CONTRIBUTIONS

FROM THE

CUSHMAN FOUNDATION

FOR

FORAMINIFERAL RESEARCH

VOLUME XX, Part 2

April, 1969

Contents

1969

CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME XX, PART 2, APRIL, 1969

363. ANNOTATED BIBLIOGRAPHY OF PALEOZOIC NONFUSULINID FORAMINIFERA, ADDENDUM 6

DONALD FRANCIS TOOMEY
Pan American Petroleum Corporation, Research Center, Tulsa, Oklahoma
and
B. L. MAMET
Department of Geology, University of Montreal, Montreal, Canada

ABSTRACT

This addendum includes 116 annotated references pertaining to Paleozoic nonfusulinid Foraminifera, and can be considered reasonably complete through the year 1967. As in previous bibliographies, (Toomey, 1959, 1961, 1963, 1965, 1966, and Toomey and Mamet, 1967, and 1968),[1] the aims are unchanged: (1) to summarize briefly the pertinent data contained in each article; (2) to list all new genera and species described therein; and (3) to denote, within brackets, all taxonomic changes noted from current and subsequent publications, and to include pertinent comments when possible, thus making the bibliography a more useful working tool.

INTRODUCTION

This annotated bibliography consists of 22 references containing original descriptions of genera and species and taxonomic nomenclature of Paleozoic nonfusulinid Foraminifera. An additional 94 references that utilized smaller foraminifers in stratigraphic subdivision and that mention incidental occurrences are also included for completeness.

The 116 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 1967. Including this addendum, the total number of annotated Paleozoic nonfusulinid foraminiferal references has reached 1081. 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.

The compilers have decided to forego literature evaluations in each yearly addendum. Instead, literature evaluations will appear in every other addendum. This will permit a larger literature sampling (at least 225 references) and hence, a more accurate evaluation of apparent literature trends.

[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; v. 19, p. 41-69.

ANNOTATED BIBLIOGRAPHY

A. *PRECARBONIFEROUS FORAMINIFERA*

1. BOUCKAERT, J., CONIL, R., and THOREZ, M., 1967, Position stratigraphique de quelques gîtes famenniens à Foraminifères: Géol. Soc. Belge, Bull., v. 75, pt. 2 (1966), p. 159-175, 4 pl., [in French].

The writers report the stratigraphic occurrences of a number of previously described species of smaller foraminifers from the Upper Devonian (Famennian) rocks of the Dinant Synclinorium of Belgium. Two new species, *Septabrunsiina baeleni* and *Septaglomospiranella* (?) *gosseleti,* are described from the Famennian Fm1c interval and illustrated by thin-section photomicrographs. A simple key for the identification of characteristic Upper Devonian Belgium foraminifers is also included, as is a table showing the comparison of the Belgium foraminiferal horizons to the Soviet foraminiferal biozones, and the German conodont zones. [The legend for Plate 1 is in error; the explanation for figure 1 should be for figure 3.]

2. CHUBASHOV, B. I., 1963, Iron deposits between the Devonian and Carboniferous in the Chussovaya Basin: Sovietskaia Geologia, v. 7, p. 127-130, [in Russian].

The writer reports the occurrence of 3 characteristic foraminiferal assemblages, composed of previously described species, from the Upper Devonian (Famennian), the Etroeungt, and the Lower Carboniferous (Tournaisian) beds of the Chussovaya Basin of the Soviet Union.

3. EISENACK, A., 1966, Über *Chuaria wimani* Brotzen: Neues Jahrb. f. Geol. u. Paläont. Monatsh., no. 1, p. 52-56, 3 text-fig., [in German].

The writer suggests that the microfossil *Chuari wimani* Brotzen, found in the Precambrian Visingsö Formation of Sweden, is probably a chitinous foraminifer. *C. wimani* closely resembles younger forms found in the Briovérien of Normandy. This questionable form is described in detail and illustrated by excellent whole-specimen photomicrographs.

4. EISENACK, A., 1967, Foraminiferen aus dem Ordovizium und Gotlandium des baltischen Gebietes: Neues Jahrb. f. Geol. u. Paläont. Abh., v. 128, no. 3, p. 244-274, pl. 24-28, 10 text-fig., [in German].

The present work concerns agglutinated foraminifers with or without organic cement and purely chitinous forms. It involves three reports. The first is a supplement to a paper that appeared in 1954 and concerns Ordovician foraminifers from Estonia. The neotype of *Psammosphaera micrograna* is discussed, and one new species, *Stegnammina micrograna*, plus a few previously described forms are tabulated, described, and illustrated.

