs.

The writer presents an informative discussion on the remarkable plasticity in size, form, and test makeup of Paleozoic foraminifers—especially the forms *Blastammina polymorpha* and *B. polyedra.* He also notes that it would be a relatively easy matter to study these forms if we could realistically relate their peculiarities to substrate influence. In this way it would be possible to know something of their habitat and the conditions of deposition.

Eisenack also emphasizes the point that many species can form relatively suddenly, that is, they are able to rapidly alter their test structure. This is a striking feature and appears to be directly concerned with the problem of the origin of new species.

Many Lower and Middle Paleozoic foraminiferal specimens that the writer has collected during his long career contain various included bodies. These are problematical, but the writer suggests that the presence of included bodies within the foram test may be related to as yet unknown nutritional phenomena and the hypothetical existence of a naked stage during the early phases of the life cycle—that is, before actual formation of the test.

7. GEUKENS, F., 1964, Un problème relatif aux Foraminifères des schistes graphiteux de l'Ordovicien et du Cambrien belge (Abstract): Repts. 22nd. Internat. Geol. Cong., India, p. 117, [in French].

Reports the occurrence of the smaller foraminifers *Bathysiphon* sp., *Rhabdammina* sp., *Raibosammina* sp., and *Lagenammina* sp., from the Lower Paleozoic (Cambro-Ordovician) black shales of Belgium.

8. HOWELL, B. F., and DUNN, P. H., 1935, Early Cambrian Foraminifera from Greenland and Labrador (Abstract): Proc. Geol. Soc. America for 1934, p. 350-351.

The writers report the discovery of Early Cambrian agglutinated Foraminifera, closely resembling forms currently assigned to *Psammosphaera* sp. and *Hyperamminoides* sp., from Ella Island, east Greenland and Forteau Point, Labrador. [See Howell and Dunn, 1942, for a formal description and discussion of this microfauna.]

9. IRELAND, H. A., 1967, Microfossils from Silurian of England (Abstract): Am. Assoc. Petroleum Geologists, Bull., v. 51, no. 3, p. 471, Abstracts of A.A.P.G.-S.E.P.M.-N.A.G.T. Papers, Los Angeles, Calif., April 10-13.

The writer notes that acid residues of some English Silurian carbonates have yielded numerous agglutinated foraminifers. These microfaunas correlate with contemporaneous beds in North America, Norway, Sweden, Austria, Czechoslovakia, and Australia. Preliminary examination of specimens from Gotland and Scania indicates that most of the species present from these islands are similar to those from England. In addition, a few of the species from England, Norway, and Gotland are identical to those from the Arbuckle Mountains of southern Oklahoma, the Kansas subsurface, and the central United States, but most of them are new.

Nearly all of the agglutinated Foraminifera belong to the family Saccamminidae; most are attached forms, and these have not been previously described. A few species of *Bathysiphon, Hyperammina*, and *Ammodiscus* are the only other genera present. More than 11,000 agglutinated foraminifers from England and 3,000 from Gotland have been isolated and studied.

10. IRELAND, H. A., 1967, Zonation and correlation of the subsurface Hunton Group (Silurian-Devonian) in Kansas by Foraminifera and acid residues. *IN*: Essays in paleontology and stratigraphy, R. C. Moore Commemorative Volume, Edited by C. Teichert and E. L. Yochelson, p. 479-502, 4 text-fig., 2 tables, Dept. Geol., Univ. Kansas Special Pub. 2, The Univ. Kansas Press, Lawrence.

Silurian agglutinated Foraminifera, previously described by Ireland (1966) and others, have been found to be useful in identifying and correlating certain subsurface stratigraphic horizons in Kansas with outcrops in the Arbuckle Mountains of southern Oklahoma and in areas east of Kansas. The Silurian Zone 3, the only zone reported in this study that contains agglutinated foraminifers, shows excellent correlation (similar microfaunas) with the Clarita Member at the top of the Chimneyhill in the Arbuckle Mountains. A series of cross-sections show the subsurface distribution of the Silurian foraminiferal unit (Zone 3) in the Salina and Forest City Basins of Kansas. [See Lee (1943, 1956) and Ireland, 1966, for additional information on this distinctive agglutinated microfauna.]

11. JUFEREV, O. V., 1961, Systematics of *Parathurammina*: Voprosy Mikropaleontologii, No. 5, p. 121-127, 1 text-fig., 2 tables, [in Russian].

A revision of the systematics of the Upper Devonian-Lower Carboniferous foraminiferal genus *Parathurammina* Suleimanov, 1945.

It is noted that earlier workers based their systematic speciation primarily on wall structure and thickness. The present writer rejects these views and proposes a new classification that is solely based on the gross morphology of the apertural spines. Three main groups are distinguished: (1) papilliform, (2) tubular, and (3) conical. [It should be noted that the shape of the apertural spines on *Parathurammina* partially depends on the orientation of the thin section, since all workers utilize random sections. In addition, no mention is made of the fact that *Parathurammina* was originally described as a calcisphere by Williamson (1880) as *Calcisphaera spinosa*.]

12. KRESTOVNIKOV, V. N., and TERENTIEVA, K. F., 1933, On the lithology of the Devonian deposits of the Moscow Basin: Bull. Soc. Nat. Moscou, v. 41, n. s., sec. geol. 11, no. 1, 3 pl., 1 text-fig., [in Russian].

The writers report the occurrence of the smaller foraminifer *Nodosaria* [= *Eonodosaria*] in the Upper Devonian rocks of the Bobrik region near Moscow, U.S.S.R. The photomicrographs are of randomly cut thin sections (Pl. 2, fig. 9-10).

13. LECOMPTE, M., 1936, Contribution à la connaissance des "recifs" du Frasnian de l'Ardenne: Inst. Géol. Univ. Louvain, Mém., v. 10, p. 30-112, pl. 6-11, 7 text-fig., [in French].

According to the writer the Upper Devonian (Frasnian) Chateau-Gaillard reef at Trelon, northern France, has yielded the following foraminifers: *Apterinella* (*sic*), *Bigenerina*, *Climacammina*, *Endothyra*, *Nodosinella*, *Glomospira*, and representative Nonionidae. [Examination of the writer's photomicrographs of supposed Devonian Foraminifera (pl. 7) indicates that they bear very little resemblance to foraminifers; some are definitely nepionic gastropods.]

14. LIPINA, O. A., 1961, Facies dependent Foraminifera from the Frasnian and lower Tournaisian of the western slope of the Urals: Voprosy Mikropaleontologii, No. 5, p. 147-161, [in Russian].

Based on a study of the Upper Devonian-Lower Carboniferous smaller Foraminifera from the western slope of the Ural Mountains, Soviet Union, the writer asserts that their distribution patterns are dependent upon three factors: (1) evolution, (2) migration, and (3) the influence of physio-chemical conditions. This article deals only with the last factor, and most of the paleoecologic examples are taken from strata of the Famennian-Tournaisian boundary beds.

Depth of water is thought to be of little influence on the distribution of Paleozoic Foraminifera, since most occurrences appear to be restricted to shallow-water platform facies; there were probably no bathyal forms in the Paleozoic. It is believed that slight modifications in salinity induced obvious changes in foraminiferal assemblages (reduction of size and thickness of the test wall). As a result the Foraminifera are divided into what may be considered "normal marine" multilocular forms (Endothyridae and Tournayellidae) and euryhaline monolocular forms (*Parathurammina, Bisphaera, Archaesphaera,* and *Tuberitina*). Moderately agitated and well aerated seas appear to be favorable to both groups. *Girvanella*-bearing and ostracode-rich sediments of reduced salinity appear to be favorable to the monolocular forms. Crinoidal, crinoidal-algal, and algal limestones do not appear to be favorable to either group. Siliceous radiolarites, spiculites, and siliceous mudstones are usually devoid of Foraminifera.

15. McCLELLAN, W. A., 1966, Arenaceous Foraminifera from the Waldron Shale (Niagaran) of southeast Indiana: Bull. American Paleontology, v. 50, no. 230, p. 447-518, pl. 36-42, 2 text-fig., 11 tables.

A large and diverse agglutinated foraminiferal microfauna consisting of 16 genera and 33 species is described from the Waldron Shale of Silurian (Niagaran) age in southeastern Indiana and northern Kentucky. The microfauna is described and illustrated by line drawings and thin-section and whole-specimen photomicrographs. One new genus, *Sorostomasphaera*, and 7 new species are recognized; these are, *Stegnammina contorta, Hemisphaerammina casteri, Metamorphina imbricata, Sorostomasphaera waldronensis, Webbinelloidea hattini, W. globulosa,* and *W. ventriquetra.* Several species are recorded from rocks of Silurian age for the first time.

The Waldron Shale microfauna can be differentiated from certain other Silurian formations on the basis of the foraminiferal assemblages and relative abundance of certain groups. The Waldron microfauna is dominated by members of the Saccamminidae, whereas Lower Silurian foraminiferal assemblages appear to be characterized by the abundance of members of the Ammodiscidae.

Important taxonomic changes include the following: *Psammosphaera gracilis* Ireland, 1939, and Summerson, 1958, *P. conjunctiva* Dunn, 1942, *P. excerpta* Dunn, 1942, and Summerson, 1958, *P. gigantea* Dunn, 1942, *P. minuta* Dunn, 1942, *P. delicatula* Stewart & Lampe, 1947, and Summerson, 1958, *P. devonica* Stewart & Lampe, 1947, and Summerson, 1958, *P. discoidea* Stewart & Lampe, 1947, and Summerson, 1958, *P. rotunda* Stewart & Lampe, 1947, and Summerson, 1958, *P. aspera* Summerson, 1958, and *P. elongata* Summerson, 1958, all = *P. cava* Moreman; *Sorosphaera columbiense* Stewart & Lampe, 1947, and Summerson, 1958 = *S. bicella* Dunn; *S. multicella* Dunn, 1942 = *S. osgoodensis* Stewart & Priddy; *Proteonina cumberlandiae* Conkin, 1961 = *Lagenammina cumberlandiae* (Conkin); *Fairliella discoidea* Summerson, 1958 = *Hemisphaerammina discoidea* (Summerson); *Webbinella tholus* Moreman, 1933, *W. quadripartita* Moreman, 1933, *Sorosphaera geometrica* Eisenack, 1954, and Gutschick, Weiner & Young, 1961, and *Webbinella bipartita* Ireland, 1958, and Summerson, 1958, all = *Metamorphina tholsus* (Moreman), and *Webbinella gibbosa* Ireland, 1939 = *Metamorphina gibbosa* (Ireland).

Of especial interest is a discussion of the validity of the genus *Bifurcammina* (p. 497-499), in which it is concluded that the bifurcation of the test in the last coil, the primary basis for the establishment of this genus, is accidental; such forms should probably be regarded as sports referable to the genus *Ammodiscus*.

16. MALAKHOVA, N. P., 1960, Contribution to the problem of the age of the Kolturban Limestones (southern Urals): Akad. Nauk S.S.S.R., Doklady, v. 132, no. 2, p. 432-434, [in Russian].

Pebbles present in the Kolturban Limestones from the southern Urals, U.S.S.R., contain various previously described foraminiferal elements, among which are recognized such genera as: *Caligella, Parathurammina, Umbella* [= *Umbellina*], *Eogeinitzina, Eonodosaria, Tikhinella, Uralinella, Nanicella, Paratikhinella, Ammodiscus,* and *Moravammina.* According to the microfauna the pebbles vary in age from Middle to Upper Devonian (Givetian-Famennian).

17. MALAKHOVA, N. P., 1963, New data on the stratigraphy of the Paleozoic of the Magnitovorsk Basin: Akad. Nauk S.S.S.R., Ural Branch, Inst. Geol., Trans., Sverdlovsk, No. 65, *IN*: Papers on the problems of stratigraphy No. 7 - Stratigraphy and fauna of the Paleozoic of the Ural Mountains, p. 53-76, [in Russian].

A volcano-sedimentary series of rocks from the middle and southern Urals, ranging in age from Upper Devonian to Middle Carboniferous, has been examined and is compared to the standard section on the Russian Platform. The age of the Koltuban and Zilair Formations, of the Famennian Series near Vernieuralsk, and of the coal-bearing strata in the Great Balandon district is discussed in detail. All of the foraminiferal taxa mentioned have been previously described.

18. MALAKHOVA, N. P., 1963, Types of Foraminifera found in the volcano-sedimentary rocks of the Zelenokam Formation of the Urals: Akad. Nauk. S.S.S.R., Ural Branch, Inst. Geol., Trans., Sverdlovsk, No. 65, *IN*: Papers on the problems of stratigraphy No. 7 - Stratigraphy and fauna of the Paleozoic of the Ural Mountains, p. 91-117, 1 text-fig., 2 tables, [in Russian].

The writer describes and discusses a number of Silurian and Lower and Middle Devonian foraminiferal assemblages occurring in the volcano-sedimentary rocks of the Zelenokam Formation of the Ural Mountains, U.S.S.R. All taxa have been previously described. Megafauna, especially brachiopod assemblages, are also evaluated.

19. POYARKOV, B. V., 1957, On some Foraminifera from the Famennian and Tournaisian deposits of the western spurs of the Tian-Shan Mountains: Leningrad Univ., Vestnik, ser. geol. & geograph. No. 12, p. 26-41, 1 text-fig., 8 tables, [in Russian with English summary].

This article deals with the stratigraphic distribution of 23 genera and 56 species of smaller Foraminifera from the Upper Devonian (Famennian) and Lower Carboniferous (Tournaisian) carbonates of the Tian-Shan Mountains, U.S.S.R. Five foraminiferal assemblages are recognized; these range in age from uppermost Devonian to lower Viséan. Comparison with the European microfaunal zonation is also outlined. [The writer reports the following foraminifers as new: *Quasituberitina magna* n. gen., *Q. magna* var. *minor*, *Bisphaera elongata*, *Cribrosphaera ovalis*, *Eotuberitina reitlingeri* M. Maclay var. *tenuissima*, *E. crassa* var. *minima*, *E. malassica*, *Tuberitina magna*, *T. malakhovae* nom. n., *Thurammina bykovae* nom. n., *Hyperammina paraminima* var. *crassa*, *H. pseudovulgaris*, *Exserammodiscus neobrevitubus* n. gen., *Glomospirella uiramica*, *Septatournayella magna*, *S. lebedvae*, *Endothyra donguztauensis*, *E. asiatica*, *Septaglomospiranella grozdilovae*, and *Plectogyra paraturcestanica*. However, none of the above are formally described or illustrated, hence all must be regarded as *nomina nuda*. Some of these species were formally described in a later paper; *see* Purkin, Poyarkov, and Rozanec, 1961.]

20. POYARKOV, B. V., 1964, Status of *Umbella*: Akad. Nauk S.S.S.R., Doklady, v. 163, no. 3, p. 728-730, 3 text-fig., [in Russian; English translation *IN*: Doklady ESS, Am. Geol. Inst., v. 163, nos. 1-6, p. 210-212, 3 text-fig., March, 1965].

Comparative analysis of the morphology of the shells of the Devonian fossil microörganism *Umbella*, foraminiferal texts of representative Lagenidae, and the utricles and gyrogonites of *Chara* confirms the suggestion that *Umbella* is a plant microfossil. The writer accepts this view and places *Umbella* in the family Umbellaceae Fursenko, 1959. Under the organ genus *Umbella* Maslov, 1950, the following forms are included: *Umbella bella* Maslov, *U. bashkirica* Bykova, *U. patella* Bykova, *U. pugatochovensis* Bykova, *U. bykovae* Reitlinger, and *U. bykovae* var. *grandis* Reitlinger. Under the new organ genus *Elenia* the following forms have been included: *Elenia* [*Umbella*] *famena* (Bykova), *E.* [*U.*] *ornata* (Bykova), and *E.* [*U.*] *ollaria* (Bykova); and the following forms are now included under the new organ genus *Quasiumbella*: *Quasiumbella* [*Umbella*] *rotunda* (Bykova), *Q.* [*U.*] *saccaminiformis* (Bykova), and *Q.* [*U.*] *nana* (Reitlinger). All of the above forms are reported from the Middle and Upper Devonian of European U.S.S.R. and central Asia. Representative sketches of *Umbella* and *Quasiumbella* are included. [See Toomey, 1965, and Teichert, 1965, for pertinent discussions relevant to the genus *Umbellina*.]

21. POYARKOV, B. V., 1966, Devonian charophytes in Tien-Shan. *IN*: Fossil Charophyta of the U.S.S.R., Akad. Nauk S.S.S.R., Trudy, Geol. Inst., Trans., No. 143, p. 161-200, 2 pl., 10 text-fig., 7 tables, [in Russian].

From the Devonian rocks of Tien-Shan, asiatic U.S.S.R., 5 new species and 1 new variety of the problematical form *Umbella* are described and illustrated by thin-section photomicrographs. The new forms are: *Umbella bashkirica* Bykova var. *magna*, *U. sumsoriensis*, *U. hemisphaerica*, *U. mica*, *U. minima*, and *U. borcoldoica*.

A brief review of all previously described species of *Umbella* is given, and it is again reaffirmed that *Umbella* should be considered as a charophyte. Taxonomic changes include the following: *U. rotunda* Bykova, 1955, and *U. radiata* Konolipina, 1959 = *Quasiumbella rotunda* (Bykova); *U. nana* Reitlinger, 1954 = *Quasiumbella nana* (Reitlinger); and *U. globula* Reitlinger, 1966 = *Quasiumbella globula* (Reitlinger). [See Reitlinger, 1966, and Toomey, 1965, for pertinent comments on this problematical form.]

22. PRONINA, T. V., 1960, New species of Foraminifera from lower Givetian deposits of the central and southern Urals: Akad. Nauk S.S.S.R., Paleont. Zhur., No. 1, p. 45-52, 1 pl., [in Russian].

From the Middle Devonian (lower Givetian) limestones of the central and southern Urals, U.S.S.R., a microfauna comprising 1 new genus and 10 new species is described and illustrated by thin-section photomicrographs. The new forms are: *Parathurammina graciosa*, *P. aperturata*, *P. cordata*, *P. arguta*, *P. irregularis*, *P. marginara*, *Cribrosphaera crassa*, *C. novita*, *Tubeporina gloriosa* n. gen., and *Archaelagena borealia*.

23. REITLINGER, E. A., 1966, On the Umbellas in the European part of the U.S.S.R. and in Transcaucasia: *IN*: Fossil Charophyta of the U.S.S.R.: Akad. Nauk S.S.S.R., Trudy, Trans., Geol. Inst. No. 143, p. 213-219, 1 pl., 1 table, [in Russian].

A discussion of all the described forms of *Umbella* from the Devonian of the Soviet Union and Poland. It is noted that most workers regard *Umbella* as a foraminifer, although Poyarkov assigns *Umbella* to the Charophyta (a practice followed in this paper). The writer states: that "actually, the uniqueness of *Umbella* morphological structure, the presence of basal and apical apertures, despite the similarity of the wall microstructure to the lagenid Foraminifera, gives us reason to believe that they are of algal nature." Loeblich and Tappan (1961) called attention to the fact that the name *Umbella* is preoccupied for the mollusc *Umbella* d'Orbigny, 1841, and suggested the name *Umbellina*. However, according to Reitlinger the genus *Umbella* is regarded as a charophyte and, hence, it is still possible to retain the old generic name *Umbella*.

The writer describes and presents thin-section photomicrographs of 3 new species of *Umbella* from the Upper Devonian of Armenia, U.S.S.R. The new forms are: *Umbella globula, U.? lageniformis,* and *U.? elliptica.* At present 18 species and 2 varieties of *Umbella* have been described. By the nature of their gross morphology and shell microstructure the writer subdivided all of the described forms into 5 major groups. An evolutionary sequence demonstrating morphological change from Middle Devonian (Givetian) to Upper Devonian (Famennian) is briefly discussed. [See Toomey, 1965, for a foraminiferal opinion; the new species described by Reitlinger, i.e., *U.? lageniformis* and *U.? elliptica,* definitely appear to be more closely related to lagenid or archaelagenid-type foraminifers.]

24. ROZMAN, J. S., 1962, Stratigraphy and brachiopods of the Famennian Stage of the Mugodzhar (southern part of the Urals) and adjacent areas: Akad. Nauk S.S.S.R., Trudy, Geol. Inst. No. 50, 196 p., 31 pl., 49 text-fig., 12 tables, [in Russian].

Primarily a brachiopod paper; however, does contain numerous references to Upper Devonian Foraminifera. The writer notes that the lower upper Famennian is characterized by the first appearance of *Endothyra communis* in association with *Vicinesphaera squalida*, and *Parathurammina cushmani*. The uppermost Famennian is characterized by the *Septatournayella rauserae* assemblage. It is further noted that the base of the Likhvinsk is drawn at the acme of the *Endothyra communis-Quasiendothyra kobeitusana* assemblage, whereas the lower Tournaisian (Lower Carboniferous) is subdivided into three zones based on the genera *Quasiendothyra, Septatournayella,* and *Bisphaera.*

25. SOBAT, R., 1966, *Semitextularia thomasi* Miller and Carmer (Foram.) aus dem Wissenbacher Schiefer (Eifel-Stufe) von Meggen im Sauerland (Rheinisches Schiefergebirge): Paläont. Zeit., v. 40, no. 3/4, p. 237-243, pl. 23, 3 text-fig., [in German].

Monochloroacetic acid residues of lower Middle Devonian carbonates from the Eifel Stufe, near Meggen, in the Rhenish Schiefegebirge, West Germany, have yielded numerous pyritized steinkerns of the foraminifer *Semitextularia thomasi* Miller and Carmer. Four distinctive morphological forms are recognized within the assemblage and described, although all are placed under the genotype. Previous reported occurrences of *Semitextularia* from Russia, eastern Europe, and North America are also discussed and comparisons offered. The foraminifers are illustrated by whole-specimen photomicrographs.

26. WELCH, R. G., 1962, Extraction of arenaceous Foraminifera by solution of limestone: Search, Univ. Kansas Publ., v. 2, p. 5-8, 2 tables.

The purpose of this study was to determine the method by which agglutinated Foraminifera could be extracted with the greatest efficiency and least damage by acid solution of the limestone. The limestone chosen was the Silurian Chimney Hill Limestone Formation [Clarita Member] found in the Arbuckle Mountains of southern Oklahoma.

Results indicate that if time is an important factor, a high acid concentration, either hydrochloric or acetic, with a crushed sample is the most effective method. For more detailed work and a maximum recovery of the largest number of undamaged specimens, a solid sample is best, the acid concentration depending on the shape, size, and fragility of the microfossils sought.

Seven morphotype categories were found in the Chimneyhill Limestone, these are: (1) planispiral (*Ammodiscus*), (2) tube (*Bathysiphon*), (3) and (4) small or large spheres (*Lagenammina, Psammosphaera, Thurammina*), (5) hemisphere (*Colonammina*), (6) clustered spheres (*Sorosphaera*), and (7) other *Turritellella* [coiled tube].

B. *LATE PALEOZOIC FORAMINIFERA*

27. AIZENBERG, D. E., BRAZHNIKOVA, N. E., NOVIK, E. D., and SHULGA, P. L., 1941, On the age of the Carboniferous deposits of the Isachky elevation region: Akad. Nauk S.S.S.R., Doklady, v. 31, no. 2, p. 141-142, [in English].

A brief listing of the foraminiferal microfauna present in the Lower Carboniferous Oka Series of the Ukraine, U.S.S.R. *Archaediscus* ex. gr. *bashkiricus* is described from the uppermost Viséan beds in association with *Tetrataxis conica* var. *gibba* [= *Howchinia bradyana* Howchin], *Endothyra similis* and *Cribrostomum bradyi*. [First appearance of *Archaediscus bashkiricus* is uppermost P_2 in England, and uppermost Viséan V3c sup. in North Africa.]

28. AIZENBERG, D. E., BRAZHNIKOVA, N. E., NOVIK, E. D., and SHULGA, P. L., 1946, On the Carboniferous deposits of the Lwow Trough: Akad. Nauk S.S.S.R., Doklady, v. 51, no. 1, p. 51-54, 1 text fig., [in Russian].

A brief description of the D zone microfauna of the Lower Carboniferous of the Lwow Trough, Ukraine, U.S.S.R. The occurrence of *Forschia subangulata*, *Haplophragmella irregularis*, *H. tetraloculi*, and *Lituotubella glomospiroides* var. *magna* suggests a DI zone assemblage. It is noted that the upper part of the Oka Series belongs to the D2-PI-P2 assemblage, and contains *Endothyra omphalota* var. *minima*, *E. crassa*, *E. globulus* [now *Globoendothyra*], *Monotaxis gibba*, *Bradyina rotula*, *Archaediscus karreri*, *A. moelleri* and species of *Parastaffella* [now *Pseudoendothyra*].

29. AIZENBERG, D. E., and BRAZHNIKOVA, N. E., 1949, A hiatus in the Lower Carboniferous of the Lwow Trough: Akad. Nauk S.S.S.R., Doklady, v. 69, no. 1, p. 61-63, [in Russian].

A foraminiferal hiatus is shown to exist in the Lower Carboniferous rocks of the Lwow Trough, Ukraine, U.S.S.R., of the zones C^{Ivd} and C^{Ive}. The lower foraminiferal assemblage, which is comparable to zone IV of the Donetz Basin, is characterized by species of *Calcisphaera*, *Parathurammina*, *Brunsia*, *Endothyra globulus* var. *parva*, *E. ishimica*, and *Archaediscus krestovnikovi*, on which rests a VII foraminiferal assemblage rich in *Endothyra similis*, *E. omphalota* var. *minima*, *E. ishimica*, *Palaeotextularia breviseptata*, *P. dobroljubovae*, and species of *Cribrostomum*, *Tetrataxis*, and *Eostaffella*.

30. AIZENBERG, D. E., and BRAZHNIKOVA, N. E., 1956, A comparison of the lower Viséan of the Donetz and other regions: Akad. Nauk S.S.S.R., Doklady, v. 108, no. 4, p. 691-694, [in Russian].

A discussion of the biostratigraphic correlations of the Lower Carboniferous (upper Tournaisian to middle Viséan) rocks of the Donetz Basin, Moscow Basin, and the Urals.

In the Donetz Basin the C^{Iva} is characterized by *Quasiendothyra solida* [now *Urbanella*], *Q. magna*, *Endothyra spinosa* [now *Spinoendothyra*], *E. chomatica* [now *Dainella*], *E. prisca*, *E. similis*, *E. crassa* var. *compressa* [now *Endothyranopsis*], and *E. similis*. The C^{Ivb} - C^{Ivc} contains *Lituotubella tenuissima*, *L. glarea*, *Endothyra staffeliformis*, *E. chomatica*, *E. prisca*, *E. crassa* var. *compressa*, *E. omphalota* var. *minima*, *Tetrataxis eominima*, and species of *Eostaffella*. The C^{Ivd} yields *Forschia subangulata*, *Lituotubella glomospiroides*, *Endothyra staffeliformis*, *E. chomatica*, *E. crassa* var. *compressa*, *E. ishimica*, *E. omphalota* var. *minima*, *E. similis*, *Permodiscus syzranicus*, *P. rotundus*, and *Eostaffella mediocris* [now *Mediocris*]. The C^{Ive} is correlated with the Tula Horizon and carries numerous species of Archaediscidae. [The lower Viséan microfauna of the Donetz Basin is of particular importance, since this substage is usually absent in the Moscow Basin or poorly represented in the Urals. The existence of *Spinoendothyra* in Viséan time, associated with *Dainella*, has also been noted in western Europe. Conversely, true *Endothyranopsis* does not occur stratigraphically as low as Brazhnikova asserts, which suggests that this form is probably misidentified.]

31. AIZENBERG, D. E., and BRAZHNIKOVA, N. E., 1956, A stratigraphic outline of the Lower Carboniferous of the greater Donbass Basin: Akad. Nauk Ukraine A.S.R., Geol. Zhur., v. 16, no. 1, p. 7-20, [in Ukrainian with Russian abstract].

A biostratigraphic discussion of the Lower Carboniferous rocks of the Ukrainian Donbass Basin, U.S.S.R. The lower part of the Buzinovaya interval is characterized by *Bisphaera* spp., *Glomospirella* spp., *Tournayella discoidea*, *Endothyra communis*, *E. karacubensis*, and *Parathurammina* spp., and is correlated with the C^{Ita} - C^{Itb}. The upper Buzinovaya (C^{Itc} - C^{Itd}) carries *Brunsia* spp., *Tournayella segmentata* [now *Septatournayella*], *Carbonella* spp., *Endothyra glomiformis* [now *Chernyshinella*], *E.* ex. gr. *costifera* [now *Spinoendothyra*], and *Spiroplectammina* sp. [now *Palaeospiroplectammina*].

The Elenovska interval (lower and middle Viséan) contains *Endothyra chomatica* [now *Dainella*], *Endothyra convexa*, *E. similis*, *E. crassa* var. *compressa* [now *Endothyranopsis*], *Eoparastaffella* sp., *Ammodiscus* sp. [now *Cyclogyra*], *Forschia* sp., *Valvulinella* sp., *Permodiscus* sp., and *Tetrataxis* sp.

The Efremova interval (which straddles the Viséan-Namurian boundary) is characterized by *Saccamminopsis* sp., *Nanicella* sp. [now primitive *Loeblichia*], *Endothyra omphalota*, *Bradyina rotula*, *Cribrostomum* sp., *Monotaxis gibba* [now *Howchinia*], *Archaediscus moelleri* var. *gigas* [= *A. karerri*], and species of *Eostaffella*.

32. ANTROPOV, I. A., 1961, New data on Tournaisian stratigraphy of Tataria: Akad. Nauk S.S.S.R., Doklady, v. 142, no. 6, p. 1351-1354, [in Russian].

A thick Lower Carboniferous (Tournaisian) carbonate section is described from Saitovo, northern Tataria, U.S.S.R. Abundant foraminiferal assemblages enable zonation and recognition of the Trans-Volga beds (*Quasiendothyra communis, Q. kobeitusana, Q. mirabilis*), the Chernyshin beds (*Spiroplectammina nana, S. tchernyshinensis* [= *Palaeospiroplectammina*], *Chernyshinella tumulosa, C. glomiformis*), lower Kizel beds (*Plectogyra inflata* [= *Endothyra*], *P. latispiralis, P. paraukrainica*), and upper Kizel beds (*Tournayella discoidea, Plectogyra tuberculata*, and *P. parakosvensis*).

33. ARMSTRONG, A. K., 1955, Preliminary observations on the Mississippian System of northern New Mexico: New Mexico Inst. Mining and Tech., Circ. 39, 42 p., 27 text-fig.

A rich microfauna of endothyroid smaller foraminifers is reported from the Mississippian (Meramecian) Arroyo Peñasco Formation in the Sangre de Cristo Mountains of north central New Mexico. [This microfauna was later formally described; see Armstrong, 1958.]

34. ARMSTRONG, A. K., 1966, Biostratigraphy of Mississippian System in northcentral New Mexico (Abstract): Geol. Soc. America, Program Annual Meetings, San Francisco, Calif., p. 6.

Lower Carboniferous (uppermost Osagean and lower Meramecian) rocks crop out in the San Pedro, Nacimiento, Jemez, Sandia, Manzano, and Sangre de Cristo Mountains of northcentral New Mexico. They range in thickness from 10 to 130 feet. The lower unit, carrying an uppermost Osagean microfauna, consists of a basal quartz sandstone and shale overlain by pelletoidal, ostracodal, calcisphere-bearing lime mudstones capped by stromatolitic limestones. The microfauna from this unit consists of *Endothyra spinosa* Chernysheva, *E. inflata* Zeller, and *Septabrunsiina* n. sp.

The overlying unit of marine limestones varies from oolitic packstones, to lime mudstones, to dolomites, all with differing amounts of fine quartz sand. The oolitic facies contains a rich microfauna of early Meramecian age and carries: *Endothyra spiriodes* Zeller, *E. macra* Zeller, *E. prodigiosa* Armstrong, and *E. inflata* Zeller.

35. ARMSTRONG, A. K., and HOLCOMB, L. D., 1967, Interim report on Mississippian Arroyo Peñasco Formation of northcentral New Mexico: Am. Assoc. Petrol. Geologists, Bull., v. 51, no. 3, p. 417-433, 10 text-fig.

Brief interim report on the stratigraphy, carbonate petrography, and micropaleontology of the Mississippian (Osagean-Meramecian) Arroyo Peñasco Formation of northcentral New Mexico.

The oldest foraminiferal microfauna recognized in the Arroyo Peñasco Formation is composed of *Endothyra spinosa* Chernysheva, *Endothyra inflata* Zeller, and *Septabrunsiina* n. sp. It is believed that this microfauna indicates a late Osagean age. Overlying this microfauna is an assemblage characterized by *Endothyra spiroides* Zeller with a more advanced form of *E.* aff. *E. spinosa* Chernysheva. Generally, above this zone, there is a rich foraminiferal assemblage of early Meramecian age composed of *Endothyra macra* Zeller, *E. prodigiosa* Armstrong, *E. irregularis* Zeller, and *Septatournayella* n. sp.

36. BAARS, D. L., 1966, Pre-Pennsylvanian paleotectonics—key to basin evolution and petroleum occurrences in Paradox Basin, Utah and Colorado: Am. Assoc. Petroleum Geologists, Bull., v. 50, no. 10, p. 2082-2111, 27 text-fig.

The writer notes (p. 2101) that on the basis of smaller Foraminifera (identified by B. A. L. Skipp) that the upper part of the Ouray Formation, in Utah and Colorado, and the lower member of the Leadville Formation indicate an early to middle Osagian (Lower Carboniferous) age for that interval.

Endothyroids of the lower member of the Leadville are poorly preserved because of dolomitization. The foraminifers found in this interval in the eastern Paradox Basin closely resemble *Chernyshinella*, and probably are related closely to *C. tumida* (E. J. Zeller) and *C. granulosa* (E. J. Zeller).

The upper member of the Leadville Formation contains a well preserved and abundant endothyroid microfauna, especially in the oolitic strata near the base. The assemblage is typified by *Endothyra tuberculata* Lipina. *Endothyra* aff. *E. tumula* (E. J. Zeller), *Septoglomospiranella anteflexa* (E. J. Zeller), and *S. dainae* Lipina commonly are present in the lower beds. *Endothyra spinosa* Chernysheva is more prevalent in pelletoidal sandstone beds in post-crinoidal bank strata where the other species are of diminished importance.

37. BALTZ, E. H., and READ, C. B., 1960, Rocks of Mississippian and probable Devonian age in Sangre de Cristo Mountains, New Mexico: Am. Assoc. Petroleum Geologists, Bull., v. 44, no. 11, p. 1749-1774, 12 text-fig.

The writers present a thorough discussion of the sparse occurrence of endothyroid foraminifers found to date in the so-called pre-Pennsylvanian sediments of northcentral and northeastern New Mexico. In this paper, a new Lower Mississippian unit, the Tererro Formation, is named and formally described from the Sangre de Cristo Mountains region of New Mexico. Within the Manuelitas Member of this formation the present writers report finding only a few specimens and fragments of *Endothyra*, and they call attention to the inaccuracies and discrepancies of the reported distribution of these foraminifers by Armstrong (1955, 1958), [see

Armstrong and Holcomb, 1967, for additional foraminiferal data].

38. BARTENSTEIN, H., 1949, Stratigraphische und ökologische Folgerungen aus dem Auftreten von Ostracoden und Foraminiferen im productiven Ruhr-Oberkarbon: Neues Jahrb. f. Min. Monatshefte, Abt. B, p. 60-64, 1 text-fig., [in German].

A preliminary investigation of the marine and brackish foraminiferal horizons in the cyclic upper Namurian and Westphalian sediments of the Ruhr region of Germany. It is noted that only agglutinated foraminifers appear in most of the marine horizons [these are delineated on Text-fig. 1], as well as in some *Lingula* horizons, which are partly marine and may also be brackish. The finding of foraminifers in sediments which until now have been regarded as representing fresh water environments indicates a stronger marine or brackish water environment in the productive Upper Carboniferous section than had been previously suspected.

39. BARWICZ, W., 1966, Microfauna in the Lower Zechstein of the Pre-Sudetic Monocline: Rudy i Metale Niezelazne (Sci. and Tech. Jour. of the Non-Ferrous Metals Industry), v. 11, no. 8, p. 422-425, 6 text-fig., 1 table, [in Polish with abstracts in Russian, English, French, and German].

Description is given of the characteristics of the basal Zechstein (Permian-Wolfcampian) sediments of the Pre-Sudetic Monocline in Poland. A rich complex of smaller foraminifers consisting of 16 previously described species has been identified from this interval. In an area between Lubin and Sieroszowice a zone has been encountered in the Zechstein limestones which contains the above mentioned foraminiferal assemblage and another in which this assemblage is conspicuously absent.

A few representative smaller foraminifers are illustrated by thin-section photomicrographs.

40. BLUDOROV, A. P., TUZOVA, L. S., SHISHKIN, A. V., and SHUBAKOV, G. N., 1961, On the presence of coal in the Lower Carboniferous of southern Udmurtia: Akad. Nauk S.S.S.R., Doklady, v. 136, no. 5, p. 1168-1171, [in Russian].

The non-marine, coal-bearing Stalinogorsk Horizon of Lower Carboniferous (Viséan) age lies with pronounced disconformity on the Likhvinsk Limestone, in southern Udmurtia, U.S.S.R. The Lower Carboniferous (Tournaisian) age of the Likhvinsk Limestone is ascertained by the presence of *Endothyra parakosvensis*, *E. tuberculata*, *E. latispiralis*, *Chernyshinella* ex. gr. *glomiformis*, and *Spiroplectammina tchernyshinensis* [= *Palaeospiroplectammina*].

41. BOGGS, S., JR., 1966, Petrology of the Minturn Formation, east central Eagle County, Colorado: Am. Assoc. Petroleum Geologists, Bull., v. 50, no. 7, p. 1399-1422, 3 pl., 9 text-fig., 1 table.

From the Pennsylvanian Minturn Formation of a portion of Eagle County, Colorado, the writer reports the following smaller foraminifers:

A. Robinson Limestone Member - smaller foraminifers (mainly agglutinated) associated with a varied biota including *Ivanovia*?, *Archaeolithophyllum*?, *Komia*, and Des Moines fusulinids.

B. White Quail Limestone Member - agglutinated foraminifers dominate the assemblage, but phylloid algae, *Komia*?, and other marine biotic elements also occur. Plate 2, fig. F shows a thin-section photomicrograph of this member which contains hedratid-type tubular foraminifers and a large *Bradyina*.

C. Jacque Mountain Limestone Member - contains tubular foraminifers (*Calcitornella* sp.) [probably *Hedraites*; see Henbest, 1963], associated with phylloid algae and other biotic elements.

42. BOGUSH, O. I., 1963, Foraminifera and stratigraphy of the Middle and Upper Carboniferous of the oriental part of the Alaisk Range: Akad. Nauk S.S.S.R., Sibirskoe Otdel., Inst. Geol. i Geophys., 132 p., 11 pl., 1 text-fig., 2 tables, [in Russian].

The Bashkirian-Moscovian-Kasimovian-Sakmarian Stages of the Middle and Upper Carboniferous of the oriental portion of the Alaisk Range, U.S.S.R., are subdivided into nine faunal zones based mainly on fusulinids. Stratigraphic use of smaller foraminifers is restricted to the lower portion of the Middle Carboniferous sequence. From this lower interval 18 species of smaller Foraminifera are described, of which 3 species and 1 variety are new. The new forms are: *Bradyina planissima*, *B. tarassovi*, *Climacammina bosbiensis*, and *Tuberitina collosa* Reitlinger var. *tschekabadica*. All forms are illustrated by thin-section photomicrographs.

43. BOGUSH, O. I., and JUFEREV, O. W., 1956, Foraminifera and stratigraphy of the Carboniferous sediments in the Kara-Tau Range: Moskovskoe obshchesto ispytalelei prirody, Biull. Otdel. Geol., v. 61, ser. geol. no. 31, p. 114-115, [in Russian with English summary on p. 435-436].

The present writers subdivided the strata (uppermost Devonian to Middle Carboniferous age) in the Kara-Tau Range, U.S.S.R. (Kazakh, S.S.R.), into 11 foraminiferal assemblages based on previously described species of smaller foraminifers.

44. BOGUSH, O. I., GERASIMOV, E. K., CHERNIAK, G. E., and JUFEREV, O. V., 1963, Krestiakh Con-

glomerates in the mouth of the river Lena and their analogues: Akad. Nauk S.S.S.R., Doklady, v. 153, no. 1, p. 166-169, [in Russian].

The age of two Lower Carboniferous formations present in the Soviet Arctic is established on the basis of their contained microfauna. Emphasis is placed on the similarity of these northernmost Siberian microfaunas with that of identical microfacies present in rocks of similar age on the Russian Platform and in the Urals.

The upper Tournaisian Bastaks Suite contains: *Brunsia sygmoidalis, B. irregularis, Septoglomospiranella dainae, Tournayella discoidea, T. pigmaea, T. moelleri, Septatournayella segmentata, Carbonella tumula, Quasiendothyra communis turbida, Q. communis communis, Q. rotai, Q. urbana, Q. compta, Chernyshinella glomiformis, Plectogyra crassitheca, P.* cf. *P. spinosa, P. corrallovaensis, P. tuberculata,* and *P. kosvensis.*

The Viséan Krestiakh Conglomerates contain: *Earlandia elegans, Archaesphaera crassa, Plectogyra prisca, P. similis, P. leniciniosa, P. explicata, P. bradyi, Tetrataxis media,* and Fusulinidae. [The presence of *Quasiendothyra communis communis* as high as the upper Tournaisian is in contradiction with the observed Eurasiatic distribution of this characteristic upper Famennian-lower Tournaisian index fossil; *Quasiendothyra rotayi* and *Q. compta* are now classified as species of *Planoendothyra,* and *Q. urbana* is now classified as a species of *Urbanella.*]

45. BRADY, H. B., 1872, On *Saccammina carteri,* a new foraminifer from the Carboniferous limestone of Northumberland: Trans., Nat. Hist. Northumberland and Durham, v. 4, p. 269-278, 1 pl.

Duplicate of the 1871 article.

46. BRAZNIKHOVA, N. E., 1939, Data for the study of Foraminifera of the Central Donbass Basin: Akad. Nauk Ukraine S.S.R., Geol. Zhur., v. 6, no. 1-2, p. 245-289, 7 pl., [in Ukrainian, with Russian and English summaries].

Primarily a fusulinid paper; however, mention is made of the occurrence of certain smaller foraminiferal genera (*Tuberitina, Ammodiscus, Glomospira, Endothyra, Tetrataxis, Bradyina,* and Textulariidae [= Palaeotextulariidae]) from the Middle and Upper Carboniferous of the Central Donbass Basin (Ukraine) of the Soviet Union.

47. BRAZHNIKOVA, N. E., 1964, Studying *Eosigmoilina* from the Lower Carboniferous of the greater Donets Basin: Akad. Nauk U.R.S.R. (Kiev), Trudy, Inst. Geol. Sci., Trans., Strat. & Paleontol. Ser., No. 48, Materials on the Upper Paleozoic fauna of the Donets Basin, v. 2, p. 3-15, 3 pl., [in Russian].

The genus *Eosigmoilina* Ganelina, 1956, is discussed in detail, and forms that are referred to this genus from the Lower Carboniferous rocks of the Donets Basin of the Soviet Union are described and illustrated by rather poor whole-specimen sketches (?) and representative sketches(?) of thin-section photomicrographs. Two species are regarded as new: *Eosigmoilina rugosa,* and *E.* (?) *minuta.*

48. BRAZNIKHOVA, N. E., and YARTSEVA, M. V., 1958, Development of Foraminifera in the Lower Carboniferous of the greater Donetz Basin: Akad. Nauk Ukraine S.S.R., Geol. Zhur., v. 18, no. 1, p. 31-38, [in Ukrainian with Russian summary].

A biostratigraphic survey of the characteristic Lower Carboniferous foraminiferal assemblages found in the Ukraine, U.S.S.R. All foraminiferal references are made to previously described forms.

$C^{I}t^{a}$ is characterized by species of *Archaesphaera, Vicinesphaera, Parathurammina, Bisphaera, Glomospiranella, Brunsiina, Tournayella discoidea, Quasiendothyra communis, Q. kobeitusana,* and *Umbella.*

$C^{I}t^{b}$ is characterized by the appearance of *Endothyra* ex. gr. *glomiformis* [now *Chernyshinella*].

$C^{I}t^{c}$ contains abundant *Brunsia, Spiroplectammina* [now *Palaeospiroplectammina*], *Endothyra inflata, E. ukrainica* [now *Septatournayella*], *E. spinosa* [now *Spinoendothyra*], and *Tournayella segmentata* [now *Septatournayella*].

$C^{I}t^{d}$ contains *Endothyra glomiformis, Bisphaera, Glomospiranella, Palaeospiroplectammina, Tournayella,* and *Carbonella.*

$C^{I}v^{a}$ shows a mixture of characteristic Tournaisian forms along with such Viséan forms as *Eostaffella, Eoparastaffella,* and *Endothyra chomatica* [now *Dainella*].

$C^{I}v^{b}$ - $C^{I}v^{c}$ contains *Haplophragmella, Tetrataxis, Endothyra omphalota minima, E. ishimica, E. paula,* and *E. bradyi.*

$C^{I}v^{d}$ contains *Ammodiscus* [= *Cyclogyra*], *Forschia, Permodiscus,* and *Valvulinella.*

$C^{I}v^{e}$ contains *Palaeotextularia* and abundant Archaediscidae.

$C^{I}v^{f}$ contains *Saccamminopsis, Palaeotextularia, Cribrostomum, Climacammina, Nanicella* [now *Loeblichia*], *Samarina* [now *Janishewkina*], *Bradyina, Monotaxis* [now *Howchinia*], *Parastaffella* [now *Pseudoendothyra*], *Millerella* [*non Millerella* Thompson], *Endothyra globulus,* and *E. crassa* [now *Endothyranopsis*].

$C^{I}v^{g}$ contains a microfauna very similar to the preceding assemblage.

$C^{I}n^{a}$ contains *Endothyra* ex. gr. *crassa* [now *Endothyranopsis*], *Janishewkina, Bradyina, Climacammina, Howchinia, Archaediscus* ex. gr. *moelleri, Monotaxinoides, Globivalvulina, Eosigmoililna,* *Ammovertella, Glomospira, Ammobaculites, Loeblichia, Endothyra, Howchinia, Archaediscus braznikovae,* and *A. angulatus.*

49. Brazhnikova, N. E., and Rostovtheva, L. P., 1966, Foraminifera: *IN*: Aisenberg, D. E., and Brazhnikova, N. E., On the zone C^{Ita} of the Donetz Basin: Akad. Nauk Ukraine S.S.R., Inst. Geol. Sci., Kiev, p. 9-42, pl. 1-18, [in Russian].