The second portion consists of a contribution on the smaller foraminifers of the Baltic Sea limestones (Upper Ordovician glacial boulders) which carry species of the genera *Ordovicina, Blastammina, Pseudastrorhiza, Amphitremoida, Thurammina, Saccammina,* and the newly established genus *Pachyammina* for *Amphitremoida*? *pachytheca* Eisenack, 1954. Newly described species are: *Pseudastrorhiza stella, P. tetraedrica, Amphitremoida tubulosa, A. fusiforma, A. minuta, A.*? *tenuissima, Pachyammina longa* n. gen., and *P. polyedrica*. The most common species in the Baltic Sea limestones is *Pachyammina pachytheca*.

The third part is a contribution on the smaller foraminifers from the Silurian rocks of Gotland Island and consists of descriptions of 21 species representing the following genera: *Blastammina, Stegnammina, Psammosphaera, Sorosphaera, Amphitremoida, Thurammina, Saccammina, Hyperammina, Archaechitinia,* and *Archaeochitosa*. Among the new species described are: *Blastammina haploida, B. striata, B. astrophora, Stegnammina rhabdomorpha, Psammosphaera nux, Amphitremoida robusta, A. elongata,* and *Thurammina visbyensis*.

Representative forms from all three microfaunas are illustrated by excellent thin-section and whole-specimen photomicrographs and/or line drawings.

5. FERRARI, A., and VAI, G. B., 1965, Ricerche stratigrafiche e paleoecologiche al Monte Zermula (Alpi Carniche): Giornale di Geologia, Ann. del Mus. Geol. Bologna, ser. 2, v. 33, no. 2, p. 389-406, 5 pl., 3 text-fig., 1 table, [in Italian with German abstract].

The writers report the occurrence of Middle and Upper Devonian (Givetian-Frasnian) foraminiferal assemblages in the biocalcilutites of the Italian Carnic Alps of northern Italy, near the town of Monte Zermula. No new taxa are described, and only a few representative foraminifers are illustrated by rather poor thin-section photomicrographs. The Middle Devonian (Givetian) assemblage contains: *Archaesphaera* sp., *Bisphaera* sp. cf. *B. malevkensis, Parathurammina* ex. gr. *dagmarae, P.* sp. cf. *P. magna, Irregularina* sp., *Rauserina* sp., *Eovolutina* sp., and *Umbellina* sp. The Upper Devonian (Frasnian) foraminiferal assemblage contains: *Archaesphaera* sp., *Radiosphaera* sp., *Bisphaera* sp., *Parathurammina suleimanovi, P.* sp. cf. *P. suleimanovi* var. *stellata, P.* sp. cf. *P. cushmani, P.* sp. cf. *P. spinosa, P.* ex. gr. *dagmarae, Rauserina* sp., *Irregularina* sp., ?*Uslonia* sp., *Caligella* sp., and *Eovolutina* sp.

6. FILIPPOVA, M. F., 1959, On the correlation of diverse facies of the upper Famennian (Upper Devonian). *IN*: Stratigraphy of the lower part of the Lower Carboniferous in the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 137-145, 1 text-fig., [in Russian].

The writer notes that the *Septatournayella rauserae* and *Endothyra communis-E. kobeitusana* assemblage Zones are recognized in the Melekess and Ulianov boreholes (Volga-Ural Basin). Both zones are included in the Upper Devonian (Famennian). [In the original type-region of Belgium the *Endothyra communis-E. kobeitusana* assemblage is characteristic of the Lower Carboniferous (Tournaisian).]

7. IRELAND, H. A., 1967, Regional depositional basins and correlation of Siluro-Devonian beds using arenaceous Foraminifera and acid residues. *IN*: Tulsa Geol. Soc., Digest, v. 35, Symposium: "Silurian-Devonian rocks of Oklahoma and environs," Edited by D. F. Toomey, p. 99-118, 6 text-fig., 1 table.

The carbonate beds of Silurian and Devonian age in the central Midcontinent are known as the "Hunton Group" in the subsurface and at their outcrop area in the Arbuckle Mountains of southern Oklahoma. The agglutinated Foraminifera found in the subsurface of Kansas, and similar microfaunas previously described from Oklahoma, Missouri, and elsewhere provide information for identification and correlation of the Silurian-Devonian rocks locally and regionally. The lithologic samples lack diagnostic criteria, but the acid residues and especially the contained agglutinated Foraminifera make it possible to zone the beds, identify faults, pinchouts and other stratigraphic characteristics that previously have not been determined. The study of lithologic samples, acid residues, and the Foraminifera define zones that can be correlated with outcrops.