An illustrated catalog of 41 species, subspecies, varieties, and forms of smaller foraminifers present in the Lower Carboniferous (lowest part of the Tournaisian-zone C^{Ita}) of the Donetz Basin region of the Soviet Union. Most of the microfauna has been previously described, although two new subspecies are included. These are: *Cribrosphaeroides simplex* Reitlinger subsp. *donaica,* and *Paratikhinella cannula* (Bykova) subsp. *kajalica.* All of the Foraminifera are described and illustrated by excellent thin-section photomicrographs. [Plates 19-21 contain thin-section photomicrographs of *Umbella,* a questionable foraminifer, although there is no discussion of these forms anywhere in the text.]

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

First description (p. 17) and illustration (pl. 4, fig. 2) of the Lower Carboniferous foraminifer *Endothyra bowmanni* Phillips, from Great Britain. [Considerable controversy has arisen due to various interpretations of Brown, 1843, and the figures given by Phillips, 1846. Recently, the I.C.Z.N. has ruled that *Endothyra bowmani* Phillips in Brown emend. Brady, 1876, is the valid type species of *Endothyra;* see China, 1965, for this important decision.]

51. Chanton, N., 1963, Etude de la microfauna du Viséen et du Moscovian de différents bassins sahariens (T i n d o u f, Taoudeni, Colomb-Béchar, Reggane, Polignac, Fezzan ouest): Géol. Soc. France, Bull., 7ème sér., v. 5, no. 3, p. 383-392, pl. 17-18, 2 text-fig., 1 table, [in French].

The Lower Carboniferous (Viséan) and Middle Carboniferous (Moscovian) microfaunas from six basins in North Africa have been studied in detail; special emphasis has been placed on the smaller foraminifers, and their distribution within the six basins is fully discussed. It is noted that there are a great many microfaunal similarities with strata of the same age in Spain and on the Russian Platform. The microfauna, including fusulinids, is listed on table 1, and thin-section photomicrographs of representative foraminifers are also included.

52. Chermnykh, V. A., 1960, Detailed stratigraphy of the Viséan deposits in the Bolshaya Shaitanovka Basin in the north Urals: Akad. Nauk S.S.S.R., Doklady, v. 132, no. 6, p. 1403-1406, [in Russian].

The Lower Carboniferous (Viséan) in the Petchora region of the northern Urals, U.S.S.R., attains a thickness of somewhat over 2,000 feet and has been subdivided into eight foraminiferal zones. A microfauna of one hundred previously described species of smaller foraminifers is reported. The foraminiferal assemblages are very similar to those found on the Russian Platform, although species of the genera *Permodiscus, Mikhailovella, Samarina,* and *Bradyina* are conspicuously scarce in the Urals.

53. Ciry, R., and Amiot, M., 1965, Sur quelques Foraminifères Permiens d'Asie centrale. *IN*: Italian Expeditions to the Karakorum (K^2) and Hindu Kush, A. Desio, Leader, Scientific Repts., Pt. 4, Paleontology-Zoology-Botany, v. 1, 1st. pt. - Fossils of Karakorum and Chitral, p. 127-133, pl. 19, E. J. Brill, Leiden, [in French].

Principally a paper describing the Permian fusulinids from the Gircha Formation exposed in the Shaksgam Valley, Karakorum, Pakistan, and the Bulola (Hindu Kush), Afghanistan. From the Shaksgam Valley locality the miliolid *Hemigordiopsis renzi* Reichel is reported as occurring in a cream-colored sublithographic limestone in association with fusulinids. This smaller foraminifer is illustrated by a single very poor thin-section photomicrograph.

54. Civrieux, J. M. Sellier De, and Dessauvagie, T. F. J., 1965, Reclassification de quelques Nodosariidae, particulièrement du Permien au Lias: Publ. Inst. Études et Rec. Min. de Turquie, No. 124, 178 p., 25 pl., 27 text-fig., [in French with comprehensive English abstract].

A monographic revision of some Nodosariidae based on a detailed study of the Upper Permian microfaunas of Turkey (Taurus Mountains in the province of Antalya, the old Pamphylia), in addition to some Mesozoic material from Austria and France.

From the Upper Permian, 29 species are described and illustrated by whole-specimen drawings and thin-section photomicrographs. Of this Upper Permian microfauna, 8 genera, 20 species, and 1 subspecies are new. The new forms are: *Geinitzina taurica, G. ichnousa, Pachyphloia cukürkoyi, P. schwageri, Tristix geinitzianus, Langella cukürkoyi, L. ocarina, L. conica, Cryptoseptida anatoliensis* n. gen., *Cryptomorphina limonitica* n. gen., *Calvezina ottomana* n. gen., *Pseudolangella fragilis* n. gen., *Frondina permica* n. gen., *Frondononodosaria pyrula* n. gen., *F.? orthocerina, Protonodosaria globifrondina, Tauridia pamphyliensis* n. gen., *Ichtyolaria permotaurica, I. primitiva, I. latilimbata,* and

Langella perforata n. subsp. A new genus, *Sosninella*, probably a polymorphinid, is provisionally proposed, based on thin-sections previously illustrated and described by Sosnina, 1960.

In this revision of the Nodosariidae, the Paleozoic genera are tentatively subdivided into four main groups: (1) the geinitzinids, (2) the cryptoseptids, (3) the frondinids, and (4) the colaniellids.

In agreement with the International Rules of Nomenclature, the type species originally designated for *Pachyphloia* and *Colaniella* are substituted by new type species. Also, the original type of *Geinitzina postcarbonica* Spandel is herein considered as the genoholotype of *Geinitzina*.

A new generic name, *Langella* (*pro Padangia* Lange, 1925) is also proposed and a new diagnosis of the genus given. New diagnoses are proposed for the following genera: *Geinitzina*, *Pachyphloia*, *Ichtyolaria*, *Protonodosaria*, *Colaniella*, *Lingulina*, and *Frondicularia*. Discussion is also given to the genera *Spandelina* and *Tristix* and the genera *Monogenerina* and *Nodosinella*, based on unidentifiable types, which are now considered invalid. The genera *Spandelina*, *Lingulinopsis*, *Frondilina*, *Lunucammina*, *Spandelinoides*, and the so-called Nanicellinae are here considered insufficiently documented, and doubt is cast upon their validity.

In addition, a practical nomenclature of oriented thin-sectioned foram specimens is proposed. Finally, the writer discusses some general problems concerning the Nodosariidae such as: (1) the wall structure of certain Paleozoic forms that have been referred to the Nodosinellidae by some authors, (2) the inadequate definition of *Nodosinella* and the Nodosinellidae, (3) the inadequate descriptions and diagnoses of genera based exclusively on random thin-sections, (4) the non-validity of genera and species based on corroded specimens or internal molds, (5) the lack of proof concerning the Paleozoic spiroserial Nodosariidae, (6) the evolutionary trends in aperture form and in test size, and (7) intergeneric and interspecific boundaries.

55. Cocozza, T., 1965, Carboniferous outcrops in the Monticiano-Roccastrada Ridge (Tuscany): Geologia, v. 8, no. 3, p. 488-523, 5 pl., 27 text-fig., [in Italian with abstracts in English, German, and French].

Five outcrops of Paleozoic strata (Lower to Upper Carboniferous) were examined along a tributary of the Merse River in Tuscany, Italy. Most of the rock exposures in this area have been metamorphosed; however, some fossiliferous detrital limestones contain smaller foraminifers identified as *Bradyina* gr. *G. nautiliformis* Moeller, *Endothyra bradyi* Mikhailov, *Tetrataxis* sp., and *Climacammina* cf. *C. fragilis* Reitlinger. The above smaller foraminifers are illustrated by rather poor thin-section photomicrographs.

56. Conil, R., 1966, Micropaléontologie du Viséen des environs de la Dendre: Soc. Belge de Géol., Bull., v. 74, no. 2-3, p. 244-246, 1 chart, [in French].

The writer briefly discusses the micropaleontology of the Lower Carboniferous (Viséan) rocks in the vicinity of Dendre (Namur Syncline), Belgium. Chart 1 lists the distribution of 38 smaller foraminifers, all previously described, retrieved from well cuttings. Relatively barren rock facies at the base of the Viséan make the "first appearance" criterion uncertain, and, as a result, comparison with the zonation in use for the Dinant Synclinorium proved to be difficult.

57. Conil, R., and Lys, M., 1966, Foraminifères et algues du Tournaisien supérieur et du Viséen de la Belgique: Ann. Soc. Géol. de Belgique, v. 89, Bull. 6, p. 207-221, 3 pl., [in French].

Ten species of Lower Carboniferous (Tournaisian-Viséan) smaller foraminifers are described from the Dinant region of Belgium. Of this microfauna one species, *Archaesphaera barbata*, is described as new. All forms are illustrated by thin-section photomicrographs. On the basis of this microfaunal study the Lower Carboniferous rocks of the Dinant synclinorium have been subdivided into five biostratigraphic zones. Two species of calcareous algae are also described and illustrated.

58. Conkin, J. E., and Conkin, B. M., 1967, Arenaceous Foraminifera as a key to Upper Devonian-Lower Mississippian relationships in the type Mississippian area: *IN*: Essays in paleontology and stratigraphy, R. C. Moore Commemorative Volume, Edited by C. Teichert and E. L. Yochelson, p. 85-101, 6 text-fig., Dept. Geol., Univ. Kansas Special Pub. 2, The Univ. Kansas Press, Lawrence.

The known stratigraphic distribution of 35 important species of agglutinated Foraminifera in the Upper Devonian and the Mississippian (Kinderhookian and lower Osagean) in the type Mississippian area of the United States is as follows: 4 species are restricted to the Upper Devonian; 4 species occur in the Upper Devonian and Kinderhookian; 4 species range from the Upper Devonian through the lower Osagean; 15 species are restricted to the Kinderhookian; 7 species occur in the Kinderhookian and lower Osagean; and 1 species, *Hyperammina kentuckyensis*, is restricted to and definitive of the Osagean. Thus there are distinct differences in species content between the Upper Devonian and the Kinderhookian microfaunas, as well as between those microfaunas of the Kinderhookian and lower Osagean. It is believed that agglutinated Foraminifera are of considerable value in age determination and correlation not only within the Upper Devonian and Lower Mississippian of the type Mississippian area, but also interregionally in the United States. Figures 5 and 6 give representative whole-specimen photomicrographs of this Upper Devonian-Lower Mississippian microfauna.

59. CRESPIN, I., 1964, Foraminifera in Cabawin No. 1 well: *IN*: U-K-A. Cabawin No. 1, Queensland of Union Oil Development Corp. Kern Co. Land Company and Australian Oil and Gas Corp. Ltd.: Australian Bur. Min. Res., Geol. and Geophysics, Publ. No. 43, p. 39-49.

The writer lists Cretaceous and Permian species of smaller Foraminifera recovered from a well drilled in the Surat Basin of Queensland, Australia. Foraminifera are not abundant in the Permian rocks, but a tentative foraminiferal correlation with the Springsure assemblage is suggested.

60. CUSHMAN, J. A., 1928, The designation of some genotypes in the Foraminifera: Contrib. Cushman Lab. Foram. Res., v. 3, pt. 4, p. 188-190.

Formal designation of the type species of the following Upper Paleozoic Foraminifera: *Nodosinella* (*N. digitata* Brady, 1876), *Agathammina* (*A. pusilla* Geinitz, 1846), *Stacheia* (*S. marginuloides* Brady, 1876) and *Bradyina* (*B. nautiliformis* von Möller, 1878).

61. EINOR, O. L., 1951, Viséan Stage in Armenia: Akad. Nauk S.S.S.R., v. 78, no. 6, p. 1195-1197, [in Russian].

Two microfaunal zones are recognized in the Lower Carboniferous Viséan limestones of Armenia: (1) a lower assemblage characterized by *Endothyra* sp. cf. *E. omphalota*, and *E. bowmani*, and (2) an upper assemblage rich in *Endothyra omphalota*, *E. bradyi*, *Tetrataxis minima*, *Permodiscus transcaucasicus*, and *Hyperammina vulgaris* [= *Earlandia*]. Both assemblages appear to be of lower to middle Viséan age.

62. EINOR, O. L., and VDOVENKO, M. V., 1963, Stratigraphy of the Lower Carboniferous of the Beleuty Basin in central Kazakhstan: Materials on the geology, geophysics, and geochemistry of the Ukraine, Kazakhstan, and Transbaikalia, Sci. Res. Sect. Kiev State Univ., No. 1, p. 35-46, 1 text-fig., [in Russian].

The writer lists previously described species of Lower Carboniferous (Viséan-Namurian) smaller foraminifers from the rocks of the Beleuty Basin in central Kazakhstan, U.S.S.R.

63. GÜVENC, T., 1966, Présence de Carbonifère Inférieur, microfauna et microflore du Viséen l.s. de la vallée de Goksu (Taurus Occidentaux, Turquie): Soc. Géol. France, C.R., v. 4, p. 158-159, 1 text-fig., [in French].

A thin series of organic-detrital limestones, discovered at the base of a thrust sheet, in the Taurus Occidentaux, Turkey, is regarded as Lower Carboniferous (Viséan) age due to the presence of the following smaller foraminifers: *Eotuberitina*, *Endothyranella*, *Forschia*, *Permodiscus* sp. aff. *P. vetustus*, *Moravammina*, *Ammodiscus*, *Endothyra* sp. aff. *E. bowmani*, *E.* sp. aff. *E. convexa*, and *Earlandia*. This microfauna has many similarities with the smaller foraminifers described from the Donetz and Moscow Basins.

64. HARLTON, B. H., 1929, Some Pennsylvanian Ostracoda and Foraminifera from southern Oklahoma—a correction: Jour. Paleontology, v. 3, no. 3, p. 308.

A brief note giving corrected changes in location for certain Pennsylvanian foraminifer- and ostracode-bearing units outcropping in the Ardmore Basin of southern Oklahoma. These corrections apply to two earlier Harlton papers (1927).

65. HUTTON, A. N., 1967, A new technique for the study of smaller Foraminifera in indurated limestone: Micropaleontology, v. 13, no. 1, p. 107-110, 1 pl.

A simple method is described for obtaining oriented sections of smaller Foraminifera from slices of indurated limestone using a surgical scalpel and small diamond drill bits. One plate of foram photomicrographs illustrating the technique is included. The illustrated specimens are from the Upper Paleozoic (Namurian) Upper Limestone Group of Lanarkshire, Scotland.

66. IRELAND, H. A., 1967, Preparatory techniques for microfossils and inorganic insoluble residues: Jour. Paleontology, v. 41, no. 2, p. 523.

The writer briefly outlines the technique that he has found most satisfactory in extracting Paleozoic microfossils (agglutinated foraminifers, scolecodonts, and conodonts) from acid residues of carbonate rock.

67. JENSEN, H. I., 1904, Contributions to a knowledge of Australian Foraminifera. Pt. 1: Linnean Soc. New South Wales, Proc., v. 29, p. 810-831, pl. 23.

Mainly a listing and a description of a few new species of Recent foraminifers found off Australia, and, in addition, foraminifers found in some Tertiary limestones of Australia. Mention is also made (p. 830) of a thin-section examination of the Permo-Carboniferous Pokolbin Limestone which proved to be rich in Late Paleozoic foraminifers [this Permian microfauna had been previously reported by Howchin (1893)].

68. JOHNSON, G. A. L., and DUNHAM, K. C., 1963, The geology of Moor House, Monograph of the Nature Conservacy, No. 2, 182 p., 14 pl., 31 text-fig., 1 map, 6 tables, London.

Numerous listings are given of smaller foraminifers occurring in Lower and Upper Carboniferous limestones that crop out within the boundaries of Moor House National Nature Reserve, northeast Westmorland, northern England.

Lower Carboniferous limestone beds that contain smaller foraminifers within this region are: Melmerby Scar, Robinson, Lower Smiddy, Lower Little, Jew, Tyne Bottom, Single Post, Scar, Five Yard, Three Yard, and Four Fathom.

From the Upper Carboniferous only the Great Limestone has yielded smaller foraminifera in this region.

All of the foraminifers are either only referred to genus or listed under previously described species; none are illustrated.

69. JURKIEWICZ, H., 1966, Foraminifers of the Lower Zechstein in the vicinity of Galezice and Kajetanow in the Swietokrzyskie Mountains: Poland Instyt. Geol., v. 6, Biul. 195, p. 159-200, 5 pl., 2 text-fig., 1 table, [in Polish with Russian and English summaries].

A study of the microfauna from bore holes, mine shafts, and outcrops of the Permian (Wolfcampian) Lower Zechstein Formation in the vicinity of Galezice and Kajetanow in the Swietokrzyskie Mountains, Poland, has yielded 28 species of Foraminifera. Stratigraphically, this interval has been subdivided into 3 foraminiferal zones. These four species and 1 subspecies are regarded as new: *Reophax permianus*, *Ammodiscus rösleri discoides*, *Geinitzina elongata*, *Fronticularia delicatula*, and *F. corpulenta*. All forms are described and illustrated by drawings of whole-specimens and interior sections; plates 4 and 5 give photographs of representative strewn-slide microfaunal assemblages from each of the designated foraminiferal zones.

The present study demonstrates that this microfauna can also be correlated with the Lower Zechstein in Sudetes, in central Poland, and Germany.

70. KHURSIK, V. Z., 1966, Buried reefs of Artinskian age in the Permian of the Ural region: Izv. Vyssh. Ucheb. Zavedneii, Geol. I Razved., v. 9, no. 4, p. 29-33, 1 text-fig., [in Russian].

Reef structures of Lower Permian (Artinskian) age were discovered on the eastern border of the Russian Platform and at the western edge of the Ural piedmont trough. Both reef structures contain three similar zones: (1) large robust brachiopods, (2) algal-bryozoan, and (3) bryozoan-small brachiopods. The principal difference in the reefs associated on the platform from those on the trough appears to be in their small foraminiferal assemblages. The platform reefs contain: *Glomospira*, *Tolypammina*, *Globivalvulina*, *Nodosaria*, *Geinitzina*, and *Dentalina*. The reefs located on the trough contain the following smaller foraminifers: *Hemidiscus*, *Hemigordius*, *Tetrataxis*, *Lasiodiscus*, *Ammovertella*, *Ammodiscus*, *Dentalina*, and *Frondicularia*. The platform reefs are identified with the Sylvinsk Reefs of the Ufa Plateau, and those associated with the piedmont trough with the Sarginsk Reefs of the same plateau. The foraminiferal difference is attributed to facies changes rather than to a difference in age.

71. KIREEVA, G. D., 1949, Stratigraphy of the lower part of the Middle Carboniferous in the pre-Ural Molotov District: Akad. Nauk S.S.S.R., Izvestia, no. 2, p. 77-92, [in Russian].

In the lower part of the Middle Carboniferous of the pre-Ural Molotov District, U.S.S.R., four microfaunal assemblages are recognized from the lower Namurian to the top of the Bashkirian: (1) the Protvae Horizon is characterized by *Endothyra crassa sphaerica*, *Bradyina* ex. gr. *cribrostomata*, *Archaediscus moelleri*, *A. karreri*, *A. rugosus*, *A. baschkiricus*, and *Globivalvulina* sp., (2) the upper Namurian is characterized by *Bradyina cribrostomata*, *Endothyra bradyi*, *Archaediscus* ex. gr. *rugosus*, *A. baschkiricus*, *A. karreri*, *A. moelleri*, and *A. ovoides*, (3) the lower Bashkirian is distinguished by conspicuous fusulinid assemblages, and (4) the foraminifer *Bradyina nautiliformis* makes its appearance in upper Bashkirian time.

72. KIREEVA, G. D., and DALMATSKAIA, I. I., 1960, On the problem of the stratigraphy of the Bashkirian Stage: Akad. Nauk S.S.S.R., Izvestia, ser. geol., no. 9, p. 29-39, [in Russian].

A comparison is made of the biostratigraphic zonations of the Late Paleozoic Bashkirian Stage as proposed by various Soviet workers. This zonation is primarily based upon fusulinids, but representative species of the smaller foraminiferal genera *Archaediscus*, *Globivalvulina*, and *Bradyina* also appear to be useful to the biostratigrapher. In particular, the lower Bashkirian Stage is characterized by an assemblage of *Archaediscus subbashkiricus*, *A. subbashkiricus* var. *grandis*, *A. postrugosus*, *A. pseudomoelleri*, and abundant *Bradyina cribrostomata*.

73. KOCHANSKY-DEVIDÉ, V., and RAMOVS, A., 1966, Oberkarbonische Mikrofossilien und Stratigraphische

Entwicklung in den Westkarawanken: Slovenia Acad. Sci. & Art, 35 p., 11 pl., 1 text-fig., 5 strat. sections, [in Yugoslavian with German summary].

The writers describe the algae, smaller Foraminifera, and fusulinids from the Upper Carboniferous rocks (Gshel and Orenburg Stufe) of northwestern part of Yugoslavia. All forms are illustrated by thin-section photomicrographs; none are new.

74. LAPPARENT, DE A. F., and LYS, M., 1966, Attribution au Permien supérieur du gisement à Fusulines et Brachiopodes de Kwaja Gar (Bamian, Afghanistan): Acad. Sci. Paris, C.R., v. 262, p. 2138-2140, [in French].

The Upper Permian deposits of Kwaja Gar, north of Bamian in Afghanistan, is rich in fusulinids and brachiopods. This fauna was first reported by Hayden in 1907, and was later regarded by Reed (1931) as Upper Carboniferous age.

Horizon 2 contains, along with the algae *Mizzia* and *Permocalculus* and abundant fusulinids, the following smaller foraminifers: *Glomospira regularis*, *G.* sp. *Hemigordius* n. sp., *Cribrostomum* sp., *Spiroplectammina* sp. [= *Palaeospiroplectammina*], *Globivalvulina* sp., *Langella perforata* (Lange), and *Geinitzina* sp. Horizon 4 contains approximately the same smaller foraminifers, although no algae are reported from this unit.

75. LAPPARENT, DE, A. F., BLAISE, J., LYS, M., and MOUTERDE, R., 1966, Presence du Permien, du Lias et du Jurassique dans la région d'Urusgan (Afghanistan central): Acad. Sci. Paris, C.R., v. 265, ser. D, no. 11, p. 805-807, [in French].

The writer reports the occurrence of Upper Permian fusulinids and smaller foraminifers from central Afghanistan. The foraminifers occur in dolomitic limestones and have been identified as: *Climacammina sphaerica*, *C. gigas*, *Globivalvulina bulloides*, *Tuberitina bulbacea*, *Cribrostomum*, *Glomospirella*, *Pachyphloia*, *Langella*, *Geinitzina*, *Hemigordius*, and *Pseudobradyina*.

76. LEBEDEVA, N. S., 1962, *IN*: KALFINA, L. L., Biostratigraphy of the Paleozoic of the Altai Mountain Region. Pt. 3 - Upper Paleozoic: Trudy Sibirskae Nauk Isl. Inst. Geol. i. Min. S.S.S.R., Novosibirsk, p. 100-115, pl. 1-3, [in Russian].

From the Lower Carboniferous (Viséan) rocks of the Altai Mountain Region, of the Urals, U.S.S.R., 31 species of smaller foraminifers are described and illustrated by representative thin-section photomicrographs. Of this microfauna, 4 species and one variety are new. The new forms are: *Endothyra*? *evoluta* Lebedeva var. *maxima*, *Plectogyra maximovae*, *P. chumyshensis*, *Globoendothyra mrassuensis*, and *G. mikutzkyi*. Some fusulinids are also described and illustrated.

77. LEGRAND, R., MAMET, B., and MORTELMANS, G., 1966, Sur la stratigraphie du Tournaisien de Tournai et de Leuze. Problèmes de l'étage Tournaisian dans sa localité-type: Bull. Soc. Belge Géol., v. 74, p. 140-188, 2 pl., [in French].

The writers present a revision of the lithostratigraphy and biostratigraphy (megafauna and some Foraminifera) of the Lower Carboniferous (Tournaisian) at its type locality in Belgium. Foraminiferal assemblages 5, 6, 7, 8?, and 10 have been recognized. Assemblage 5 (Upper Devonian-Famennian) contains *Septaglomospiranella* sp., a primitive *Quasiendothyra* sp., and *Umbellina* sp. Assemblage 6 (lower Tournaisian) has abundant *Quasiendothyra communis*, *Endothyra* (?) ex. gr. *primaeva*, *Caligella* sp., *Irregularina* sp., *Bisphaera* sp., *Lugtonia* sp., and others. Assemblage 7 (middle Tournaisian) is characterized by abundant *Chernyshinella* sp., *Septatournayella* sp., *Endothyra* ex. gr. *rjausakensis*, and others. Assemblages 8 and 9 (upper Tournaisian) which were originally recognized in the Dinant Synclinorium are poorly displayed in Tournai due to pronounced rock dolomitization. A discussion is also included on the definition of the base of the lower Tournaisian and of the Lower Carboniferous utilizing a phylogenetic sequence of forms of *Quasiendothyra*.

78. LEV, O. M., 1965, New data on foraminiferal complexes from Permian sediments of the Olenek Highland: Scientific Res. Inst. of the Geol. of the Arctic, ser. Paleontol. and Biostrat., No. 8, p. 14-23, 2 tables, [in Russian].

Discusses and lists the stratigraphic distribution of Permian Foraminifera from sediments of the Olenek Highland, Arctic region, U.S.S.R. All forms have been previously described.

79. LIBROVITCH, L. S., and NALIVKIN, V. D., 1961, Carboniferous deposits of the Urals: IV Congrès pour l'avancement de la stratigraphie du Carbonifère, Heerlen, v. 2, p. 385-393, 3 text-fig., [in English].

A complete discussion of the stratigraphy of the Lower, Middle and Upper Carboniferous sequence in the Ural Mountains, U.S.S.R. The occurrences of numerous previously described species of smaller foraminifers are given for each of the diagnostic stratigraphic horizons. This is supplemented by excellent well documented stratigraphic sections shown on Figs. 1-3.

80. LISITSINA, N. A., and BOGUSH, O. I., 1954, Stratigraphy of the Upper Paleozoic of the oriental part of the Alaisk Range: Moskovskoe obshchestva ispytalelei prirody, Biull. Otdel. Geol., v. 29, no. 3, p. 3-17, 3 text-fig., [in Russian].

Middle Carboniferous (Moscovian) limestones of the Alaisk Range, U.S.S.R., are reported to contain the following smaller foraminifers: *Archaediscus* sp., *Bradyina* sp., *Tuberitina* sp., *Globivalvulina* sp., *Ammodiscus multivolutus*, *Bradyina nautiliformis*, *B.* sp. cf. *B. lepida*, *Deckerella* sp. aff. *D. mjachkovensis*, and *Hemigordius discoideus*. Numerous fusulinids are associated with the above microfauna.

81. MCBRIDE, E. F., and KIMBERLY, J. E., 1963, Sedimentology of Smithwick Shale (Pennsylvanian), eastern Llano region, Texas: Am. Assoc. Petroleum Geologists, Bull., v. 47, no. 10, p. 1840-1854, 4 pl., 7 text-fig., 2 tables.

The writers report the occurrence of agglutinated foraminifers (tolypamminids = minammodytids, and *Saccammina*) from the Early Pennsylvanian Smithwick Shale claystones of Burnet County, central Texas.

82. MALAKHOVA, N. P., 1950, On the age of the Lytva and Chusovaya Limestones on the western slopes of the middle Urals: Akad. Nauk S.S.S.R., Doklady, v. 71, no. 1, p. 129-131, [in Russian].

It is noted that the base of the Tournaisian, or Etroeungt Beds, along the western slopes of the middle Urals is characterized by the foraminifers *Archaesphaera minima*, *A. magna*, *Parathurammina suleimamovi*, *Bisphaera* spp., *Endothyra communis* [now *Quasiendothyra communis*], and *Septatournayella* sp.

83. MALAKHOVA, N. P., and YAROSH, P. Y., 1961, On the age of the rocks of the Greenstone Series in the Polevskii region (middle Urals): Akad. Nauk S.S.S.R., v. 142, no. 3, p. 650-652, [in Russian].

In the Polevskii region of the middle Urals, U.S.S.R., the Zyuzelskaya Formation, whose age was formerly regarded as ranging from Upper Silurian to Lower Devonian, has been found to contain smaller foraminifers representing the following genera: *Brunsia*, *Ammodiscus*, *Endothyra*?, *Eostaffella*, *Tetrataxis*, *Archaediscus*?, and *Pachysphaera*. It is now thought that this formation is of Lower Carboniferous age.

In addition, the Polevskii Formation, consisting principally of marbleized limestones, has yielded fusulinids, and smaller foraminifers representing the genera: *Glomospira*, *Brunsia*, *Ammodiscus*, and *Archaediscus*. This unit is now thought to be no older than Middle Carboniferous.

84. MANUKALOVA, M. F., 1956, Stratigraphy of the Middle Carboniferous of the Donetz Basin according to the Foraminifera: Moskovskoe obshchestvo ispytatelei prirody, Biull. Otdel geol., v. 31, no. 6, p. 79-102, 3 pl., [in Russian].

Primarily a fusulinid paper in which nine foraminiferal assemblages are recognized in rocks from upper Namurian to Moscovian time in the Donetz Basin, U.S.S.R. The three oldest zones are characterized by representatives of the family Archaediscidae, whereas the overlying zones are based on fusulinids. One new smaller foraminifer, *Bradyina elongata,* is described and illustrated by thin-section photomicrographs. A number of new fusulinid species are also described and illustrated.

85. MANUKALOVA-GREBENICH, M. F., 1959, Stratigraphic subdivision of the Lower Carboniferous in the Donetz Basin: Akad. Nauk S.S.S.R., Izvestia, ser. geol. No. 1, p. 116-119, [in Russian].

A biostratigraphic subdivision of the rocks of the Lower and Middle Carboniferous of the Donetz Basin, U.S.S.R., into 32 foraminiferal assemblages. These foraminiferal assemblages are based upon previously described species of smaller foraminifers and range in age from Tournaisian to upper Namurian. Of special interest is that the Tournaisian-Viséan boundary is placed at the first major "outburst" of the genus *Quasiendothyra* [now *Dainella*].

86. MIKHAILOV, A. V., 1948, New data on the stratigraphy of the eastern Altai: Moskovskoe obshchestvo ispytalelei prirody, Biull. otdel Geol., Trudy, v. 23, no. 2, p. 67-76, 3 text-fig., [in Russian].

A microfauna of *Tetrataxis* ex. gr. *conica*, *Bradyina* sp. aff. *B. donetziana*, *Climacammina* sp. cf. *C. elegans*, *Glomospira* sp., *Cribrostomum* sp., *Endothyra* sp., *Hemidiscus* sp., *Tuberitina* sp., and *Nodosaria* sp. is reported from the Upper Carboniferous carbonate series of the eastern Atlai in southwestern Asia.

87. MIKLUKHO-MAKLAI, A. D., 1960, Stratigraphy of the Carboniferous sequence in Middle Asia: IV Congrès pour l'avancement de la stratigraphie du Carbonifère, Heerlen, v. 2, p. 409-415, 2 text-fig., [in English].

A complete résumé of Carboniferous biostratigraphy of Middle Asia, U.S.S.R. Some of the more pertinent features are: (1) the Tournaisian may be subdivided into three recognizable units, (a) the Etroeungt layers with common *Quasiendothyra*, (b) stratigraphic intervals dominated by simple single-chambered foraminifers (*Parathurammina*, *Tuberitina*), and (c) those intervals characterized by more advanced multicamerate forms such as *Plectogyra rjausakensis*, *P. tuberculata*, and *P. inflata*; (2) the Viséan is divided into two distinctive foraminiferal complexes, (a) those units with *Planoarchaediscus* ex. gr. *spirillinoides*, *Archaediscus* ex. gr. *karreri*, *Propermodiscus* sp., *Tetrataxis* sp., and *Plectogyra* ex. gr. *omphalota*, (b) those layers that carry *Asteroarchaediscus* ex. gr. *baschkiricus*, *Neo-*

archaediscus rugosus, *Plectogyra* ex. gr. *bradyi*, and *Endothyranopsis crassus*; (3) the base of the Namurian is placed at the appearance of the fusulinid *Eostaffella* ex. gr. *protvae*.

88. MIKLUKHO-MAKLAI, A. D., 1960, Stratigraphy of the Carboniferous deposits in Middle Asia: Leningrad Univ., Vestnik, ser. geol. and geogr., Bull. 1, p. 20-30, 2 text-fig., [in Russian].

Same article as given in the 1960, IV Congrès pour l'avancement de la stratigraphie du Carbonifère.

89. MIKLUKHO-MAKLAI, A. D., 1960, Correlations of Upper Paleozoic deposits of Central Asia and the Caucasus to the Far East by means of Foraminifera: 21st International Congress, Contrib. of the Russian Geologists, p. 69-77, [in Russian].

Primarily a stratigraphic paper dealing with a fusulinid zonation of the Upper Paleozoic deposits of the eastern Soviet Union. Mention is made that some smaller foraminifers are used as stratigraphic markers, i.e., *Asteroarchaediscus* for the Bashkirian Stage, and *Geinitzina ovata*, *Pachyphloia* sp., and *Colaniella parva* for the Pamirian Stage.

90. MIKLUKHO-MAKLAI, A. D., 1961, Stratigraphy of the Permian deposits in middle Asia: Leningrad Univ., Vestnik, ser. geol. and geogr., No. 12, Bull. 2, p. 18-41, 2 tables, [in Russian].

Primarily a Permian stratigraphy paper of the Caucasus region of the U.S.S.R. based upon fusulinid zonation. However, numerous previously described smaller foraminifers are shown to be useful in subdividing the Upper Permian of central Asia. The lower Murgabian contains such forms as *Pachyphloia gefoensis* and *Geinitzina tcherdyncevi*, and the Pamirian contains numerous nodosariids, the first *Robuloides*, and the last *Globivalvulina* and *Climacammina*.

91. MIKLUKHO-MAKLAI, A. D., and PORCHNYAKOVA, G. S., 1961, On the stratigraphic division of the Middle Carboniferous of the Alau Range (southern Fergana): Leningrad Univ., Vestnik, ser. geol. and geogr. No. 18, Bull. 3, p. 5-18, 1 text-fig., [in Russian].

The lower part of the Middle Carboniferous rocks in the vicinity of the Alau Range and Karatchatisk, southern Fergana, U.S.S.R., is biostratigraphically zoned on the basis of previously described species of *Asteroarchaediscus*, *Neoarchaediscus*, *Globivalvulina*, *Bradyina*, and Fusulinidae.

92. MIKLUKHO-MAKLAU, K. V., 1965, Some characteristics of Foraminifera in the marginal part of the Kazan Basin: All-Union Geol. Inst., Trans., v. 115, Biostratigraphic Papers, p. 114-125, 2 pl., 3 tables [in Russian].

Briefly discusses the occurrence of certain types of previously described Permian uniserial foraminifers occurring within the Kazan Basin of the Soviet Union. The following genera are represented: *Nodosaria*, *Pseudonodosaria*, *Lingulonodosaria*, and *Spandelina*. All of the foraminifers discussed are illustrated by what appear to be drawings of thin-section photomicrographs.

93. MINATO, M., 1943, New locality of *Saccamminopsis*: Geol. Soc. Japan, Jour., v. 50, no. 603, p. 319-320, [in Japanese].

A new occurrence of the smaller foraminifer *Saccamminopsis carteri* [= *S. fusuliniformis*] is reported from the Lower Carboniferous upper Viséan rocks (*Yuanophyllum Zone*) of Japan.

94. MIRONOV, K. N., GROZDILOVA, L. P., LAPINA, N. N., and LEBEDEVA, N. S., 1966, Lower Carboniferous of Dolgiy Island in the Pechora Sea: Akad. Nauk S.S.S.R., Doklady, v. 166, no. 4, p. 928-930, 1 text-fig., [in Russian].

The Carboniferous sequence of Dolgiy Island in the Pechora Sea, northern Soviet Union, is typical of the western side of the Urals and contains similar facies and microfossil assemblages. Previously described species of smaller foraminifers are particularly abundant and their study has demonstrated that part of the lower Viséan and lower Tournaisian substages are missing. Smaller foraminifers are listed from the upper Tournaisian and the Tula and Aleska Horizons of the upper Viséan sediments.

95. MYERS, D. A., 1966, Geologic map of the Tajique Quadrangle, Torrance and Bernalillo Counties, New Mexico: U. S. Geol. Survey, Map GQ-551.

A few genera of smaller Foraminifera (*Bradyina, Climacammina*) are noted on a series of measured sections of the Pennsylvanian (Desmoinesian-Virgilian) Madera Limestone exposed in the Tajique Quadrangle, in Torrance and Bernalillo counties, northcentral New Mexico.

96. NALIVKIN, V. D., 1949, On the Middle Carboniferous of the Ufa Amphitheatre; Akad. Nauk S.S.S.R., Izvestia, ser. geol. no. 2, p. 105-110 [in Russian].

The Middle Carboniferous rocks of the Ufa region, U.S.S.R., consists of approximately 375 feet of carbonates which have been subdivided into seven foraminiferal assemblage zones. The rocks range in age from Namurian to upper Bashkirian, and are subdivided primarily on the basis of previously described species of Fusulinidae, Archaediscidae, and Asteroarchaediscidae. [It is noted that *Asteroarchaediscus bashkiricus*, which is presented as a characteristic index of the Bashkirian Stage, is now generally accepted as widely present in the Namurian].

97. OKIMURA, Y., 1963, Foraminiferal zones underlying the *Profusulinella beppensis* Zone in the Akiyoshi Limestone Group: Hiroshima Univ., Geol. Rept. No. 12, p. 305-318, pl. 39-40, [in Japanese with English summary].

A revision of the stratigraphy presented in Okimura's 1958 article. It is to be noted that the *Plectogyra communis* [now *Quasiendothyra*] and *P. primaeva* [now *Septaglomospiranella*] Zones, formerly thought to be Osagian in age, are now considered as Meramecian. The endothyroid *spiroides*-"*symmetrica*" Zones are attributed to the Chesteran-Springeran.

98. OKIMURA, Y., 1965, Microbiostratigraphical studies on the foraminiferal faunas of the Lower Carboniferous formations of the Chugoku region, southwest Japan: Hiroshima Univ., Geol. Rept. No. 15, 46 p., 1 pl., 7 text-fig., 7 tables, [text in Japanese with excellent English abstract; plate and text-fig. captions and table explanations in English].

The Lower and Middle Carboniferous rocks of the Chugoku region, southwestern Japan, especially in the Atetsu, Taishaku, and Akiyoshi Limestone areas, are microbiostratigraphically subdivided into lower and upper parts on the basis of the contained microfaunal elements. The lower portion of well bedded limestones with "schalstein" and chert, of Lower Carboniferous age, is subdivided into 3 zones which contain abundant smaller foraminifers (endothyroids, palaeotextularids, archaediscids, tuberitinids, and tetrataxids). The upper portion of unstratified limestones, disconformably overlying the lower portion, and Middle Carboniferous in age, is characterized by relatively primitive fusulinids. The microfaunal characteristics of the lower interval suggests a Viséan age, whereas the upper interval apparently ranges from Bashkirian to Moscovian in age.

One plate of thin-section photomicrographs of some representative Lower Carboniferous smaller foraminifers is given. Of special interest are the excellent photomicrographs of the foraminifer *Saccamminopsis fusulinaformis* (M'Coy).

99. OLROYD, R. W. L., 1965, A summary of the micropalaeontology of the Lower Carboniferous of County Sligo, Ireland. *IN*: HUBBARD, W. F., and SHERIDAN, D. J. R., The Lower Carboniferous stratigraphy of some coastal exposures in County Sligo, Ireland: Roy. Dublin Soc., Sci. Proc., ser. A, v. 2, no. 12, p. 189-195, pl. 16-17, 2 text-fig.

The Lower Carboniferous limestones and shales exposed on the coast of northwestern Ireland were mapped and various vertical sections measured. The lithology and foraminiferal content of these coastal limestones are similar to those of the upper part of the inland succession previously described. They are correlated with the upper formations (Benbulben-Glencar Formation and the Darty Limestone), and not with the lowest formation (Ballyshannon Limestone), as has been previously done. The contained smaller foraminifers are thought to be indicative of a Lower Carboniferous (Viséan-D_1) age. All of the foraminifers are referred to previously described species and listed under their respective formational units.

100. OMARA, S., VANGEROW, E. F., and KENAWY, A., 1966, Neue Funde von Foraminiferen in Oberkarbon von Abu Darag, Ägypten: Paläont. Zeit., v. 40, no. 3/4, p. 244-256, pl. 24, 2 text-fig., [in German].

From Upper Carboniferous shales intercalated in Nubian-type sandstones at Abu Darag, eastern desert, Egypt, an agglutinated foraminiferal assemblage of 19 species is described and illustrated by whole-specimen photomicrographs. This microfauna is represented by previously described foraminiferal species of the families Astrorhizidae, Ammodiscidae, Textulariidae, Palaeotextulariidae, and Trochamminidae. One new subspecies, *Trochammina arenosa* Cushman and Waters *abudaragensis*, is described and illustrated. The microfauna is thought to be Westphalian in age and to have been deposited in a shallow sea adjacent to a coastline. [See Omara and Vangerow, 1965, for a previously described foraminiferal assemblage from this area.]

101. OZAWA, Y., 1928, A new genus, *Depratella*, and its relation to *Endothyra*: Contrib. Cushman Lab. Foram. Res., v. 4, pt. 1, p. 9-10.

In a brief discussion of the relationship of the fusulinid *Depratella* to *Endothyra* the writer notes that after detailed examination of the shell structure of some Lower Carboniferous *Endothyra* from the Avon Gorge, England, he found some forms with an agglutinated texture. However, in some species the wall becomes very thin, more or less loses its agglutinated texture, and approaches the shell structure of primitive *Fusulina*. Some forms of *Endothyra* may also have a perforate test, but others are undoubtedly imperforate like *Fusulina*. There is no doubt but that *Staffella*, characterized by a lenticular or nautiloidal test, is derived from *Endothyra* by the loss of the agglutinating character of the test in Lower Carboniferous time (Viséan). *Depratella* is derived from *Endothyra* during the Lower Permian.

102. PAJIC, V., 1963, The Middle Carboniferous microfauna of western Serbia: Vesnik Zavoda Geol.

- Geofiz, Istraz., Yugoslavia, ser. A, no. 21, p. 235-253, 6 pl.

The writer lists a number of previously described Middle Carboniferous (Bashkirian and Moscovian Stages) smaller foraminifers and fusulinids from western Serbia, Yugoslavia. The foraminifers occur in limestone lenses enclosed in schists. Most of the microfauna is illustrated by rather poor thin-section photomicrographs of random foram sections.

103. PANTIC, S., 1963, Upper Permian microfossils from the Anisian Conglomerates of Haj Nehaj, Montenegro: Vesnik Zavoda Geol.-Geofiz. Istraz., Yugoslavia, ser. A, No. 21, p. 175-213, 10 pl.

From limestone pebbles of Permo-Triassic conglomerates at Montenegro, Yugoslavia, a diverse microfauna of 11 species of Upper Permian smaller foraminifers is recorded. Of this microfauna one species, *Lasiotrochus hajnehajensis*, is described as new. All of the microfauna is described and illustrated by thin-section photomicrographs. Associated with the smaller foraminifers are fusulinids and calcareous algae.

104. PAYTON, C. E., 1966, Petrology of the carbonate members of the Swope and Dennis Formations (Pennsylvanian), Missouri and Iowa: Jour. Sed. Petrology, v. 36, no. 2, p. 576-601, 26 text-fig., 3 tables.

The writer reports the occurrence of smaller foraminifers from the Pennsylvanian (Missourian) Swope Formation of Missouri and Iowa. Identified forms are: *Bradyina*, *Polytaxis*, *Textularia*? [= *Palaeotextularia*], and *Calcitornella* [= *Hedraites*].

105. PETRENKO, A. A., 1949, Stratigraphy of the Carboniferous deposits of the southwestern part of the southern Urals: Akad. Nauk S.S.S.R., Izvestia, ser. geol. no. 6, p. 165-188, [in Russian].

Principally a discussion of the stratigraphy of the Carboniferous sediments of the southwestern part of the southern Urals, U.S.S.R. Mention is made of the lower Viséan age of a thin limestone unit in the Mugodzhar. The microfauna reported from this carbonate unit includes: *Endothyra crassa* Brady, *E. similis* Rauser. and Reitlinger, *Hyperammina vulgaris* Rauser. and Reitlinger [= *Earlandia*] and *Archaediscus krestovnikovi* Rauser.

106. PETRENKO, A. A., 1961, Age and origin of the Carboniferous Coal Measures of the eastern slope of the Urals and in Kazakhistan: IV Congrès pour l'avancement de la stratigraphie du Carbonifère Heerlen, v. 2, p. 529-540, 1 text-fig., [in English].

The Coal Measures of the Carboniferous of the eastern slope of the Urals, and Kazakhstan, U.S.S.R., are dated on the basis of their contained smaller foraminifers. The Ber-Chogur Series are dated as Lower Carboniferous (upper Tournaisian) due to the presence of *Endothyra* sp. cf. *E. tschikmanica* and *Glomospira elliptica*. The presence of *Endothyra crassa* [now *Endothyranopsis*], *Archaediscus karreri*, *A. krestovnikovi* var. *pusillus* indicate a Lower Carboniferous (upper Viséan) age for the Karagandysai Series, whereas the foraminifers *Bradyina cribrostomata* and *Archaediscus baschkiricus* [now *Asteroarchaediscus*] are representative species for the Lower Carboniferous (Namurian).

107. PLUMHOFF, F., 1966, Marines Ober-Rotliegendes (Perm) in Zentrum des nordwestdeutschen Totliegend-Beckens. Neue Bewise und Folgerungen: Erdöl und Kohle, v. 19, no. 10, p. 713-720, 3 pl., 2 text-fig., [in German with English abstract].

In the center of the Rotligendes Basin of northwestern Germany the Lower Permian Rotligendes Formation passes conformably into the Zechstein Formation (Upper Permian). The uppermost portion of the Rotligendes Formation is characterized by a rich marine microfauna in which smaller foraminifers are a dominant constituent. Previously described species representing the following genera occur quite commonly: *Hyperammina*, *Ammodiscus*, *Reophax*, *Lingulina*, *Pseudoglandulina*, *Earlandia*?, *Glomospira*, *Ammobaculites*, *Geinitzina*, *Spandelina*, *Monogenerina*, *Calcitornella* [=*Hedraites*], *Cornuspira*, *Nodosaria*, *Dentalina*, *Spandelinoides*, and *Spirillina*. Associated with this rich and diverse foraminiferal assemblage are ostracodes, molluscs, and fish remains.

From a paleogeographic point of view the marine microfauna from the uppermost Rotliegendes indicates a marine ingression of the Scandic prior to Zechstein time. The Banderschiefer Bed is a characteristic marker horizon used in stratigraphic correlations (see text-fig. 2). The writer believes that the uppermost Rotliegendes and the Zechstein belong to the same biostratigraphic unit.

The microfauna is illustrated by whole-specimen photomicrographs of characteristic forms from diagnostic stratigraphic horizons.