8. KUZNETSOV, S. S., and MIKLUKHO-MAKLAY, A. D., 1955, On the presence of Devonian on the main Caucasus ridge: Akad. Nauk S.S.S.R., Doklady, v. 104, no. 6, p. 890-891, [in Russian].

From the Upper Devonian rocks of the Caucasus Mountains, Soviet Union, an assemblage of 14 taxa of smaller foraminifers and questionable forms is reported. Most have been previously described, however; 3 forms are reported as new but are to the compilers' knowledge *nomina nuda*: these are *Archaesphaera gigantea, Irregularina granda,* and *Lagenammina minima.*

9. MOURAVIEFF, N., and BULTYNCK, P., 1967, Quelques Foraminifères du Couvinien et du Frasnien du board sud du Bassin de Dinant: Géol. Soc. Belge, Bull., v. 75, pt. 2, p. 153-156, 1 pl., [in French].

The writers report the occurrence of Middle (Couvinian) and Upper (Frasnian) Devonian agglutinated and calcareous foraminifers from the southern portion of the Dinant Basin of Belgium. The microfauna was derived from acid residues and consists mainly of pyritized steinkerns referable to the genera *Semitextularia, Pseudopalmula, Paratextularia, Moravammina,* and *Nanicella.* Representative forms are illustrated by whole-specimen photomicrographs.

10. PFLUG, H. D., 1965, Organische Reste aus der Belt-Serie (Algonkium) von Nordamerika: Paläont. Zeit., v. 39, no. 1/2, p. 10-25, 4 pl., [in German with English summary].

Numerous organic remains, all regarded as *incertae sedis,* are described from the Upper Precambrian Belt Series of Montana. One problematical microfossil, *Tricellaria delylensis* n. gen and sp., exhibits several structures similar to Foraminifera. All forms are illustrated by whole-specimen photomicrographs and line drawings.

11. PRONINA, T. V., and CHUVASHOV, B. I., 1965, On the development of the systematics, paleoecology, and stratigraphic significance of the family Parathuramminidae: Akad. Nauk S.S. S.R., Voprosy Mikropaleontologii, No. 9, p. 71-82, 1 text-fig., [in Russian].

Deals mainly with the systematics of a dozen forms of *incertae sedis,* here regarded as Foraminifera (Parathuramminidae). The Parathuramminidae, as envisioned by the writers, range from Cambrian to Carboniferous, with an acme of development during the Devonian. They exhibit a wide range of habitats, running the gamut from planktonic to attached benthonic forms. It is thought that their various ecologic adaptations are reflected in their wall structure, which varies from pseudochitinous agglutinated to calcareous secreted.

Taxonomic modifications include the following: (1) the genus *Archaelagena* is proposed to supercede the Paleozoic *Eolagena* and *Lagenammina* [the type species of *Archaelagena, A. howchiniana* Brady, belongs within the botanical realm, while *Eolagena* is a bilayered secreted form, and *Lagenammina* an agglutinated pseudochitinous foraminifer], (2) *Archaesphaera suleimanovi* Vissarionova is transferred to *Archaelagena* [to the reviewers' knowledge this taxon is from Bogush and Juferev, 1962], (3) a new subgenus, *Bullella,* is proposed on *Bisphaera* (*Bullella*) *uchalensis,* for the monolayered Devonian bisphaerids [this new taxon, *Bullella,* is preoccupied by *Bullella* Simpson, 1900; in addition, its holotype is a *nomen nudum*], (4) the species *Bisphaera concavatus* Vissarionova in Bykova 1955, is transferred to *Parathurammina* [the compilers are unaware of the formal description of this taxon], and (5) the type descriptions of the genera *Irregularina* and *Eovolutina* are emended, and the forms *I. tcheslavkensis* Bykova and *I. longa* Konolipina are transferred to the genus *Cribrosphaeroides.*

12. SPASSOV, H., and FILIPOVIĆ, I., 1966, The conodont fauna of the older and younger Palaezoic in southeastern and northwestern Bosnia: Geol. Glasnik Br. 11., p. 33-53, 3 pl., 1 text-fig., [in Serbo-Croatian with English summary].