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

A number of foraminiferal assemblages are described from the Mt. Magnitskaia section in the Urals, U.S.S.R.; all are composed of previously described foraminiferal species. The *Quasiendothyra* Zone is recognized and found to contain abundant *Q. communis* and *Q. kobeitusana*. The Tournaisian microfauna appears to be well developed, but the lower Viséan boundary is difficult to place, since *Haplophragmella*, *Tetrataxis*, and *Palaeotextularia* gradually appear as components within the Tournaisian assemblage.

The lowermost Viséan assemblage is characterized by *Quasiendothyra chomatica* [now *Dainella*], primitive *Globoendothyra* and the first *Endothyra* ex. gr. *staffeliformis.*

The Grumbey complex carries the earliest *Endothyranopsis, Eostaffella mediocris* [now *Mediocris*], and *Pseudoendothyra.* This assemblage is similar to that of the Bobrikovski.

The first *Archaediscus* appears within the Tula Horizon.

109. POTIEVSKAIA, P. D., 1964, Some fusulinids and small foraminifera in the Bashkir sediments of the greater Donets Basin: Akad. Nauk U.R.S.R. (Kiev), Trudy, Inst. Geol. Sci., Trans., Strat. and Paleontol. Ser., No. 48, Materials on the Upper Paleozoic fauna of the Donets Basin, v. 2, p. 31-59, 5 pl., [in Russian].

Primarily a paper describing the fusulinid microfauna of the Bashkir sediments (lower Middle Carboniferous) of the greater Donets Basin of the Soviet Union; however, 5 smaller foraminifers are also described and illustrated by excellent thin-section photomicrographs. Three of the smaller foraminifers are new: *Plectogyra baschkirica, Tetrataxis extensa,* and *Eolasiodiscus dilatatus.*

110. RAUSER-CHERNOUSSOVA, D. M., and DALMATSKAIA, I. I., 1954, New species of Foraminifera of the Middle Carboniferous of the Mordovsk, S.S.R., and the Pensensk district: V.N.I.G.R.I., Trudy, Paleont. Sbornik, v. 1, p. 82-90, pl. 23, [in Russian].

Primarily a fusulinid paper, although one smaller foraminifer, *Textularia elinae* [= *Palaeotextularia*] is described from the Middle Carboniferous rocks of Mordovsk, U.S.S.R., and illustrated by one thin-section photomicrograph. On the basis of fusulinids the Moscovian Stage of the Middle Carboniferous is subdivided into four substages: (1) the Vereian Substage containing *Endothyra aljutovica* and *Climacammina aljutovica,* (2) the Kachiran Substage carrying *Haplophragmina kashirica* and *Bradyina minima,* (3) the Podolian Substage characterized by abundant *Climacammina grandis,* and *Bradyina pseudonautiliformis,* and (4) the Miatckogo Horizon which yields *Bradyina lepida.*

111. REICHELT, H., 1956, Das Ergebnis neuerer stratigraphischer Untersuchungen unter besondered Berücksichtigung der Mikrofauna in oberen Westfal A der Zeche Friedrich Heinrich am linken Niederrhein: Z. deut. Geol. Gess., v. 107, p. 92-102, 9 text-fig., 1 table, [in German].

In a large, well exposed mining district within which the predominantly flat-lying beds simplify recognition of individual strata in the sequence, the Bochumer beds (i.e., from the Katharina Coal to the Karoline Coal) have been thoroughly investigated with especial reference to their contained microfauna.

The sudden pinching-out of foraminiferal horizons from coal-rich sequences demonstrates that one must be very cautious in correlating coal units between widely separated sections of the Carboniferous rocks of the Ruhr region of western Germany. Moreover, the fact that there are Foraminifera (all agglutinated: *Hyperammina, Glomospira, Glomospirella,* and *Ammodiscus*) within many intervals of the Bochumer beds was quite surprising. In regard to facies development, it demonstrates that as early as upper Westphalian A time the lower Rhine region had acquired a unique character (many intercalations of units thought to be of brackish-water origin) as compared with the Aachen region to the west and the central part of the Ruhr district to the east.

Foraminiferal horizons are shown on table 2; the microfauna is not illustrated.

112. REITLINGER, E. A., 1954, Results of the study of the Donbass Series for the stratigraphy of the Namurian and Bashkirian on the Russian Platform: Akad. Nauk S.S.S.R., Izvestia, ser. geol. no. 3, p. 72-82, 1 table, [in Russian].

A comparative study of the biostratigraphy of the Middle Carboniferous strata of the Russian Platform with that of the Donbass standard section. It is noted that the Krasnaya Polyana Formation is the microfaunal equivalent of the C^5I (E) of the Donetz, by comparison of the various species of *Globivalvulina, Climacammina, Palaeotextularia,* the endothyroids, archaediscids, and fusulinids.

113. REITLINGER, E. A., 1960, Characteristics of the Ozerko-Khovansk Formations on microscopic organic remains: Akad. Nauk S.S.S.R., Trudy, Geol. Inst., Bull. 14, p. 135-179, 3 pl., 5 text-fig., 1 table, [in Russian].

The lower boundary of the Etroeungt Beds in the Ural Mountains, U.S.S.R., is drawn on the basis of an evolutionary sequence of Tournayellidae and Quasiendothyridae smaller foraminifers. On the Russian Platform this boundary is impossible to recognize, since tournayellids and quasiendothyrids are absent; however, these forms are replaced by calcispheres and monolocular primitive smaller Foraminifera. Most Soviet workers attribute this change in microfaunal assemblages to changes in water salinity.

The Ozerko dolomites and limestones are correlated with the top of the *Septatournayella rauserae* Zone, while the Khovansk Formation is thought to be equivalent to the *Endothyra communis-Quasiendothyra kobeitusana* Zone.

This paper mainly describes the calcispheres, but two new species of questionable Foraminifera are described and illustrated by whole-specimen photomicrographs. The new forms are: *Rauserina compressa* and *Tscherdyncevella globulosa.*

114. REITLINGER, E. A., 1961, On some questions of the systematics of the Quasiendothyridae: Voprosy Mikropaleontologii, No. 5, p. 31-68, 6 pl., 2 text-fig., [in Russian].

A complete systematic revision of the Upper Devonian-Lower Carboniferous smaller foraminifers of the Family Quasiendothyridae and some representatives of the Family Tournayellidae. The genus *Quasiendothyra* is emended to include forms with wide fluctuations of coiling, the genus *Cribroendothyra*, originally proposed by Lebedeva for cribrate primitive Endothyridae, is here considered cogeneric with the genus *Quasiendothyra.* The genus *Klubovella* is regarded as an isomorphic form and is ranked as a distinct morphologic subgenus. All discussed foraminifers are illustrated by excellent thin-section photomicrographs.

Six new species, one new subspecies, and four new varieties are described. The new forms are: *Septaglomospiranella* (*S.*) *nana, S.* (*S.*)? *kingirica, S.* (*S.*)? *crassa, S.* (*Rectoseptaglomospiranella*) *elegantula, S.* (*R.*) *asiatica, S.* (*R.*)? *crassiformis, Septaglomospiranella* (*S.*) *primaevae* (Rauser) subsp. *graciosa, Quasiendothyra communis* (Rauser) var. *radiata, Q. konensis* (Lebedeva) var. *mutabilis, Q. konensis* (Lebedeva) var. *glomiformis, Septaglomospiranella* (*S.*) *primaevae* (Rauser) var. *kazakhstanica.*

The following important taxonomic changes are also included: *Endothyra communis* Tchernycheva, 1940, Rauser, 1948, Grozdilova and Lebedeva, 1954, Lipina, 1955, *forma regularis* Lipina, 1955, *E. communis* var. *communis* Lebedeva, 1956, var. *umbilicata* Lebedeva, 1956, *Quasiendothyra kamenkaonsis, Q. petchorica,* and *Endothyra turbida* all = *Quasiendothyra communis* (Rauser); *Endothyra konensis, E. klubovi,* and *E. tengisica* Lebedeva, 1956, *E. dentata* Durkina, 1959, and *E. radiosa* Malakhova, 1959 = *Quasiendothyra konensis* (Lebedeva); and *Spiroplectammina* sp. Lebedeva, 1956, and *Ammobaculites*? sp. Lipina, 1960 = *Septaglomospiranella* (*Rectoglomospiranella asiatica*) Reitlinger.

115. REITLINGER, E. A., 1964, Present status of the studies of the order Endothyrida: Voprosy Mikropaleontologii, No. 8, Morphology, taxonomy, and present status of studies on foraminifers and ostracodes, p. 30-52, 1 pl., 2 text-fig., 3 tables, [in Russian].

The writer presents a lucid analysis of the worldwide usage of endothyroid Foraminifera in Lower Carboniferous micropaleontological studies up to 1963. Text-figure 1 illustrates the dramatic increase of the endothyroid literature since 1925. It is noted that most of the current work is being done in the Soviet Union. Tables 2 and 3 show the stratigraphic subdivision of the Soviet Lower Carboniferous sequence on the basis of faunal representatives of the order Endothyrida: the characteristic "index fossils" for each stratigraphic subdivision are noted.

116. ROSS, C. A., 1967, Stratigraphy and depositional history of the Gaptank Formation (Pennsylvanian), west Texas: Geol. Soc. America, Bull., v. 78, no. 3, p. 369-384, 4 pl., 4 text-fig.

The writer notes that smaller foraminifers and diverse skeletal grains are relatively abundant in the limestones of the Pennsylvanian Gaptank Formation of west Texas. The microfauna includes such forms as: *Glomospira, Tetrataxis, Bradyina, Endothyra, Bigeneria* [*sic*], and *Orthovertella* [probably *Hedraites*].

117. ROSS, C. A., 1967, Late Paleozoic Fusulinacea from Northern Yukon Territory: Jour. Paleontology, v. 41, no. 3, p. 709-729, pl. 79-86, 2 text-fig.

Primarily a paper describing the Late Paleozoic fusulinids from the Northern Yukon Territory, Canada. One new species of smaller foraminifers, *Endothyra arctica*, is described from rocks of Pennsylvanian age (probably Moscovian) and illustrated by thin-section photomicrographs. In addition, the forms *Endothyra* sp. and *Brunsia* sp. are illustrated and described from rocks of this region believed to be of Pennsylvanian (late Morrowan) age. The foraminifers *Bradyina* sp. and *Climacammina* sp. are noted as occurring in Pennsylvanian rocks of early Moscovian age in this area.

118. ROZOVSKAIA, S. E., 1961, On the systematics of the Family Endothyridae: Moskovskoe obshchestvo ispytatelei prirody, Bull. Otdel Geol. No. 3, p. 150-151, [in Russian].

A short synopsis of a number of proposals presented to the Commission of Zoological Nomenclature relative to the Family Endothyridae. The more important points are: (1) *Endothyra bowmani* is a *nomen dubium* since Brown and Philips descriptions are unsatisfactory, (2) the first revision of the genus is that of Brady, 1876, which has been accepted for more than 50 years, (3) in order to stabilize nomenclature, *Endothyra bradyi* Mikhailov, 1939 (= *E. bowmani* Brady, 1876) is suggested as the type of *Endothyra*, (4) the genus *Plectogyra* is synonymous with *Endothyra* as emended, (5) Plectogyrinae Reitlinger, 1959, is emended as Endothyrinae Brady, 1884, and (6) the subfamily

Quasiendothyrinae is proposed on *Quasiendothyra* Rauser-Chernoussova, 1948. [See China, 1965, for the final decision of the Commission of International Zoological Nomenclature].

119. SAFAROV, E. I., and KAPTSAN, V. K., 1964, Recent data on the Carboniferous deposits in Moldavia: Akad. Nauk S.S.S.R., Doklady, v. 157, no. 6, p. 1336-1368, 1 text-fig., [in Russian].

Two foraminiferal assemblages present in well cores from Moldavia, U.S.S.R., indicate the existence of lower and upper Viséan (Lower Carboniferous) rocks in this area. The lowermost Viséan is characterized by the presence of early *Globoendothyra* and *Dainella*, mixed with a residual Tournaisian microfaunal assemblage.

120. SALTOVSKAYA, V. C., 1963, Stratigraphy of the Middle Carboniferous deposits of the Zeravshano-Gissorslsoi Mt. Province: Akad. Nauk Tadzhikskoi S.S.R., Dushanbe Inst. Geol., Trudy, v. 7, p. 3-29, 6 text-fig., 1 table, [in Russian].

Primarily a paper discussing the Middle Carboniferous stratigraphy of the Zeravshano-Gissorslosoi Mt. Province, U.S.S.R., based principally on fusulinid age determinations and correlations. A number of previously described smaller foraminiferal species are also listed.

121. SAURIN, E., 1964, Foraminifères Namuriens de Tan-Lam: Archives Géol. du Viet-Nam, v. 6, p. 37-74, 7 pl., [in French].

From the Lower Carboniferous (Namurian) limestones of Tan-Lam, province of Quang-Tri, central Viet Nam, southeast Asia, a microfauna of 54 species is briefly described and illustrated by mediocre thin-section photomicrographs. Three species are described as new: *Plectogyrina fontainei*, *Globoendothyra annamitica*, and *G. tanlamensis*. A few fusulinids are also described. One taxonomic change is included: cf. *Haplophragmella dussaulti* Saurin, 1960 = *Ammobaculites* cf. *A. dussaulti* Saurin.

122. SCHUBERT, R. J., 1907, Vorläufige Mitteilung über Foraminiferen und Kalkalgen aus dem dalmatischen Karbon: Verh. K. K. Geol. Reichsanstalt, No. 8, p. 211-214, [in German].

The writer lists a number of smaller foraminifers, in association with fusulinids and calcareous algae, from the Upper Carboniferous of Dalmatia (Yugoslavia). [This microfauna is now regarded as Lower Permian in age. It should be noted that the designation of *Valvulinella* is an invalid *nomen nudum*. The correct designation is that of Schubert, March 1908, with *V. youngi* as the type species. True *Valvulinella* died out at the end of the Lower Carboniferous; Permian "*Valvulinella*" probably should be re-named].

123. SEMIKHATOVA, E. N., 1946, On the study of fusulinids and the stratigraphy of the Carboniferous deposits of the region of the Don-Medveditza dislocations: Akad. Nauk S.S.S.R., Doklady, v. 52, no. 6, p. 529-532, [in English].

Primarily a discussion of the fusulinid biostratigraphy of the Carboniferous sediments of the Don-Medveditza dislocations, U.S.S.R. It is noted that the Middle Carboniferous Sukhov Series contains *Endothyra* sp. and *Bradyina* sp. The microfauna of the Lower Panika Series (Upper Carboniferous) contains *Glomospira* sp., *Globivalvulina* sp., *Palaeotextularia* sp., *Cribrostomum* sp., and *Bradyina* sp.

124. SEMIKHATOVA, S. V., 1953, On the history of the Middle Carboniferous Epoch of the Russian Platform: Moskovsksoe obshchestvo iskytalelei prirody, Biull. Otdel. Geol., v. 28, no. 4, p. 33-52, 2 tables, [in Russian].

The writer briefly describes the stratigraphic dispersion and geographic distribution of 20 Middle Carboniferous smaller foraminifers and fusulinids from several regions of the Russian Platform (Donetz, Prae-Timan, Molotov, Saratov, western Urals, Don, Ouliuanovsk, and Dniepopetrovsk). Of especial note is the large microfauna referred to the Archaediscidae.

125. SEMIKHATOVA, S. V., 1959, Fundamental questions of the stratigraphy of the lowermost layers of the Lower Carboniferous. *IN*: Stratigraphy of the lower part of the Lower Carboniferous of the Volga-Ural districts: V.N.I.G.R.I., Trudy, v. 14, p. 5-30, 5 tables, [in Russian].

The writer presents a historical and paleontological review of the so-called "passage beds" of the Devonian-Carboniferous and Tournaisian-Viséan boundaries of the Volga-Ural districts of the Soviet Union. The problems most apparent in correlating the Khovansk Beds of the Russian Platform with the *Endothyra communis* layers of the Volga region are briefly outlined.

126. SERGUNKOVA, O., 1957, Stratigraphic scheme of the Lower Carboniferous of the southern part of the Tian-Chian Range: Resolution Committee for the unified stratigraphic scheme of the pre-Paleozoic and Paleozoic of the Oriental part of Kazakhstan, p. 114-118, 2 tables, [in Russian].

The Lower Carboniferous rocks (Tournaisian and Viséan Stages) of the Tian Chian Range, southern Kazakhstan, U.S.S.R., is subdivided into eight foraminiferal assemblages based upon previously described species of smaller Foraminifera. The foraminiferal ranges are compared to a previously used megafaunal zonation.

127. SHEPHARD-THORN, E. R., 1963, The Carboniferous limestone succession in northwest County Limerick, Ireland: Roy. Irish Acad., Proc., v. 62, sec. B., No. 17, p. 267-294, pl. 14, 3 text-fig.

From the Lower Carboniferous (Viséan) rocks of the Corgrig Lodge Beds, exposed in the northwestern part of Limerick County, Ireland, a microfauna of 16 species (all previously described) is listed and commented upon. R. H. Cummings identified the foraminiferal assemblage and noted that the microfauna is probably of upper D-zone age.

128. SHULGA, P. L., 1952, A stratigraphic scheme for the Paleozoic of the southwestern limb of the Russian Platform: Akad. Ukraine Nauk S.S.R., Geol. Zhur. v. 12, no. 4, p. 31, [in Ukrainian].

The Lower Carboniferous (Viséan) sediments in Volynia and Padolia, U.S.S.R., are divided into five biostratigraphic zones: (1) the basal Olesko, which contains endothyrids of the group *Endothyra globulus*, primitive *Eostaffella*, and abundant *Parathurammina* and *Calcisphaera*, (2) the Busk Horizon, which is characterized by *Forschia suangulata*, *Lituotubella glomospiroides*, *Haplophragmella irregularis*, and *Endothyra omphalota minima*, (3) The Ustilug, which yields *Saccamminopsis carteri ukrainica*, *Endothyra crassa* [now *Endothyranopsis*], *Monotaxis gibba* [= *Howchinia*], *Stacheia fusiformis* [now *Fourstonella*], and *Archaediscus moelleri gigas* [= *Archaediscus karreri*], (4) the Poritsk, which carries *Nanicella ammonoides* [now *Loeblichia*], *Quasiendothyra ukrainica* [now *Loeblichia*] and *Archaediscus bashkiricus* [now *Asteroarchaediscus*], and (5) the Ivanichi Horizon, which is characterized by *Endothyra crassa sphaerica*.

129. SHVEDOV, N. A., USTRITZ, B. I., CHERNIAK, G. Y., and SOSSIPATROVA, G. P., 1961, Stratigraphic scheme of the Upper Paleozoic of the Taimyr: V.N.I.G.A., Sbornik stat. p. paleont. i biostratigraphii, No. 24, Leningrad, p. 12-15, 1 table, [in Russian].

The writers present a preliminary outline of the biostratigraphic subdivision of the Upper Paleozoic rocks of the Soviet Arctic, Taimyr Peninsula. Marine Middle Carboniferous Makarovsk sediments contain *Neoarchaediscus stilus*, *Asteroarchaediscus* ex. gr. *subbaschkiricus*, and *Archaediscus* aff. *reliquus*. The lowermost Lower Permian sediments rest unconformably on the Carboniferous and contain *Neoarchaediscus gregorii*. Somewhat higher in the section such characteristic forms as *Protonodosaria praecursor*, *P. proceraformis*, and *Hyperammina* cf. *H. borealis*, make their appearance. The lower part of the Upper Permian carries *Pseudonodosaria ventrosa*, *Dentalina kalinkii*, *Frondicularia planilata*, and numerous nodosariids. The upper part of the Upper Permian is non-marine and has been zoned by pollen.

130. SHVETSOV, M. S., 1940, On the petrography and stratigraphy of the Devonian and Carboniferous deposits in Moscow: Bull. Soc. Nat. Moscou. v. 48 sec. geol. 18, no. 3-4, p. 153-168, 4 pl., 3 text-fig., [in Russian with English summary].

The writer discusses the microfacies of the Upper Devonian and Lower Carboniferous Khovansk, Malevka, Upinsk, and Tula Limestones of the Moscow district, U.S.S.R. Microfaunal lists are given for the Lower Carboniferous (upper Viséan) sediments, which contain the following forms: *Archaediscus karreri*, *Hyperammina vulgaris*, *Endothyra crassa*, *E. crassa* var. *complexa*, *E. similis*, *E. globulus*, *E.* sp. cf. *E. omphalota*, and *Haplophragmella* sp. cf. *H. fallax*. [This is one of the earliest Soviet references in which Lower Carboniferous limestones have been recognized and identified by their microfaunas.]

131. SHVETSOV, M. S., 1940, Contribution to the petrography and paleontology of the Dinantian (Lower Carboniferous) of the Moscow Basin: Bull. Soc. Nat. Moscou, v. 48, sec. geol. 18, no. 5-6, p. 74-78, 1 pl., [in Russian with English summary].

A petrographic study of the Lower Carboniferous (Tournaisian) Chernyshin Limestone of the Moscow Basin discloses the presence of abundant foraminifers (*Endothyra* and *Textularia*) associated with blue-green algae. [The Chernyshin *Textularia* are now referred to *Palaeospiroplectammina*.]

132. SILVA, I. P., 1965, Permian Foraminifera from the upper Hunza Valley. *IN*: Italian Expeditions to the Karakorum (K^2) and Hindu Kush, A. Desio, Leader, Scientific Repts., Pt. 4, Paleontology-Zoology-Botany, v. 1, 1st. pt.-Fossils of Karakorum and Chitral, p. 89-125, pl. 10-18, 1 text-fig., E. J. Brill, Leiden.

A suite of Permian Foraminifera (fusulinids and smaller foraminifers), illustrated both by sketches and rather poor thin-section photomicrographs, is described from the Gircha Formation of the upper Hunza Valley in the western Karakorum (Pakistan). Of 16 species of smaller foraminifers, one, *Hemigordius*? *pakistanus*, is regarded as new. Most of the foraminifers occur in thin, dark-grey dolomite limestone intercalations within the predominantly clastic (dark arenaceous slates) Gircha Formation.

133. SKIPP, B., HOLCOMB, L. D., and GUTSCHICK, R. C., 1966, Tournayellinae, calcareous Foraminif-

era, in Mississippian rocks of North America: Cushman Found. Foram. Res., Spec. Pub. No. 9, 38 p., 7 pl., 7 text-fig.

Recent work in North America has shown the presence of tournayellid foraminifers in rocks of Kinderhookian, Osagean, and Meramecian age, and that these have restricted ranges useful for stratigraphic zonation in the North American Lower Carboniferous. To date, none have been recovered from the Devonian. A striking similarity between the tournayellid and endothyroid microfaunas of the Early Carboniferous of the North American Cordillera and several areas of the U.S.S.R. suggests coeval development, similar environments, and possibly connecting seaways during that period. A correlation chart, based on ranges of identical and similar Tournayellinae, is presented in which the Osagean-Meramecian boundary of the United States (tentatively correlated with the Tournaisian-Viséan boundary of western Europe) is interpreted to lie within and not above the Kizel Horizon of the Soviet Union. Such an interpretation assigns many of the tournayellids to the Viséan rather than the Tournaisian.