A study of the conodonts of the Silurian (upper Llandovery-lower Wenlockian) *amorphognathoides* Zone in Bosnia, Yugoslavia, has also yielded the agglutinated foraminifer *Involutina* sp. [probably *Ammodiscus* or *Glomospirella*]. This foraminifer is illustrated on Plate 1 by whole-specimen photomicrographs. [Noteworthy is the occurrence of the same foraminifer in the *amorphognathoides* Zone of the Silurian Clarita Formation of the Arbuckle Mountains of southern Oklahoma.]

13. STANTON, R. J., JR., 1967, Radiosphaerid calcispheres in North America and remarks on calcisphere classification: Micropaleontology, v. 13, no. 4, p. 465-472, 1 pl., 1 table.

In his discussion of the calcispheres found in the Upper Devonian (Frasnian) Valentine Member of the Sultan Limestone in southern Nevada (Arrow Canyon Range) the writer notes that calcispheres occur in a pellet, lithoclast, fossil-fragment, lime grainstone. The associated biota consists of stromatoporoids, ostracodes, gastropods, and smaller foraminifers of the genera *Umbellina, Irregularina, and Parathurammina.*

14. TSCHERNICH, V. V., 1967, New Late Silurian Foraminifera of the Urals: Akad. Nauk S.S. S.R., Paleont. Zhur., No. 2, p. 37-43, 1 text-fig., 1 table, [in Russian].

The writer describes 2 new genera and 5 new species of Late Silurian agglutinated smaller foraminifers from the Ural Mountains region of the Soviet Union. A new subfamily, Ammovolo-lummininae, is erected under the family Ammodiscidae and the following new taxa are described within it: *Ammovolummina recta* n. gen., *A. saumensis, A. pseudotuba, A. sphaerica,* and *Serpenulina uralica* n. gen. All of the above forms are illustrated by representative line drawings.

15. WILSON, J. L., 1967, Carbonate-evaporite cycles in lower Duperow Formation of Williston Basin: Bull. Canadian Petrol. Geol., v. 15, no. 3, p. 230-312, 22 pl., 14 text-fig., 1 appendix.

In a comprehensive study of the Upper Devonian (Frasnian) carbonate-evaporite cycles in the lower Duperow Formation of the Williston Basin region (North Dakota, Montana, and Saskatchewan) the writer reports the presence of the questionable foraminifer *Umbellina* within this interval. The writer notes that *Umbellina* is fairly abundant in both the normal marine and restricted marine lime wackestones of the Duperow. Within this formation it is unknown in the stromatoporoid reefoid faunas. It is speculated that the organism's distribution pattern suggests that it was pelagic and could have existed in surface layers of hypersaline water or that it drifted over a wide area and was deposited in sediments of greatly different environments. [See Toomey, 1965; Rich, 1965; Teichert, 1965; and Bykova & Polenova, 1955, for further discussions relative to this problematical form.]

B. *LATE PALEOZOIC FORAMINIFERA*

16. AIZENBERG, D., and BRAZHNIKOVA, N. E., 1959, On the stratigraphy of the lower part of the Lower Carboniferous in the occidental part of the Greater Donbass. *IN*: Stratigraphy of the lower part of the Lower Carboniferous in the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 156-168, [in Russian].

The writer notes that in the occidental portion of the Greater Donbass region of the Soviet Union the base of the Lower Carboniferous (Tournaisian) is placed at the base of the *Endothyra communis-E. kobeitusana* assemblage Zone.

The Tournaisian-Viséan boundary is characterized by relict tournayellids in association with *Lituotubella, Quasiendothyra* [now *Urbanella* and *Dainella*], *Endothyra* ex. gr. *globulus* [now *Globoendothyra*], and the fusulinids *Eoparastaffella* and *Eostaffella*. [One *nomen nudum, Endothyra micula* Vdovenko, is cited by the writers.]

17. AIZENBERG, D. E., BRAZHNIKOVA, N. E., ISHENKO, T. A., and LAGUTIN, P. K., 1963, On the characteristics of the basal layers of the Lower Carboniferous in the Donetz Basin: Akad. Nauk R.S.R. (Ukraine), Geol. Zhur., v. 23, no. 1, p. 73-78, [in Russian].

The writers present a lucid discussion of the microfauna present in the transition beds between the Upper Devonian (Famennian) and the Lower Carboniferous (Tournaisian). The Ukrainian position of placing the systematic boundary at the base of the *Quasiendothyra kobeitusana* Zone is strongly defended. [This is one of the very rare instances in the Soviet literature in which the strict application of a pertinent rule of zoological nomenclature is applied, i.e., Quasiendothyra konensis forma symmetrica is considered as non-Linnean and is not italicized.]

18. AIZENBERG, D. E., BRAZHNIKOVA, E. V., and ROSTOVCEVA, L. F., 1966, On the $C_1{}^ta$ Zone of the Donets Basin. *IN*: The fauna of the lowest part of the Tournaisian (Zone $C_1{}^ta$) in the Donets Basin: Akad. Nauk U.R.S.R. (Kiev), Inst. Geol. nauk, p. 3-42, 18 pl., 1 text-fig., [in Russian].

The writers present an excellent revision of both the mega- and microfauna of the uppermost Devonian-Lower Carboniferous Etroeungt transitional beds in the Soviet Donets Basin. The microfauna suggests a distinctive Lower Carboniferous aspect for this biota, although certain Devonian elements are still conspicuous. The microfauna of calcareous secreted foraminifers is composed of 9 species which had previously made their appearance in the Upper Devonian; 22 taxa are specific to the horizon, whereas 11 species grade upward into the Lower Carboniferous.

The microfauna is described in detail and illustrated by excellent thin-section photomicrographs. This publication has the finest plates, both in quality of the photography and in reproduction, ever seen in a Soviet foraminiferal paper. The value of this remarkable compendium is only marred by its slightly archaic and erratic taxonomy. Two subspecies are described as new; these are: *Cribrosphaeroides simplex* Reitlinger *donaica,* and *Paratikhinella cannula* Bykova *kajalica.* Six other taxa do not follow the Rules of Zoological Nomenclature and are here reported conditionally. These are: *Cribrosphaeroides simplex* Reitlinger *donaica forma magna, Bisphaera malevkensis* Birina *forma magna, B. malevkensis* Birina *forma nana, Rauserina notata* Antropov *forma polycellata, Paracaligella antropovi* Lipina *forma incurva, Chernyshinella disputabilis* Dain *forma primitiva.*

19. ALEXANDROVICZ, S. W., and SIEDLECKA, A., 1964, A lithological profile of the Dinantian

limestones at Czerna near Krzeszowice: Ann. Soc. Geol. Pologne, v. 34, no. 3, pl. 17-18, 7 text-fig., [in Polish with English summary].

Lower Carboniferous (upper Viséan) limestones exposed on the eastern slope of the Czernka Valley, Poland, are predominantly detrital limestones or intraformational limestone conglomerates. Some of the limestone units contain abundant *Endothyra* sp. in association with algae and calcareous spheres (*Calcisphaera* spp.). Plate 18 contains photomicrographs of representative carbonate rock types in which some foraminifers are present.

20. ALVARADO DE, A., and SAMPELAYO, A. H., 1945, Zona occidental de la cuenca del Rubagon. Datos para su estudio estatigraphico: Inst. Geol. Min. España, Boll. No. 58, p. 1-43, 6 text-fig., 2 cross-sections (foldouts), [in Spanish].

The writer reports the occurrence of the smaller foraminifers *Textularia* [probably *Palaeotextularia*] and *Endothyra* sp. aff. *E. bowmani* from the Lower Carboniferous limestones of the Peña (Asturias), Spain.

21. ANISGARD, H., and CAMPAU, D. E., 1963, *Paramillerella thompsoni* n. sp. from Michigan and a redefinition of *Paramillerella*: Contrib. Cushman Found. Foram. Res., v. 14, pt. 3, p. 99-108, pl. 9-11, 3 text-fig.

Primarily a discussion of the systematic position of *Paramillerella, Endothyra,* and *Eostaffella.* The genus *Endothyra, sensu* Zeller, is considered synonymous with the primitive fusulinoid *Paramillerella.* A new species, *Paramillerella thompsoni,* is described and illustrated by thin-section photomicrographs and drawings. The new form is from the lower Bayport Formation (Pennsylvanian) of Michigan. [The genus *Paramillerella* Thompson, 1951, *non sensu* Anisgard and Campau, is congeneric with *Eostaffella* Rauser-Chernoussova, 1948, and should therefore be dropped. Moreover, the I.C.Z.N. has designated the type of *Endothyra* as *E. bowmani* Phillips in Brown *emend.* Brady, hence, *Endothyra sensu* Zeller is therefore invalid. In addition it has been renamed *Eoendothyranopsis* by Reitlinger in 1966. *Paramillerella sensu* Anisgard and Campau does not adhere to the I.C.Z.N. ruling and is to be considered as an *Eoendothyranopsis*].