The genus *Septoglomospiranella* Lipina, 1955, for which one new subspecies is described, is found in: the Redwall and Escabrosa Limestones, Arizona; the Leadville Limestone, Colorado; the Madison Limestone, Wyoming; the Tin Mountain Limestone, California; the Shunda and Pekisko Formations, Alberta, Canada; and the Gilmore City Limestone, Iowa. *Septabrunsiina* Lipina, 1955, for which two new species are described, is recognized in: the Redwall, Leadville, and Madison Limestones, and in the Livingstone and Mount Head Formations, Alberta. *Tournayella* Dain, 1953, and *Septatournayella* Lipina, 1955, for which two new species are described, are found in: the Redwall Limestone, the Madison Limestone, Montana; beds formerly assigned to the Brazer Limestone in southeastern Idaho and northern Utah; parts of the White Knob Limestone of Idaho; the Arroyo Peñasco Formation, New Mexico; the Mount Head Formation, Alberta; and the Salem Limestone, Indiana. A section containing translations into English of the original descriptions of major Russian genera and species discussed in this paper is appended.

A very significant section on the tournayellid wall structure gives evidence that the test wall was originally composed of finely perforate porcellaneous (?) material that was later totally recrystallized.

The new taxa are: *Septabrunsiina mckeei*, *S. parakrainica*, *Septoglomospiranella primaeva* (Chernysheva) *noda*, n. subsp., *Septatournayella henbesti*, and *S. kennedyi*. All forms are described and illustrated by excellent thin-section photomicrographs.

Important taxonomic changes include the following: *Endothyra kynensis* Malakhova, 1956, and *Endothyra*? spp. McKay & Green, 1963, = *Septaglomospiranella dainae* Lipina, 1955; and *Endothyra primaeva* Chernysheva, 1940, = *Septaglomospiranella primaeva* (Chernysheva).

134. Smith, N. M., 1966, Sedimentology of the Salem Limestone in Indiana: The Ohio Jour. Sci., v. 66, no. 2, p. 168-179, 3 fig., 1 table.

Primarily a study of the "internal stratigraphy" of the Lower Carboniferous (Meramecian) Salem Limestone of Indiana, particularly to the determination of Salem depositional conditions, in order that this unit may be properly utilized as a future source of dimension stone.

It is noted that the smaller foraminifer *Endothyra* is a conspicuous biotic element within the Salem Limestone. Fig. 2 and 3 show percentage abundance of *Endothyra* in a number of outcrop sections and cores from various localities in Indiana.

135. Solomina, R. V., 1962, The Carboniferous stratigraphy of the Verkojan deposits: V.N.I.G.A., Sbornik stat. p. paleont. i biostratigraphii, Geol. Inst. Arctic, v. 30, p. 16-34, [in Russian].

In the Soviet Arctic the Tiksin Horizon contains *Archaediscus* cf. *A. krestovnikovi*, *Planoarchaediscus* sp., *Brunsiella ammodiscoidea*, and *Plectogyra* ex. gr. *bradyi*; its age is Carboniferous (Viséan to Namurian).

The Makarov rests on the Namurian and its lower part is characterized by *Neoarchaediscus incertus*, *N. stilus*, *N. timanicus*, and *Asteroarchaediscus* ex. gr. *baschkiricus* and is probably Bashkirian in age. The upper part of the Makarovsk is thought to be Moscovian in age and carries *Archaediscus pauxillus*, *A. krestovnikovi*, *Planoarchaediscus stilus*, *Neoarchaediscus rugosus*, and *Planospirodiscus minimus*.

The Colodmin Series is thought to be of Upper Carboniferous age and contains *Asteroarchaediscus subbaschkiricus*, *Neoarchaediscus accuratus*, *N. collatatus*, and *Archaediscus commutabilis*.

136. Solovieva, M. H., 1963, Stratigraphy and fusulinid zonation of the Middle Carboniferous in central Asia: Akad. Nauk S.S.S.R., Trudy, Geol. Inst., v. 76, 133 p., 14 text-fig., 24 tables, [in Russian].

Primarily a discussion of the stratigraphy and fusulinid zonation of the Middle Carboniferous sediments (Namurian-Bashkirian-Moscovian) of central Asia, U.S.S.R. Reference is made to a number of previously described species of smaller foraminifers and it is noted that species of the families Archaediscidae, Bradyinidae, and Palaeotextulariidae provide reliable local stratigraphic markers.

137. SOSNINA, M. L., 1965, Some Permian Fusulinidae and Lagenidae of the Sikhote-Alin' Range: All-Union Geol. Inst., Trans., v. 115, Biostratigraphic Papers, p. 142-169, 5 pl., 1 text-fig., [in Russian].

Primarily a fusulinid paper describing the Permian microfauna from the Sikhote-Alin' Range, of the eastern part of the U.S.S.R. In addition, 3 new species of smaller foraminifers are described and illustrated by whole-specimen drawings and thin-section photomicrographs: *Nodosaria vasiljevi*, *N. grandecamerata*, and *Dentalina orienta*.

138. SOSSIPATROVA, G. P., 1962, Foraminifera of the Upper Paleozoic of the Taimyr: V.N.I.G.A. 30, Sbornik, Stat. p. paleont. i biostratigraphii, Leningrad, p. 35-72, 5 pl., [in Russian].

The writer describes three Middle Carboniferous and Lower Permian foraminiferal assemblages from the Taimyr Peninsula, U.S.S.R. The microfauna consists of 36 species, of which 1 genus and 18 species are new. All forms are illustrated by thin-section photomicrographs. The new Permian species are: *Reophax socolinensis*, *Ammobaculites permicus*, *Nodosaria dentaliniformis*, *N. gigantea*, *N. lata*, *N. ustritskii*, *N. taimyrica*, *Frondicularia bajcurica* and *F. spectata*. The new Middle Carboniferous forms are: *Archaediscus dubius*, *A. commutabilis*, *A. enodatus*, *Planoarchaediscus abseus*, *P. absimilis*, *Neoarchaediscus accuratus*, *N. collatatus*, *Planospirodiscus taimyricus* n. gen., and *P. effectus*. Pertinent taxonomic changes include the following: *Pseudoglandulina pygmeaformis* Maclay, 1960 = *Rectoglandulina pygmeaformis* (Maclay); *Archaediscus stilus* Grozdilova and Lebedeva, 1954 = *Planoarchaediscus stilus* (Grozdilova and Lebedeva); *Archaediscus rugosus* Rauser, 1953 = *Neoarchaediscus rugosus* (Rauser); *Archaediscus timanicus* Reitlinger, 1953 = *Neoarchaediscus timanicus* (Reitlinger); and *Archaediscus minimus* Grozdilova and Lebedeva, 1953 = *Planospirodiscus minimus* (Grozdilova and Lebedeva).

139. STEPANOV, D. L., 1959, The Carboniferous System and its principal stratigraphic subdivisions: Akad. Nauk S.S.S.R., Izvestia, ser. geol., v. 11, p. 45-57, 1 text-fig., [in Russian].

The writer presents a summary report of the Commission on the stratigraphy of the Carboniferous by the National Committee of Soviet Geologists. The purpose of this commission is to see that a generalized standard classificatory scheme of the Carboniferous subdivisions can be prepared and presented for discussion and acceptance. Such points as the entity of the Carboniferous System, the division of the Carboniferous into two systems or sub-systems, the boundaries of the Carboniferous, and the biotic subdivision of the Carboniferous are all discussed in detail. Mention is made of a number of fusulinid and small-foraminifer genera that appear to have excellent stratigraphic potential.

140. STEVENS, C. H., 1966, Paleoecologic implications of the Early Permian fossil communities in eastern Nevada and western Utah: Geol. Soc. America, Bull., v. 77, no. 10, p. 1121-1130, 6 text-fig.

Stratigraphic and paleontologic studies in eastern Nevada and western Utah show that at least eight major marine and paralic fossil communities occur in rocks of Early Permian age. The eight communities are: (1) palaeotextulariid, (2) fusulinid, (3) coral, (4) dictyoclostid-*Composita*, (5) chonetoid, (6) *Heteralosia*, (7) nuculanid, and (8) euphemitid. The first five communities probably required a salinity close to 35 ppm. The palaeotextulariid community (consisting of *Palaeotextularia*, *Cribrogenerina*, *Palaeobigenerina*, and *Climacammina*) probably lived at a depth of 50-70 m; fusulinids at 20-50 m; and corals at 10-30 m. The dictyoclostid-*Composita* and chonetoid communities may have lived at a depth of a 4-10 m, the latter in an environment of lower energy level than the former. The *Heteralosia*, nuculanid, and euphemitid communities apparently were euryhaline and occupied very shallow bottoms. The writer notes that the smaller foraminifer *Globovalvulina* [*sic*] is also present in some samples of the palaeotextulariid community. [See Stevens, 1965, for a similar study on Middle Pennsylvanian rocks exposed near McCoy, Colorado.]

141. SULLIVAN, R., 1966, The stratigraphical effects of the mid-Dinantian movements in southwest Wales: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 2, no. 3, p. 213-244, 8 pl., 9 text-fig.

In the Lower Carboniferous rocks of southwestern Wales, United Kingdom, four principal carbonate facies can be recognized in the Dinantian rocks: (1) "zaphrentid-phase" facies, (2) "standard" facies, (3) "lagoon-phase" facies, and (4) reef facies. The "zaphrentid-phase" facies was deposited in deeper and quieter water on the southern edge of the shelf. The "standard facies" extended over the greater part of the shelf and represents clear, shallow, agitated waters. The "lagoon-phase" facies represents the local development of restricted coastal flats on the margins of the landmass as a result of mid-Dinantian tectonic movements. In the southern part of the shelf, reefs grew in response to this widespread shallowing of the sea. The writer reports that all of the above facies yield smaller foraminifers, *i.e.*, plectogyrids, earlandiids, endothyroids, and tournayellids.

142. TEODOROVITCH, G. I., BAGDASAROVA, M. V., GROZDILOVA, L. P., LEBEDEVA, N. S., and FOTIEYEVA, N. N., 1963, Stratigraphy of the upper Tournaisian

and lower Viséan of the west side of the southern Urals (Usuyla River): Akad. Nauk S.S.S.R., Doklady, v. 149, no. 1, p. 166-169, [in Russian].

From the Lower Carboniferous rocks of the west side of the southern Ural Mountains a continuous sequence of carbonate rocks (upper Tournaisian-lower Viséan) contain an excellent foraminiferal microfauna. The writers recognize the following four horizons: (1) the Cherepet, containing *Chernyshinella glomiformis*, *C. tumula*, *Tournayella* sp., and *Spiroplectammina tschernyshinensis* [= *Palaeospiroplectammina*]; (2) the Chikman Horizon with *Plectogyra latispiralis* [= *Latiendothyra*], *P. costifera* [= *Spinoendothyra*], *P. septima*, *Haplophragmella* sp., *Lituotubella*? sp., *Tournayella* sp., and *Palaeotextularia* ex. gr. *diversa*; (3) the strata above the Chikman or "upper Kizel" of Tournaisian age, containing *Plectogyra costifera* [= *Spinoendothyra*], *Tournayella moelleri*, *Haplophragmella* sp., *Tetrataxis obtusus*, and *T. expansus*; and (4) the Usuyala Horizon of Viséan age which carries the first *Eostaffella*, *Tetrataxis* spp., and *Plectogyra costifera* [= *Spinoendothyra*]. The writers claim that due to a conspicuous sedimentation break, this microfauna is not present in the Donbass region.

143. TORIYAMA, R., 1967, The fusulinacean zones of Japan: Mem. Fac. Sci., Kyushu Univ., ser. D, Geol., v. 18, no. 1, p. 35-260, 11 text-fig., 2 correlation charts.

Primarily a paper on the occurrence and distribution of Late Paleozoic fusulinid zones in Japan, but mention is made of a number of previously described smaller foraminiferal species that are associated with the fusulinid assemblages.

144. USTRITSK, V. I., 1962, Basic correlations of the Upper Carboniferous of the Taimyr and Verkojan: V.N.I.G.A., Sbornik Stat. p. paleont. i biostratigraphii, v. 30, Leningrad, p. 5-16, [in Russian].

From the Upper Paleozoic of the Soviet Arctic, the Tiksin Horizon contains *Archaediscus* aff. *A. kilymaensis*, *A.* aff. *A. pauxillus*, *A. krestovnikovi*, *Planoarchaediscus* cf. *P. stilus*, and *P.* aff. *A. spirillinoides*, all of which suggest a Namurian to Bashkirian age.

The Makarov Horizon is subdivided into two zones, both Bashkirian in age. The contained smaller foraminifers are: *Archaediscus commutabilis*, *A. dubius*, *A. enodatus*, *A. krestovnikovi*, *A. pauxillus*, *A. donetzianus*, *A. velgurensis*, *Planoarchaediscus stilus*, *P. absimilis*, *Asteroarchaediscus subbaschkiricus*, *Neoarchaediscus rugosus*, *N. timanicus*, *N. incertus*, *N. collallatus*, *Planospirodiscus minimus*, and *P. taymiricus*.

The Tourouzov Zone is Sakmarian in age and contains abundant nodosarids. [See Solomina 1962, and Sossipatrova 1962, for a microfaunal comparison.]

145. VANGEROW, E. F., 1965, Möglichkeiten ökologischer and paläogeographischer Untersuchungen im Oberkarbon des Ruhrgebietes anhand von Foraminiferen: Geol. Rundschau, v. 54, no. 2, p. 645-650, 1 text-fig., [in German with English, French, and Russian abstracts].

The lateral distribution of Pennsylvanian foraminifers is demonstrated for the marine horizons of the Wasserfallzone from the Ruhr district of West Germany. The possibility of using Foraminifera (totally agglutinated microfauna) as paleogeographical indicators for this region is considered and discussed in detail. One figure shows the lateral distribution pattern as presently documented.

146. VDOVENKO, M. V., 1963, Stratigraphic distribution of Lower Carboniferous Foraminifera in central Kazakhstan: Materials on the geology, geophysics, and geochemistry of the Ukraine, Kazakhstan, and Transbaikalia, Sci. Res. Sect. Kiev State Univ., No. 1, p. 59-66, [in Russian].

The writer lists previously described species of Lower Carboniferous (Tournaisian-Namurian) smaller foraminifers that occur in the Late Paleozoic rocks of central Kazakhstan, U.S.S.R. A brief discussion of the stratigraphic value of smaller foraminifers is also included.

147. VDOVENKO, M. V., and KARPOVA, M. A., 1966, Microfaunal characteristics of Namur sediments in the northwestern part of the Dneiper-Donets Lowland: Geol. Zhur., Akad. Nauk Ukrainian S.S.R., v. 26, no. 3, p. 71-76, [in Russian].

The writers briefly discuss the microfaunal characteristics of the Namurian beds of the northwestern part of the Dneiper-Donets Lowlands, U.S.S.R. (Ukraine). A number of previously described species of smaller foraminifers and fusulinids are mentioned.

148. VISSARIANOVA, A. IA., 1959, Stratigraphy and facies of the oil bearing strata of the Lower and Middle Carboniferous of the Bashkir: Inst. Sci. Res. of Petrol. in Ufa (UFNII), Trudy, No. 5, 121 p., 32 text-fig., 3 tables, [in Russian].

Primarily a paper on the Lower and Middle Carboniferous stratigraphy and facies of the Bashkir region of the Soviet Union.

A dozen districts of the Bashkir have displayed a stratigraphically consistent pattern of foraminiferal assemblages; these are summarized as follows: (1) the lower boundary of the Carboniferous is drawn at the base of the *Endothyra communis* Zone; (2) the Malevka-Upinsk intervals are characterized by abundant monolocular forams (*Bisphaera, Parathurammina*) interspersed with *Tournayella* aff. *T. minuta* and relict *Endothyra com-*

munis; (3) the Cherepet Horizon key microfossils are *Tournayella minuta*, *Chernyshinella glomiformis*, *Spiroplectammina* [= *Palaeospiroplectammina*] *tschernyshinensis*; (4) *Endothyra* aff. *E. spinosa* [= *Spinoendothyra*], *Endothyra nalivkini*, and *Tournayella moelleri* are common in the Kizel Horizon; (5) the Viséan begins with a widespread unconformity of non-marine strata overlain by Tula microfossils—*Endothyra prisca*, *E. similis*, *Archaediscus krestovnikovi*, *A. spirillinoides*, *Eostaffella* [now *Dainella*] *tujmasensis*, and *Endothyra* [now *Endothyranopsis*] *crassa*; (6) the Aleksin Horizon carries *Endothyra* [now *Endothyranopsis*] *crassa* var. *sphaerica*, *Endothyra prisca*, *E. similis*, and *E.* [now *Globoendothyra*] *globulus*; (7) from the Mikhailov and Venev Horizons the following forms are noted: *Endothyra similis*, *E.* [now *Globoendothyra*] *globulus* var. *numerabilis*, *E.* [now *Globoendothyra*] *paula*, *Endothyra omphalota*, *Monotaxis* [now *Howchinia*] *gibba*, *Bradyina rotula*, *Tetrataxis dentata*, and *T. paraminima*; and (8) the forms *Archaediscus rugosus*, *A. timanicus*, and *A. bashkiricus*, along with species of *Globivalvulina*, are abundant in the Protva Horizon.

149. WALTHALL, B. H., 1967, Stratigraphy and structure, part of Athens Plateau, southern Ouachitas, Arkansas: Am. Assoc. Petroleum Geologists, Bull., v. 51, no. 4, p. 504-528, 15 text-fig., 1 table.

The writer reports the occurrence of the smaller foraminifers *Agathammina* and *Hyperammina* in the Upper Mississippian (Chesteran) Wesley Formation of the Jackfork Group, and the foraminifers *Endothyra*? sp., *Endothyrinella* [*sic*] *minuta* Waters, and *Spirillina* sp., in the Lower Pennsylvanian (Morrowan-Atokan) Johns Valley Shale, of the Athens Plateau area, southern Ouachita Mountains, Arkansas.

150. WANG, K., 1966, On *Colaniella* and its two allied new genera: Acta Palaeont. Sinica, v. 14, no. 2, p. 206-232, pl. 1-5, 1 text-fig., [in Chinese, but with English abstract and description of all new forms].

From the Upper Permian rocks of China (Hunan? Province) two new genera and seven new species of smaller foraminifera are described and illustrated by thin-section photomicrographs. The new forms are *Colaniella minima*, *C. pulchra*, *C. xikouensis*, *C. lepida*, *Pseudocolaniella xufulingensis* n. gen., *Paracolaniella leei* n. gen., and *P. inflata*. In the present paper, previous works pertaining to the genus *Colaniella* are briefly reviewed and some misinterpretations regarding the internal structure are pointed out. These genera and others, including *Wanganella* Sosnina, are tentatively referred to Colaneillinae Fursenko, but the writer feels that their complicated internal structure and their restricted stratigraphic occurrence (Upper Permian) may justify a new family, which he suggests be called Colaniellidae.

DISTRIBUTION OF ARTICLES ACCORDING TO GEOLOGIC AGE AND CATEGORY

CAMBRIAN
7, 8

ORDOVICIAN
4, 6, 7

SILURIAN
5, 6, 9, 10, 15, 26

DEVONIAN
1, 2, 3, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 43, 58, 114, 125, 130

MISSISSIPPIAN
11, 14, 19, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 40, 43, 44, 45, 46, 47, 48, 49, 50, 51, 55, 56, 57, 58, 61, 62, 63, 68, 76, 77, 79, 82, 83, 85, 87, 88, 93, 94, 97, 98, 99, 101, 105, 106, 108, 113, 114, 115, 118, 119, 125, 126, 127, 128, 130, 131, 133, 134, 135, 139, 141, 142, 146, 147, 148, 149

PENNSYLVANIAN
38, 41, 42, 43, 46, 51, 52, 55, 64, 68, 71, 72, 73, 79, 80, 81, 84, 86, 89, 91, 95, 96, 98, 100, 102, 104, 109, 110, 111, 112, 116, 117, 120, 121, 123, 124, 129, 135, 136, 138, 139, 143, 144, 145, 147, 148, 149

PERMIAN
39, 53, 54, 59, 67, 69, 70, 74, 75, 78, 89, 90, 92, 103, 107, 122, 129, 132, 137, 138, 140, 144, 150

GENERAL
5, 6, 11, 20, 26, 60, 64, 65, 66, 101, 114, 115, 118, 139

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349. *DISCOCYCLINA* FROM PONDICHERRY, SOUTH INDIA

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ABSTRACT

The foraminiferal genus **Discocyclina** is represented by two species, **D. ramaraoi** Samanta and **D. furoni** n. sp., in the Palaeocene-Early Eocene sediments of Pondicherry, South India. A detailed account of the new species is given and the variation in the shape of the test of **D. ramaraoi** is discussed and illustrated.

INTRODUCTION

In South India the Early Tertiary marine sediments are best exposed in the Pondicherry area. Here, the marine Tertiary sequence is made up of the Pondicherry Formation (Palaeocene), the *Discocyclina*-bearing Limestone (Upper Palaeocene-Early Lower Eocene) and the Nummulitic Limestone (Late Cuisian). Of these three units, the Pondicherry Formation occurs as an outcropping unit while the other two are known from subsurface only.

These Pondicherry units are highly fossiliferous and contain abundant smaller and larger foraminifera. Among the larger foraminifera, *Discocyclina* is the most abundantly represented genus. A detailed study of the discocyclines occurring in the Pondicherry Formation and the *Discocyclina*-bearing Limestone has been carried out by the author and the genus is found to be represented by two species, namely *D. ramaraoi* Samanta and *D. furoni* n. sp. *D. ramaraoi* occurs only in the Pondicherry Formation, while *D. furoni* is present in both the units. An account of *D. ramaraoi* is given in a previous paper (Samanta, 1967). In the present paper the new species is described and illustrated and remarks on the morphological variation of *D. ramaraoi* are included.

ACKNOWLEDGEMENTS

The author is indebted to Professor R. Furon and R. Laffitte, Paris, for the samples of *Discocyclina*-bearing Limestone; to Dr. Madeleine Neumann, Paris, for topotypes of *Discocyclina pratti* (Michelin); to Mr. M. V. A. Sastry, Calcutta, for permission to examine materials from the Pondicherry Formation deposited in the collections of the Geological Survey of India; to Professor N. Rajagopalan, Madras, for valuable discussion of the stratigraphy and micropalaeontology of the Early Tertiary sediments of Pondicherry; and to Dr. J. R. Haynes for reading the manuscript.

SYSTEMATIC DESCRIPTIONS

Family DISCOCYCLINIDAE Galloway, 1928
Genus **Discocyclina** Gumbel, 1868
Discocyclina furoni Samanta, n. sp.

Plate 5, figures 1-6; plate 6, figures 1-2;
text fig. 2, figures A-G

Discocyclina pratti (Michelin) - FURON, 1941, (*not* Michelin, 1846), France Bur. Etudes Géol. et Minières Coloniales, Publ. no. 17, p. 18, pl. 2, figs. 2-4.