22. ARMSTRONG, A. K., 1967, Biostratigraphy and carbonate facies of the Mississippian Arroyo Peñasco Formation, northcentral New Mexico: New Mexico Bur. Mines and Min. Res., Mem. 20, 80 p., 12 pl., 45 text-fig., 4 tables.

A comprehensive study and synthesis of the Late Osage to Meramec (Lower Carboniferous) Arroyo Peñasco Formation which outcrops in the San Pedro, Nacimiento, Jemez, Sandia, Manzanita, Manzano, and Sange De Cristo Mountains of north-central New Mexico. Three carbonate cycles are recognized; all contain previously described smaller foraminifers and can be referred to the *Endothyra spinosa* and *E. spiroides* Zones of Skipp *et al.,* 1966. In a section on systematic paleontology 6 species of endothyrids are described; one of these, *Endothyra skippae,* is a new name to replace *Plectogyra inflata* Zeller, preoccupied by *Endothyra inflata* Lipina, 1955. Plates 8-10 contain rather poor photomicrographs of representative Arroyo Peñasco smaller foraminifers.

23. ARSOVSKI, M. N., GRUM-GRJIMALJO, O. S., GAFT, D. E., and STRATCHKOV, M. M., 1957, Stratigraphy of the Devonian and Carboniferous of the Great Karatau, *IN*: Resolutions for the unified stratigraphic scheme of the pre-Paleozoic and Paleozoic of the eastern part of Kazakhstan: p. 79-82, [in Russian].

The writers recognize five microfaunal assemblages ranging in age from Upper Devonian (Famennian) to Middle Carboniferous from the Great Karatau region of western Asia, U.S.S.R. All assemblage zones are based upon previously described taxa. The writers consider that the *Endothyra communis* Zone [now *Quasiendothyra kobeitusana* Zone] is uppermost Devonian in age.

24. BELOV, A. A., and REITLINGER, E. A., 1966, A paleontologic description of the lower tuffites of the Khram Mass, southern Georgia: Akad. Nauk S.S.S.R., Doklady, v. 170, no. 1, p. 152-154, [in Russian; English translation *IN*: Doklady ESS, v. 170, p. 44-46, American Geol. Inst.].

The lower tuffite sediments present in the vicinity of the Khram Mass, southern Georgia, U.S.S.R., previously thought to be of Triassic age, have been dated as Lower Carboniferous (lower Namurian) on the basis of previously described species of smaller Foraminifera. The foraminifers occur in thin lenses of limestone; in addition to the Foraminifera, the limestones contain rather abundant algal remains (*Calcifolium,* ungdarellids, berezellids, and girvanellids).

25. BETELEV, N. P., ROSTOVCEVA, L. F., and YOUCHKO, L. A., 1959, Some data on the stratigraphy, lithology and the facies of the Tournaisian and lower Viséan in the Tartary territory, *IN*: Stratigraphy of the lower part of the Lower Carboniferous in the Volga-Ural region of the Russian Platform: V.N.I.G.R.I., Trudy, v. 14, p. 224-244, 2 text-fig., [in Russian].

Three facies realms are recognized in the Lower Carboniferous rocks of the Tartary territory, U.S.S.R. In each the marine Tournaisian and

Viséan portions are biostratigraphically zoned on the basis of smaller calcareous foraminifers, principally based upon previously described species of Endothyridae and Tournayellidae. A zonation based on spores is also included.

26. BIRINA, L. M., 1948, A detailed scheme of the stratigraphy of the passage beds between the Devonian and the Carboniferous (Etroeungt) in the southern part of the Podmoscovian region: Sovietskaia Geologia, No. 28, p. 146-153, 1 text-fig., [in Russian].

The writer discusses the rocks and their contained faunas of the passage beds between the Upper Devonian and Lower Carboniferous beds in the southern part of the Podmoscovian region of the Soviet Union. It is suggested that the Devonian-Carboniferous boundary be placed above the *Endothyra*-bearing Ozerko-Khovansk beds (that is, at the base of the *Bisphaera* Horizon).

27. BOGUSH, O. I., and JEFEREV, O. V., 1957, Foraminifera and stratigraphy of the Carboniferous of the Karatau and the occidental slope of the Alatau-Talass: Akad. Nauk S.S.S.R., Doklady, v. 112, no. 3, p. 487-489, [in Russian].

Nine foraminiferal assemblages (based upon previously described species) are recognized and tabulated for the Upper Devonian to Middle Carboniferous sediments of central Asia. These are: (1) an upper Devonian horizon characterized by *Uralinella-Syniella*, (2) an Etroeungt horizon with *Endothyra communis* and *E. kobeitusana* [now *Quasiendothyra*], (3) a lower Tournaisian assemblage with abundant monolocular forms (mainly parathuramminids), (4) a high Tournaisian interval characterized by *Endothyra tuberculata, E. rjausakensis, Brunsiina krainica* and others, (5) a lower Viséan interval with *Archaediscus spirillinoidea* [now *Planoarchaediscus*], (6) a high Viséan sequence characterized by *E. omphalota*, (7) the highest Viséan interval which carries *Archaediscus bashkiricus* [now *asteroarchaediscus*] and *Endothyra samarica* [such an assemblage present in western Europe would be considered as lower Namurian (*Eumorphoceras* Zone)], (8) a lower Namurian sequence which carries *Archaediscus postrugosus* [now *Asteroarchaediscus*], *Globivalvulina* ex. gr. *moderata* and others, and (9) a Bashkirian interval which is characterized primarily by its fusulinid content, i.e., *Pseudostaffella antiqua*.

28. BOGUSH, O. I., and JUFEREV, O. V., 1965, Questions concerning the age of the Tiksinsk Series and its analogues in the River Lena lowlands: Akad. Nauk S.S.S.R., Doklady, v. 165, no. 4, p. 891-893, [in Russian].

The Tiksinsk Series, which outcrops in the lowlands of River Lena, U.S.S.R., is characterized by two distinctive complexes primarily composed of smaller foraminifers referable to the Archaediscidae. These are: (1) a lower complex dominated by a *Planoarchaediscus* assemblage and thought to be of Lower Carboniferous (Viséan) age and, (2) an upper complex characterized by a *Planospirodiscus-Neoarchaediscus* assemblage which suggests a Middle Carboniferous (Bashkirian) age. The Tiksinsk Series is correlated with the Marakovsk Series of western and central Taimyr, which also carries a similar microfaunal assemblage that ranges in age from Lower Carboniferous (Viséan) to Middle Carboniferous (Bashkirian).

29. BOGUSH, O. I., and JUFEREV, O. V., 1966, Carboniferous and Permian Foraminifera of the Verkhoyansk Range: Akad. Nauk S.S.S.R., Sibirskoe Otdel., Instit. Geol. i Geofiz., Izdat. "Naucha," Moskva, 208 p., 14 pl., 18 text-fig., 7 tables, [in Russian].

The writers describe 170 species of smaller foraminifers from the Carboniferous and Permian rocks of the Verkhoyansk Range of the Soviet Union. All forms are illustrated by thin-section photomicrographs. Of the total microfauna, 19 species, 1 subspecies, and 2 names are regarded as new. The new taxa are: *Vicinesphaera irregularis, Brunsia fluctata, B. tiksinensis, B. umbilicata, B. lata, B. crassa* Bogush and Juferev *nom. nov., B.? sibirica, B.? lenensis, Tolypammina glomospiroides, Septaglomospiranella (S.) verkhojanica, Tournayella? verkhojanica, Carbonella jakutica, Endothyra abramovi, E. oldae, E. verkhojanica, E. settedabanica, Plectogyrina lenensis, Quasiendothyra (E.) tchugutchanica, Planoendothyra rotai bastakhensis* n. subsp., *P.? kharaulakhensis, P.? verkhojanica, Planoarchaediscus altus,* and *Tetrataxis? brazhnikovae nom. nov*.

Important taxonomic changes include the following: *Bisphaera minima* and *B. grandis* Lipina, 1955 = *B. irregularis* Birina, 1948; *Parathurammina gekkeri* Antropov, 1950 = *P. tuberculata* Lipina, 1950; *Hyperammina moderata* Malakhova, 1954 = *Earlandia moderata* (Malakhova); *Hyperammina? lingulata* Malakhova, 1959 = *Paracaligella lingulata* (Malakhova); *Turritellella grandis* and *T. spirans* Cushman and Waters, 1927, *Trepeilopsis mississippiana* Cooper, 1947, *T. spiralis* Gutschick and Treckmann, 1959, Conkin, 1961, Conkin and Conkin, 1964, *T. recurvidens* Gutschick and Treckmann, 1959, Conkin, 1961, and Conkin and Conkin, 1964, all = *Trepeilopsis grandis* (Cushman and Waters); *Glomospiranella endothyroides* var. *quadriloba* Dain, 1953 = *Septaglomospiranella (S.) quadriloba* (Dain); *Plectogyra tumula* Zeller, 1957, *pars* = *Carbonella tumula* (Zeller); *Endothyra explicata* Ganelina, 1956, *pars* = *E. amplis* Schlykova, 1951; *Quasiendothyra communis* (Raus.)