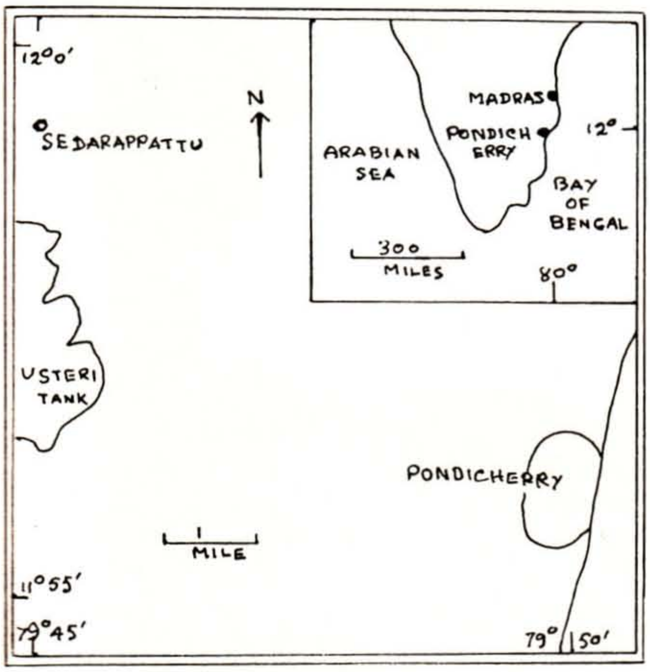
Material. Discocyclina-bearing Limestone: About 100 specimens were separated from two small pieces of *Discocyclina*-bearing Limestone provided by Professor R. Laffitte of Museum National d'Histoire Naturelle, Paris, from the Wathelet Collection [Coll. no. 1491; recovered from a boring in Pondicherry near the "Grand Etang" at depths between 150 and 180 metres (Furon, 1941, p. 18)]. Both microspheric and megalospheric generations are represented; of the former, twenty-five specimens were studied in equatorial and fifteen in vertical section; of the latter, one specimen was examined in equatorial section. In addition, the three thin sections of *Discocyclina*-bearing Limestone figured by Furon (1941, pt. 2, figs. 2-4) were also available for examination.

Pondicherry Formation: Abundant material was collected by the author from the stream-channel section east of Sedarappattu village (text. fig. 1), the type locality for the Pondicherry Formation (Rajagopalan, 1965, p. 115). Only megalospheric specimens were examined. Ten specimens were studied in equatorial and five in vertical section. Numerous vertical sections were also examined in rock sections.

Diagnosis. Test small, thin, discoidal, with uniformly papillate surface. Megalospheric embryonic apparatus small and neprolepidine. Equatorial chambers rectangular and increase appreciably in radial diameter and in height with ontogenesis. Low, slit-like to quadrate lateral chambers are arranged between thick roofs and floors.

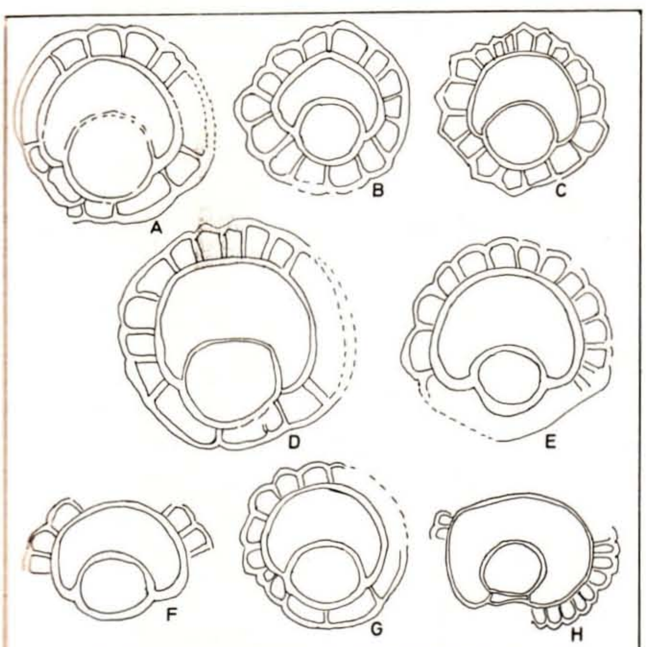
Description of megalospheric generations. The test is small, discoidal, flat or rarely curved, with or without a small umbonal elevation not distinctly demarcated from the rest of the test. Very often one side of the test is more convex than the other. Surface of the test covered with small, subrounded, fine papillae, almost uniform in size throughout the test. Diameter of test varies from 1.4 to 5.7 mm., thickness from 0.3 to 0.65 mm.

In tangential section the small, subcircular pillars are surrounded by 4-6 small, polygonal lateral chambers that are very variable in shape and size. The walls between the chambers are straight. The pillars are separated by one row of lateral chambers. The diameter of pillars varies from 15 to 37μ and the distance between the pillars from 20 - 50μ.



TEXT FIGURE 1

Locality map. Inset: Map of a part of southern India showing location of Pondicherry.



TEXT FIGURE 2

Equatorial section of megalospheric embryonic apparatuses. A-G, *Discocyclina furoni*, n. sp., × 140, from *Discocyclina*-bearing Limestone Coll. 1491, Museum National d'Histoire naturelle, Paris. H, *Discocyclina pratti* (Michelin), × 60, topotype.

In equatorial section the small, bilocular megalospheric embryonic apparatus consists of a subcircular to elliptical protoconch usually embraced up to ¾ by the large, crescentic to reniform deuteroconch (text fig. 2). Often the outer wall of the embryonic apparatus is triangular to quadrate in outline. In vertical section the protoconch is circular to elliptical and the deuteroconch is semicircular to triangular in outline. The embryonic apparatus is, therefore, of the nephrolepidine type. A eulepidine arrangement of the embryonic chambers is rarely observed. The maximum diameter of the protoconch varies from 88 to 187 and the deuteroconch from 150 to 337μ; the distance across both chambers varies from 162 to 312μ and the height of the embryonic apparatus from 125 to 150μ.

The periembryonic equatorial chambers are rectangular to pentagonal in outline and are either tangentially or radially elongate. Their arrangement is of the type γ. The two principal auxiliary chambers are very often tangentially much elongated and are larger than the other chambers in the periembryonic ring. There are about 16 to 30 chambers in the periembryonic annulus, which is frequently irregular in its width. The radial diameter of the periembryonic equatorial chambers varies from 20 to 62μ and the tangential diameter from 20 to 92μ.

The equatorial chambers are rectangular in outline and are arranged in concentric annulae that are very irregular in their courses and in width. The chambers are normally radially elongate but may be square or tangentially elongate near the centre in some specimens. The radial diameter of the equatorial chambers always increases towards the periphery, while the tangential diameter remains almost unchanged during ontogenesis. The height of the equatorial chambers increases considerably from near the centre to the periphery. The annular walls are thicker than the radial walls, which usually alternate in adjacent annulae. Near the centre the annular walls are gently convex, but they are prominently convex outwards near the periphery. The roof and floor of the equatorial chambers become thicker with ontogenesis. The annular stolons are situated on the proximal side of the radial chamber walls. The radial diameter of the equatorial chambers varies from 12 to 62μ, the tangential diameter from 16 to 37μ, and the height from 12 to 62μ. The annular walls are about 5 to 10μ thick, the radial walls 4 to 7μ thick and the roofs and floors of the equatorial chambers 10 to 25μ thick.

The lateral chambers, when observed in vertical section, vary considerably in shape, size and arrangement in different specimens as well as in different parts of the same specimen. The chamber cavities are low, slit-like, oval to quadrate in shape.

The slit-like cavities are irregularly arranged, while the more open chamber cavities are comparatively regular in arrangement. Usually, the chamber cavities near the periphery are more open than those over the embryonic apparatus. There are about 5 to 9 lateral chambers on each side of the embryonic apparatus. The length of the lateral chambers varies from 20 to 62μ and the height from 5 to 15μ. The thickness of the roofs and floors varies from 6 to 15μ.

Measurements. See tables 1 and 2 for measurements of the equatorial and vertical sections of megalospheric specimens.

Occurrence and age. Discocyclina furoni occurs in both the Pondicherry Formation and the *Discocyclina*-bearing Limestone. In the Pondicherry Formation it is quite rare and occurs in association with *D. ramaraoi*, the most abundant larger foraminiferal element present in the unit. On the basis of the contained planktonic foraminifera and nannofossils, the Pondicherry Formation is considered to be of Palaeocene age (Rajagopalan, 1966).

D. furoni is the only larger foraminifera present in the *Discocyclina*-bearing Limestone, which is made up essentially of the tests of this species. Here, it occurs associated with abundant smaller foraminifera, including some index planktonic species, some bryozoa and few ostracodes. On the basis of the presence of *Globigerina hornibrooki* Bronnimann, *G. linaperta* Finlay, *Globorotalia acuta* Toulmin, *G. aequa* Cushman and Renz, *G. convexa* Subbotina and *G. imitata* Subbotina, the *Discocyclina*-bearing Limestone is considered to be Upper Palaeocene - Early Lower Eocene in age (Samanta, 1966). *D. furoni* n. sp. is, therefore, Palaeocene to Early Lower Eocene in age.

Holotype. The specimen figured in Plate 5, fig. 1, is from the *Discocyclina*-bearing Limestone recovered from a boring in Pondicherry near the "Grand Etang" [which probably refers to the Usteri tank (see text fig. 1)] at depths between 150 and 180 metres.

Depository. Holotype and other figured specimens are deposited in the collections of the Geology Department of the University of Calcutta.

Etymology. This species is named for Professor R. Furon, Paris, in recognition of his contribution to the geology of the Pondicherry area.

Remarks. In its small, thin, discoidal test, nephrolepidine megalospheric embryonic apparatus and low lateral chambers between thick roofs and floors, *D. furoni* n. sp. is quite distinctive and cannot be closely compared with any described species of the genus. It shows some relationship to *D. ramaraoi* Samanta, with which it occurs associated in the Pondicherry Formation, only in possessing small nephrolepidine embryonic apparatus. In all other diagnostic features they are different. It can also be very easily distinguished from other Indian species of *Discocyclina* with nephrolepidine embryonic apparatus [*e.g., D. augustae* Weijden, *D. pygmaea Henriei* and *D.* sp. (Nagappa, 1959)] by the shape of the test and the structure of the lateral chamber layers. *D. furoni* possesses the largest megalospheric embryonic apparatus among the Indian representatives of the genus having a nephrolepidine megalosphere.

The previous assignment of these Pondicherry specimens to *D. pratti* (Michelin) (Furon and Lemoine, 1938; Furon, 1941, and Gowda, 1964) was obviously due to the lack of a detailed examination of the sample and to insufficient knowledge of the European form. *D. pratti*, as it is known at present through the systematic studies of Van der Weijden (1940) and Neumann (1958) is characterized by having a test of moderate size, large, eulepidine to multilocular megalosphere, and long moderately open, rectangular lateral chambers between thin roofs and floors. *D. pratti* (Michelin) and *D. furoni* n. sp. actually belong to two distinctly different groups of species and are not comparable with each other. Sections of topotypes of *D. pratti* (Michelin), kindly donated by Madeleine Neumann of Paris University, are illustrated here (text fig. 2h; Plate 6, fig. 3) to show the difference from *D. furoni*. It should be mentioned here that there is no authentic report of the occurrence of *D. pratti* (Michelin) outside the European region (Neumann, 1958).

Discocyclina ramaraoi Samanta

Plate 6, figures 4-17

Discocyclina sp. SETTY, 1966, Geol. Soc. India Bull., spec. no., p. 26.

Discocyclina ramaraoi SAMANTA, 1967, Micropaleontology, v. 13, no. 2, pp. 233-242; pl. 1, text-figs. 1-4.

EXPLANATION OF PLATE 5

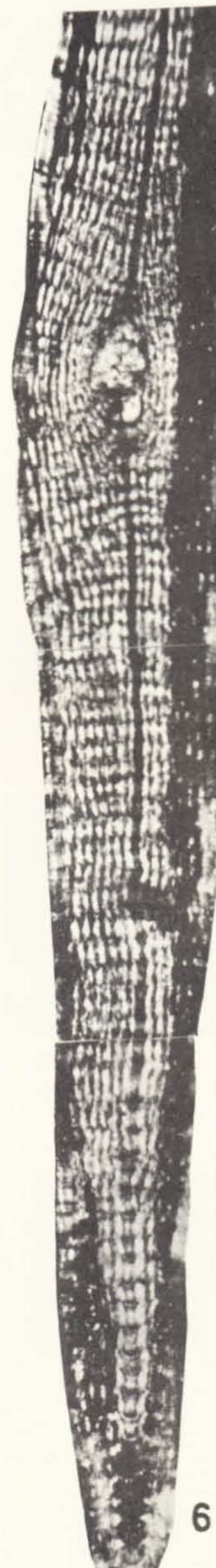
FIGS. PAGE

1-6. *Discocyclina furoni,* n. sp. (Form A). 70
1, 2, external views, × 10.5, (1, holotype). 3, 4, equatorial sections, × 30. 5, 6, vertical sections, × 45. All from the *Discocyclina*-bearing Limestone, Coll. 1491, Museum National d'Histoire Naturelle, Paris.


1


2


5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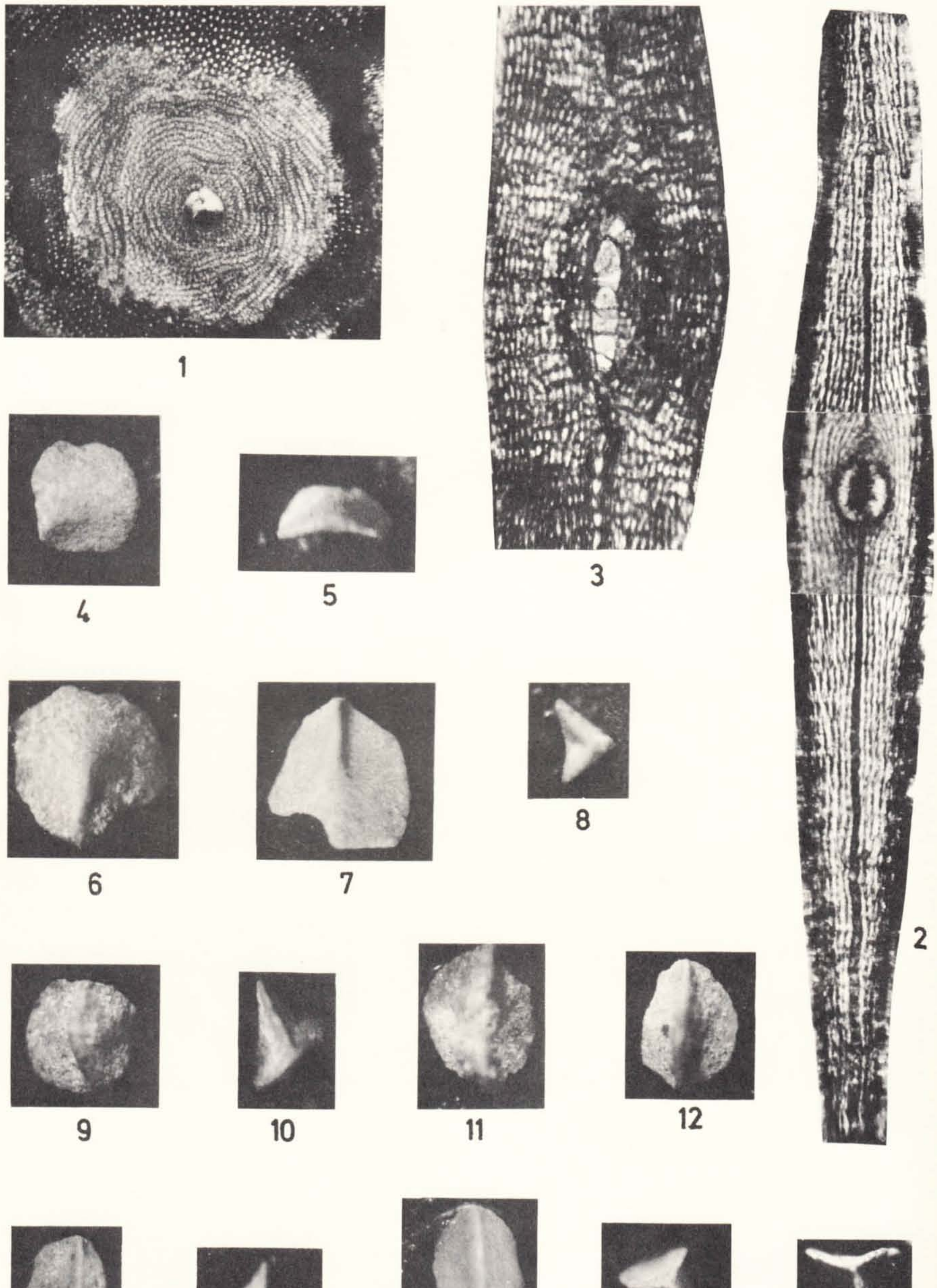
3


4

Samanta: *Discocyclina* from South India



Samanta: *Discocyclina* from South India

Remarks. After the paper on *Discocyclina ramaraoi* was sent for publication, Setty (1966) reported the rare occurrence in the Pondicherry Formation of discocyclines having tests of strikingly unusual shape. An examination of Setty's sections at Bangalore has revealed that they are identical with *D. ramaraoi* in such diagnostic internal features as the megalospheric embryonic apparatus and the equa-

TABLE 1

Measurements of Equatorial Sections of *Discocyclina furoni* Samanta, n. sp., (Form A)

Dimensions	1	2	3	4	5
Diameter of test (mm.)	2.0+	1.7+	2.2+	4.0	3.0
Embryonic chambers Diameters of protoconch (μ)	150 x 150	75 x 100	150 x 187	125 x 137	88 x 88
Diameters of deuteroconch (μ)	200 x 240	137 x 150	250 x 312	175 x 225	125 x 150
Distance across both chambers (μ)	250	175	312	225	162
Thickness of outer wall (μ)	8	8	8	10	8
Periembryonic chambers Number	22	16	about 15 in ½ of the ring		16
Radial diameter (μ)	20 - 50	30 - 40	25 - 62		20 - 37
Tangential diameter (μ)	37 - 92	25 - 62	28 - 43		20 - 25
Equatorial chambers (Near centre) Radial diameter (μ)	16 - 37	22 - 25	25 - 45	20 - 37	12 - 25
Tangential diameter (μ)	20 - 37	20 - 28	16 - 25	20 - 35	16 - 22
(Near periphery) Radial diameter (μ)	Peripheral part not preserved	37 - 50	31 - 62	max. 62	25 - 37
Tangential diameter (μ)		22 - 28	25 - 30	20 - 31	22 - 25

TABLE 2

Measurements of vertical sections of *Discocyclina furoni* Samanta, n. sp., (Form A)

Dimensions	1	2	3	4	5
Diameter of test (mm.)	5.2+	3.7	3.5+	3.5	3.2+
Thickness at centre (mm.)	0.5	0.4	0.45	0.31	0.3
Embryonic chambers Length (μ)	225	220	200	Embryonic apparatus	225
Height (μ)	125	125	150	not preserved	137
Equatorial chambers Height near centre (μ)	20	15	20	12	20
Height near periphery (μ)	50	62	37	31	37
Lateral chambers Number (on one side of the embryonic apparatus)	9	8	8	X	5
Length (μ)	31 - 62	20 - 50	37 - 62	31 - 50	20 - 30
Height (μ)	5 - 12	5 - 12	6 - 12	10 - 15	10 - 12
Thickness of roofs and floors (μ)	10 - 15	10 - 15	6 - 10	6 - 10	8 - 10

EXPLANATION OF PLATE 6

FIGS. PAGE

1, 2. *Discocyclina furoni*, n. sp. (Form A). 70
1, equatorial section, × 20. 2, vertical section, × 45. Both from the *Discocyclina*-bearing Limestone, Coll. 1491, Museum National d'Histoire Naturelle, Paris.

3. *Discocyclina pratti* (Michelin). (Form A.) 72
Central part of the vertical section of topotype, × 45.

4-17. *Discocyclina ramaraoi* Samanta. (Form A). 72
External views showing the variation in the shape of the test, × 10. All from the Pondicherry Formation exposed in the stream-channel section east of Sedarappattu village.

torial chambers. Moreover, from an examination of a large number of samples from the Pondicherry Formation collected from the stream channel section east of Sedarappattu village, it is observed that there is a gradation in shape of test from the normal lenticular variety to the unusual type (see Plate 6, figs. 4-17). Accordingly, the specimens of unusual shape are identified here as *D. ramaraoi.* This species is, thus, found to be unique among the Indian Palaeocene representatives of the genus in exhibiting a remarkable variation in the shape of the test.

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RAJAGOPOLAN, N., 1965, Late Cretaceous and Early Tertiary Stratigraphy of Pondicherry, South India: Geol. Soc. India, Journ., v. 6, pp. 108-121.

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SAMANTA, B. K., 1966, The age of the youngest marine horizon present in Pondicherry, South India. *ibid*,. p. 22.

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SETTY, M. G. A. P., 1966, Trigonal *Discocyclina* sp. from the Pondicherry Formation, Pondicherry, South India: Geol. Soc. India, Bull., special number, p. 26.

WEIJDEN, W. J. M. VAN DER, 1940, The genus *Discocyclina* in Europa: Leiden Univ., thesis, Leiden, pp. 1-116, pls. 1-12.

CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME XIX, PART 2, APRIL, 1968

RECENT LITERATURE ON THE FORAMINIFERA

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

ADAMS, C. G. Tertiary Foraminifera in the Tethyan, American, and Indo-Pacific provinces. —Systematics Assoc. Publ. No. 7, 1967, p. 195-217, tables 1-5.—Circulation of surface oceanic waters may account for two different provinces in the circumtropical zone (Central American and Indo-Pacific) besides the old Tethys province. Genera of larger Foraminifera present in the 3 provinces are tabulated for ages between upper Paleocene and Recent.

BARTLETT, GRANT A. Scanning electron microscope: potentials in the morphology of microorganisms.—Science, v. 158, No. 3806, Dec. 8, 1967, p. 1318-1319, text figs. 1, 2 (photomicrographs).—Photographic evidence of shell thickening that affects planktonics at depth, resulting in "flying buttress" spines on *Globigerina bulloides.*

BERMUDEZ, PEDRO J., and SEIGLIE, GEORGE A. A new genus and species of Foraminifer from the early Miocene of Puerto Rico.—Tulane Studies in Geol., v. 5, No. 3, Nov. 20, 1967, p. 177-179, pl. 1.—*Riveroinella martinezpicoi* gen. et sp. nov., belonging in the Ceratobuliminidae.

BULATOVA, E. I. Ob Otrjade Astrorhizida i ego Predstaviteljakh v Zapadno-Sibirskoj Nizmennosti, *in* Foraminifery Mezozoja i Kainozoja Zapadnoj Sibiri, Tajmyra i Dal'nego Vostoka. —Akad. Nauk SSSR, Sibirskoe Otdel., Instit. geol. geofiz., 1967, p. 26-49, pl. 6, text figs. 1-4 (map, range charts, check list).—Illustrations of 5 species, one from the Campanian new.

BULYNNIKOVA, S. P. Nekotorye Lituolidy iz Valanzhinskikh i Goterivskikh Otlozhenij Zapadno-Sibirskoj Nizmennosti, *in* Foraminifery Mezozoja i Kainozoja Zapadnoj Sibiri, Tajmyra i Dal'nego Vostoka.—Akad. Nauk SSSR, Sibirskoe Otdel., Instit. geol. geofiz., 1967, p. 57-68, pls. 8-12.—Five species, 2 new, from the Valanginian and Hauterivian.

BUZAS, MARTIN A. An application of canonical analysis as a method for comparing faunal areas.—Jour. Animal Ecol., v. 36, Oct. 1967, p. 563-577, text figs. 1-5 (map, graphs), tables 1-6.—Method is applied to Phleger's 1956 study of living and total populations of Foraminifera off the central Texas coast. Results may be useful in defining biofacies.

Foraminifera from the Hadley Harbor complex, Massachusetts.—Smithsonian Misc. Colln., v. 152, No. 8, Feb. 16, 1968, p. 1-26, text figs. 1-4 (maps), tables 1, 2.—Twenty-two species found over 2 years.

CATER, MAXWELL C. A note on the re-investigation of the foraminiferal localities of the Cipero Coast, Trinidad, West Indies.—Caribbean Jour. Sci., v. 6, No. 3-4, Sept.-Dec. 1966, p. 89-92.—New sampling localities necessitated by erosion.

CLOSS, DARCY, and MADEIRA, MARLY L. Foraminifera from the Paranagua Bay, State of Parana, Brasil.—Bol. Univ. Federal do Parana, Zoologia II, No. 10, Aug. 1966, p. 139-161, pls. 1, 2, text fig. 1 (map), table 1.—Twenty-six species, 1 new.

Foraminiferos e Tecamebas aglutinantes da Lagoa de Tramandai, no Rio Grande do Sul.—Iheringia, Zoologia, No. 35, Sept. 9, 1967, p. 7-31, pls. 1-6, text figs. 1, 2 (map, check list).—Thirty-three species of Foraminifera, none new.

CLOSS, DARCY, and DE MEDEIROS, VERA M. F. Thecamoebina and Foraminifera from the Mirim Lagoon, southern Brazil.—Iheringia, Zoologia, No. 35, Sept. 9, 1967, p. 75-88, text figs. 1, 2 (map, check list).—Six species of brackish Foraminifera.

CONIL, R., and LYS, M. Aperçu sur les associations de Foraminifères endothyroides du Dinantien de la Belgique.—Ann. Soc. Geol. Belgique, tome 90, Bull. No. 4, 1967, p. 395-412, pls. 1-4.—Eight species (5 new), 1 new subspecies and 1 variety.

CONTI, SERGIO, and ANDRI, EUGENIO. Sulla geologia dei Monti Livornesi e suoi riferimenti nel quadro più generale dell'Appennino Settentrionale.—Atti Istit. Geol. Univ. Genova, v. 4, fasc. 2, 1966 (1967), p. 263-456, pls. 1-23, text figs. 1-18 (outcrop photos, photomicrographs, columnar sections), tables A-D.—Thin-section illustrations of Foraminifera and other microfossils in the Flysch (Aptian-Albian to lower Eocene).

CORDEY, W. G. The development of *Globigerinoides ruber* (D'Orbigny 1839) from the Miocene to Recent.—Palaeontology, v. 10, pt. 4, Dec. 1967, p. 647-659, pl. 103, text figs. 1-5 (drawings, phylogenetic diagrams, columnar sections).—Restudy of specimens of *G. ruber* reveals 2 unrelated lineages. The ancestor of the earlier one, in lower to middle Miocene, was *G. quadrilobatus altiaperturus* and *G. quadrilobatus* s.s. Specimens of this earlier lineage are referred to *G. subquadratus* and the species is redefined. The ancestor of the later lineage, in uppermost Miocene or basal Pliocene to Recent, was a form similar to *G. obliquus*.

EL-NAGGAR, Z. R. The occurrence of *Globorotalia inconstans* (Subbotina) in the type Heersian of Belgium, and the position of the Heersian in Paleocene stratigraphy.—Revue de Micropaléontologie, v. 10, No. 2, Sept. 1967, p. 97-106, text fig. 1 (correl. chart).—Middle Paleocene, overlying Danian and underlying Landenian.

FREIMAN, E. V. O Nakhodkakh Foraminifer s Izvestkovoj v Eothenovykh Otlozhenijakh Zapadno-Sibirskoj Nizmennosti, *in* Foraminifery Mezozoja i Kainozoja Zapadnoj Sibiri, Tajmyra i Dal'nego Vostoka.—Akad. Nauk SSSR, Sibirskoe Otdel., Instit. geol. geofiz., 1967, p. 92-96, pl. 21.—Three new upper Eocene species, 1 *Cibicides* and 2 *Anomalina*.

GIBSON, THOMAS G., and SCHLEE, JOHN. Sediments and fossiliferous rocks from the eastern side of the Tongue of the Ocean, Bahamas.—Deep-Sea Research, v. 14, No. 6, Dec. 1967, p. 691-702, text figs. 1-4 (map, bottom photographs), tables 1, 2.—Late Tertiary to Recent age of rocks is based on planktonic Foraminifera and depth is interpreted from benthonic species and planktonic/benthonic ratios.

GROISS, J. TH. Foraminiferen-Faunen aus den Neuburger Bankkalken (Mittel-Tithon).—Erlanger geol. Abh., Heft 66, Nov. 23, 1967, p. 3-74, pls. 1-4, text figs. 1-6 (diagram, drawings, graphs).—Illustrated systematic catalog includes about 200 species and subspecies (none new, 27 indeterminate).

Mikropaläontologische Untersuchung der Solnhofener Schichten im Gebiet um Eichstätt (Südliche Frankenalb).—Erlanger geol. Abh., Heft 66, Nov. 23, 1967, p. 75-96, pl. 5, text figs. 1-3 (map, graphs).—Twenty species (2 new and 6 indeterminate).

GUDINA, V. I., and SAIDOVA, KH. M. Novyj Rod *Alabaminoides* (Foraminifera) i ego Vidy, *in* Foraminifery Mezozoja i Kainozoja Zapadnoj Sibiri, Tajmyra i Dal'nego Vostoka.—Akad. Nauk SSSR, Sibirskoe Otdel., Instit. geol. geofiz., 1967, p. 97-102, pl. 22, text figs. 1, 2 (photomicrograph, map).—*Alabaminoides* gen. nov. (type species *Alabamina mitis* Gudina) and 2 Recent species: *A. exiguus* (Brady) and *A. antarcticus* sp. nov.

GUTIERREZ DOMECH, M. R. *Globigerina haoi*, un nuevo Foraminifero planctonico del Eoceno Superior de Cuba.—Instit. Nac. Recursos Hidraulicos, Publ. Especial No. 2, 1966, p. 17-25, pls. 2, 3, text figs. 3, 4 (map, drawings).

HEDLEY, R. H., HURDLE, C. M., and BURDETT, I. D. J. The marine fauna of New Zealand: Intertidal Foraminifera of the *Corallina officinalis* zone.—New Zealand Oceanographic Instit., Mem. No. 38, 1967, p. 1-86, pls. 1-12, text figs. 1-60 (map, drawings), tables 1-3.—Beautifully illustrated systematic catalog includes 63 species (3 new). Study based on 10 widely scattered samples around the islands.

HILTERMANN, HEINRICH. Fortschritte der Mikropaläontologie in Deutschland mit einer Bibliographie für das Jahr 1966.—Paläont. Zeitschr., Band 41, Heft 3/4, Oct. 1967, p. 233-246.

IACCARINO, SILVIA, and PAPANI, GIOVANNI. La trasgressione del Pliocene inferiore ("Tabianiano") sul Tortoniano del Calle di Vigoleno (Piacenza).—Riv. Ital. Paleont. Stratig., v. 73, No. 2, 1967, p. 679-700, pl. 59, text figs. 1-4 (maps, columnar section, outcrop photo).—Foraminifera illustrated from lower Pliocene and from Tortonian.

ITURRALDE VINENT, MANUEL A. *Cassigerinella regularis* nueva especie de Foraminifero planctonico de la formacion Tinguaro del Oligoceno Cubano.—Instit. Nac. Recursos Hidraulicos, Publ. Especial No. 2, 1966, p. 5-15, pl. 1, text fig. 1 (map).

Foraminiferos Planctonicos del Oligoceno Superior en la Provincia de Pinar del Rio, Cuba.—Instit. Nac. Recursos Hidraulicos, Estratigrafia y Carsologia, Publ. Especial No. 4, 1967, p. 5-8, pl. 1.—Six species illustrated.

IVA, MARIANA, GHEORGHIAN, MIHAELA, and GHEORGHIAN, M. Sur la présence du groupe de *Cibicides (Cibicides) dampelae* Bycova et Chramaja dans l'Eocène Supérieur et l'Oligocène Inférieur du NW de la Transylvanie (French résumé of Rumanian text).—Dari de Seama ale Sedintelor, v. 53, pt. 2a, 1965-66 (1967), p. 17-24, 1 pl., text figs. 1-3 (map, graph, phylogenetic diagram).—Biometric study reveals an upper Eocene subspecies and a lower Oligocene subspecies, both new.

IVANOVA, E. F. Novye Vidy Foraminifer iz Otlozhenij Nizhnego Volzhskogo Jarusa Khatangskoj Vpadiny i Severnogo Tajmyra, *in* Foraminifery Mezozoja i Kainozoja Zapadnoj Sibiri, Tajmyra i Dal'nego Vostoka.—Akad. Nauk SSSR, Sibirskoe Otdel., Instit. geol. geofiz., 1967, p. 5-14, pls. 1-3, text figs. 1, 2 (map, range chart).—Four new Jurassic (lower Volgian) species from the Tajmyr Peninsula.

Foraminifery iz Otlozhenij Verkhnego Volzhskogo Jarusa Khatangskoj Vpadiny, *in* Foraminifery Mezozoja i Kainozoja Zapadnoj Sibiri, Tajmyra i Dal'nego Vostoka.—Akad. Nauk SSSR, Sibirskoe Otdel., Instit. geol. geofiz., 1967, p. 15-25, pls. 4, 5, text figs. 1, 2 (map, range chart).—Five new Jurassic (upper Volgian) species from the Khatanga depression.

JENKINS, D. GRAHAM. Planktonic foraminiferal zones and new taxa from the lower Miocene to the Pleistocene of New Zealand.—New Zealand Jour. Geol. Geophysics, v. 10, No. 4, Oct. 1967, p. 1064-1078, text figs. 1-4 (map, range chart, drawings).—A new species and 3 new subspecies of *Globorotalia.* Ranges of 80 planktonic species indicated between lower Miocene and Recent.

KENNETT, J. P. New Foraminifera from the Upper Miocene and Lower Pliocene of New Zealand.—New Zealand Jour. Geol. Geophysics, v. 10, No. 4, Oct. 1967, p. 989-1008, 3 pls.—Fourteen new species, one genus new: *Ruakituria* (type species *R. pseudorobusta* n. sp.) in the Ataxophragmiinae.

Recognition and correlation of the Kapitean stage (upper Miocene, New Zealand).—New Zealand Jour. Geol. Geophysics, v. 10, No. 4, Oct. 1967, p. 1051-1063, text fig. 1 (map), table 1 (correl. chart).—Depth interpretations and correlation based on forams. Intense cooling in uppermost Miocene is indicated by left-coiling *Globigerina pachyderma.* Shallow-water and deep-water facies of Kapitean correlated by the *Globorotalia crassaformis* bioseries.

KENT, HARRY C. Microfossils from the Niobrara Formation (Cretaceous) and equivalent strata in northern and western Colorado.—Jour. Paleontology, v. 41, No. 6, Nov. 17, 1967, p. 1433-1456, pls. 183, 184, text figs. 1-8 (map, stratigraphic sections, range charts, graphs). —About 30 species, 3 species and 1 subspecies new.

KISEL'MAN, EH. N. *Heterostomella foveolata* (Marsson)—Kharakternyj vid iz Verknego Maastrikhta Zapadno-Sibirskoj Nizmennosti, *in* Foraminifery Mezozoja i Kainozoja Zapadnoj Sibiri, Tajmyra i Dal'nego Vostoka.—Akad. Nauk SSSR, Sibirskoe Otdel., Instit. geol. geofiz., 1967, p. 86-91, pls. 19, 20.—*Heterostomella foveolata* in the upper Maestrichtian of the western Siberian lowland.

KONDA, ISAO. Foraminiferal faunules from the Minabe-Sakai shell bed, Kii Peninsula, central Japan.—Bull. Osaka Mus. Nat. Hist., No. 20, March 1967, p. 31-38, pls. 2-4, text figs. 1-5 (maps, columnar sections, graphs).—Of Pleistocene age, 2 faunules—one dominated by *Ammonia* and *Elphidium*, the other by miliolids.

KURGALIMOVA, G. G. Middle and Upper Eocene stratigraphy and facies in East Pre-Aral and North Kyzlkum regions (according to Foraminifera fauna) (in Russian).—Bull. Moscow Soc. Naturalists, Geol. Ser., tom 42, vyp. 4, 1967, p. 38-46, text figs. 1-5 (maps, zonation diagrams).

LANGER, WOLFHART. Über einige Foraminiferen aus dem niederrheinischen Oligozän.—Neues Jahrb. Geol. Paläont. Mh., Stuttgart, v. 11, Nov. 1967, p. 667-676, text figs. 1-5 (drawings, photomicrographs).—Nine species, 1 new.

Bemerkungen über *Melonis affinis affinis* (Reuss, 1851) und das Problem des "*Nautilus*" *umbilicatulus* Walker & Jacob, 1798 (Foraminifera). —Geologie, Berlin, Jahrgang 16, Heft 6, 1967, p. 718-726, text figs. 1-5 (graphs, diagram, drawing).

LINDENBERG, H. G. Die Bolivinen (Foram.) der Häringer Schichten. Mikropaläontologische Untersuchungen im Alttertiär des Unterinntal-Gebietes.—Boll. Soc. Paleont. Ital., v. 4, No. 1, 1965, p. 64-160, Anlage 1-4 (columnar sections, graphs, drawings), text figs. 1-32 (maps, diagram, range chart, drawings, graphs).—Eighteen species (3 new and 1 given a new name) and 6 subspecies (1 new) from lower to middle Oligocene. Species studied biometrically.

LYNTS, GEORGE W., and PFISTER, ROBERT M. Surface ultrastructure of some tests of Recent Foraminiferida from the Dry Tortugas, Florida. —Jour. Protozoology, v. 14, No. 3, 1967, p. 387-399, text figs. 1-16 (electron micrographs, diagram, graph), tables 1-12.—Illustrations of two layers in miliolids and *Archaias* (an outer pavement-like layer and an underlying randomly oriented layer). Illustrations of crystal aggregates on surfaces of *Discorbis, Asterigerina, Cribroelphidium, Amphistegina, Cymbaloporetta,* and *Fursenkoina.*

MALAPRIS-BIZOUARD, M. Les Lingulogavelinelles de l'Albien inférieur et moyen de l'Aube.—

Revue de Micropaléontologie, v. 10, No. 2, Sept. 1967, p. 128-150, pls. 1, 2, text figs. 1-6 (map, graphs, diagrams, drawings), tables 1-3. —One new species and 2 new subspecies.

MARKS, P. Foraminifera from the Craie de Theligny (Cenomanien, Dept. Sarthe, France).—Proc. Kon. Nederl. Akad. Wetenschappen, ser. B, v. 70, No. 4, 1967, p. 425-442, pls. 1-3, text figs. 1-11 (drawings), table 1 (check list).—Twenty-four species, 1 new.

MATSUMARU, KUNITERU. Geology of the Tomioka area, Gunma Prefecture, with a note on "*Lepidocyclina*" from the Abuta Limestone Member.—Sci. Repts. Tohoku Univ., 2nd Ser. (Geol.), v. 39, No. 2, Nov. 10, 1967, p. 113-147, pls. 7, 8, text figs. 1-31 (maps, geol. sections, columnar sections, graphs, diagrams), tables 1-7.—*Nephrolepidina japonica.*

MATTHEWS, BARRY. Late Quaternary marine fossils from Frobisher Bay (Baffin Island, N. W. T., Canada).—Palaeogeography, Palaeoclimatology, Palaeoecology, v. 3, No. 2, Aug. 1967, p. 243-263, pls. 1, 2, text figs. 1, 2 (map, diagram), tables 1-4.—Nineteen species of Foraminifera listed.

MEHES, KALMAN. A new *Orbitolina* species from the Villany Mountains, Hungary.—Bull. Hungarian Geol. Soc., v. 97, No. 3, July-Sept. 1967, p. 323-325, pl. 20.—*Orbitolina beremendensis* from the Aptian.

MICHAEL, ERHARD. Die Mikrofauna des NW-Deutschen Barrême. Teil I. Die Foraminiferen des NW-Deutschen Barrême.—Palaeontographica, Suppl.-Band 12, July 1967, p. 1-176, pls. 1-26, text figs. 1-9 (diagrams, graphs), tables 1-22 (range charts, graphs, columnar sections, occur. tables).—An illustrated systematic catalog, including 141 species and subspecies (9 species and 3 subspecies new), and paleoecologic interpretations.

MOSNA, SERGIO. Segnalazione di una zona a *Globorotalia opima opima* Bolli in marne Oligoceniche di Valle Scrivia (Bacino terziario piemontese).—Atti Istit. Geol. Univ. Pavia, v. 17, 1965-66. p. 121-123.

MURRAY, J. W. Production in benthic foraminiferids.—Jour. Nat. Hist., v. 1, 1967, p. 61-68, text figs. 1, 2 (graphs).

An ecological study of the Thecamoebina of Christchurch Harbour, England.—Jour. Nat. Hist., v. 1, 1967, p. 377-387, text figs. 1-6 (maps, graphs).

NICHOLS, M. M., and ELLISON, R. L. Sedimentary patterns of microfauna in a coastal plain estuary, *in* Estuaries, edited by George H. Lauff. —Am. Assoc. Advancement Sci., Publ. No. 83, 1967, p. 283-288, text figs. 1-6 (maps, block diagrams, graphs), tables 1, 2.—Three facies occur in the Rappahannock estuary: river facies (exclusively thecamoebinids), shoal facies (dominated by arenaceous species), and basin facies (dominated by *Elphidium*).

NORVANG, AKSEL. The internal tooth of *Bulimina striata* d'Orbigny (Foraminifera), a preliminary notice.—Vidensk. Medd. fra Dansk naturh. Foren., bd. 129, 1966, p. 285, 286, pl. 24.—Reconstruction from serial sections showing internal tooth passing through final and penultimate chambers.

OHM, UWE. Zur Kenntnis der Gattungen *Reinholdella, Garantella* und *Epistomina* (Foramin.).—Palaeontographica, Abt. A, Band 127, Lief. 3-6, Sept. 1967, p. 103-188, pls. 16-21, text figs. 1-55 (drawings, graphs), tables 1-12. —Description and illustrations of 37 species (6 new and 5 indeterminate) and 7 subspecies (5 new) mostly in *Epistomina.*

PODOBINA, V. M. Ammodisthidy Verkhnego Mela Zapadno-Sibirskoj Nizmennosti, *in* Foraminifery Mezozoja i Kainozoja Zapadnoj Sibiri, Tajmyra i Dal'nego Vostoka.—Akad. Nauk SSSR, Sibirskoe Otdel., Instit. geol. geofiz., 1967, p. 69-85, pls. 13-18, text figs. 1, 2 (range chart, map).—Six species, 1 new, from the Upper Cretaceous.

PUTRJA, F. S. O Gruppe *Recurvoides obskiensis* iz Verkhnejurskikh i Nizhnemelovykh Otlozhenij Zapadno-Sibirskoj Nizmennosti, *in* Foraminifery Mezozoja i Kainozoja Zapadnoj Sibiri, Tajmyra i Dal'nego Vostoka.—Akad. Nauk SSSR, Sibirskoe Otdel., Instit. geol. geofiz., 1967, p. 50-56, pl. 7.—Four species, 1 new, from the Oxfordian and Valanginian.

RICHTER, GOTTHARD. Faziesbereiche rezenter und subrezenter Wattensedimente nach ihren Foraminiferen-Gemeinschaften. — Senckenbergiana lethaea, Band 48, No. 3/4, Aug. 17, 1967, p. 291-335, text figs. 1-15 (maps, graphs, diagram), tables 1, 2.—Foraminifera populations (living and dead) from 6 different facies. Ecological conditions in the sub-Recent beneath the surface of the marsh are interpreted.

ROSS, CHARLES A. Development of fusulinid (Foraminiferida) faunal realms.—Jour. Paleontology, v. 41, No. 6, Nov. 17, 1967, p. 1341-1354, text figs. 1-9 (paleogeographic maps, phylogeny charts, faunal chart).

RUDDIMAN, WILLIAM F., and HEEZEN, BRUCE C. Differential solution of planktonic Foraminifera.—Deep-Sea Research, v. 14, No. 6, Dec. 1967, p. 801-808, text figs. 1-12 (map, graphs), table 1.—Differential solution results in elimination of fragile, surface-inhabiting species and consequent enrichment of resistant, deep-dwelling species below about 4,000 meters.

SADA, KIMIYOSHI. Fusulinids of the *Millerella* zone of the Taishaku Limestone (Studies of the stratigraphy and the microfossil faunas of the Carboniferous and Permian Taishaku Limestone in West Japan, No. 1).—Trans. Proc. Palaeont. Soc. Japan, n. ser., No. 67, Sept. 20, 1967, p. 139-147, pls. 12, 13, tables 1-4.—Three species.

SANDERSON, G. A. A bibliography of the family Fusulinidae, addendum 5.—Jour. Paleontology, v. 41, No. 6, Nov. 17, 1967, p. 1564-1568.

SANDULESCU, JANA. Biostratigraphy and facies of the Upper Cretaceous and Paleogene in the Tara Birsei region (East Carpathians) (English abstract of Rumanian text).—Dari de Seama ale Sedintelor, v. 52, No. 2, 1964-65 (1966), p. 241-270, pls. 1-5 (geol. maps, range chart, correl. table), pls. 1a-9a (foram drawings), text fig. 1 (map).—Illustrations of planktonics from the Upper Cretaceous facies.

SEIGLIE, GEORGE A. Distribution of foraminifers in the sediments of Araya-Los Testigos shelf and upper slope.—Caribbean Jour. Sci., v. 6, No. 3-4, Sept.-Dec. 1966, p. 93-117, text figs. 1-12 (maps), table 1.—Eleven assemblages defined, mapped, and discussed as to depth and bottom conditions.

SEROVA, M. YA. The zonal scale of the Paleogene deposits of the northwestern part of the Pacific province and their correlation to the Tethys deposits, *in* Tertiary correlations and climatic changes in the Pacific.—Pacific Sci. Cong., 11th, Pacific Sci. Assoc., Tokyo, Aug.-Sept. 1966 (Feb. 28, 1967), p. 21-27.

STEINER, MAUREEN B., and WILLIAMS, THOMAS E. Fusulinidae of the Laborcita Formation (Lower Permian), Sacramento Mountains, New Mexico.—Jour. Paleontology, v. 42, No. 1, Jan. 1968, p. 51-60, pls. 11-13, text fig. 1 (stratig. section), table 1.—Five species, none new.

THOMAS, CHARLES W. Antarctic ocean-floor fossils: their environments and possible significance as indicators of ice conditions.—Pacific Science, v. 22, No. 1, Jan. 1968, p. 45-51, text fig. 1 (map), table 1.—Foraminifera listed from 5 bottom samples.

TSCHERNICH, V. V. New Late Silurian Foraminifera of the Urals (in Russian).—Paleont. Zhurnal, 1967, No. 2, p. 37-43, 2 text figs.—Five species, 4 in *Ammovolummina* gen. nov. (type species *A. saumensis* sp. nov.) and 1 in *Serpenulina* gen. nov. (type species *S. uralica* sp. nov.), both in the new subfamily Ammovolummininae of the Ammodiscidae.

VAN DER VLERK, I. M., and POSTUMA, J. A. Oligo-Miocene Lepidocyclinas and planktonic Foraminifera from East Java and Madura, Indonesia.—Proc. Kon. Nederl. Akad. Wetenschappen, ser. B, v. 70, No. 4, 1967, p. 391-398, 1 pl., text figs. 1, 2 (map, diagram), tables I, II. —In a sequence of lepidocyclines from beds between *Globorotalia opima opima* zone and *G. barisanensis* zone, datable by the associated planktonic fauna, the grade of enclosure of the protoconch by the deuteroconch increases from older to younger beds.

WALL, JOHN H. Microfauna of the Cretaceous Alberta Shale on Deer Creek, International Boundary, Great Plains region.—Proc. Geol. Assoc. Canada, v. 18, July 1967, p. 93-108, pl. 1, text figs. 1, 2 (map, correl. diagram).—Seventeen species, none new; 7 indeterminate.

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