var. *turbida* Reitlinger, 1961 = *Dainella turbida* (Durkina); *Quasiendothyra kedrovica* Durkina, 1959 = *Planoendothyra rotai rotai* (Dain); *Quasiendothyra umbonata* Bogush and Juferev, 1960 = *Planoendothyra umbonata* (Bogush and Juferev); *Plectogyra crassitheca* Bogush and Juferev, 1962 = *Planoendothyra? crassitheca* (Lipina); *Archaediscus monstratus* Grozdilova and Lebedeva, 1954 = *Planoarchaediscus monstratus* (Grozdilova and Lebedeva); *Archaediscus postrugosus* Reitlinger, 1949 = *Neoarchaediscus postrugosus* (Reitlinger); and *Archaediscus borealis* Reitlinger, 1949 = *Neoarchaediscus borealis* (Reitlinger).

30. BONDARENKO, S. P., LAPKIN, Y. Y., and SHAMEV, M. J., 1966, Carboniferous limestone pebbles in Permian deposits of the Donetz Basin: Moscow Soc. Nat., Bull., geol. ser., v. 41, no. 1, p. 154-156, 1 text-fig., [in Russian].

A microfauna found in limestone pebbles and containing a Middle Carboniferous (Bashkirian) microfauna of previously described smaller foraminifers and fusulinids is described from a fusulinid-dated sequence of Permian rocks from the Donetz Basin region of the Soviet Union.

31. BRADY, H. B., 1870, Notes on the Foraminifera of mineral veins and the adjacent strata. *IN*: Moore, C., Report on mineral veins in Carboniferous limestone and their organic contents: British Assoc. for the Advancement of Sci., London, Rept. 39, Exeter Meeting 1869, p. 381-382.

The writer presents a discussion and description of ten "new species" of smaller Foraminifera observed in the upper part of the Lower Carboniferous rocks of England. The "new species" are: *Involutina cylindrica* [now *Earlandinella cylindrica*], *I. incerta* [transferred to *Trochammina centrifuga* by Brady, 1876; this form is probably an advanced tournayellid], *I. recta* [now *Endothyranella recta*], *I. lobata* [considered synonymous with *Endothyra bowmani* by Brady in 1876] *I. radiata* [now *Eostaffella radiata*], *I. crassa* [now *Endothyranopsis crassa*], *I. obliqua* [probably an archaediscid], *I. subrotunda* [systematic position unknown], *I. vermiformis* [placed in synonymy with *Trochammina filum* by Brady in 1876; systematic position unknown], and *I. macella* [a crushed endothyroid of the group *Endothyra omphalota*; systematic position unknown]. [Most of these so-called "new species" were later illustrated by Brady in 1876, and most of the types are deposited in the British Museum.]

32. CHANTON, N., 1967, A propos de la présence de Lasiodiscidae (Foraminifères) dans le Viséen terminal du bassin houiller de Djerada (Maroc): Soc. Géol. France, C.R.S., pt. 4, p. 166-167, 4 text-fig., [in French].

The writer reports the occurrence of the smaller foraminifer *Eolasiodiscus* sp. in rocks of Lower Carboniferous (Viséan) age from the coal producing area of Djerada, Morocco, North Africa. The foraminifer is described and illustrated by thin-section photomicrographs.

33. CHANTON, N., 1967, Étude micropaléontologique du Viséen Supérieur de Djerada (Maroc): Soc. Géol. de France, Bull., 7th ser., v. 8, p. 36-39, pl. 2, [in French].

The writer presents a summary of the biota (algae, smaller foraminifers, fusulinids, ammonoids) present in the Lower Carboniferous (uppermost Viséan) limestones of western Morocco, North Africa. The microfauna is represented by previously described taxa and confirms the age previously established on the basis of ammonoids. A few representative smaller foraminifers are illustrated by thin-section photomicrographs.

34. CHERMNYKH, V. A., YESEVA, V. I., and MIKHAYLOVA, Z. P., 1966, Middle Carboniferous stratigraphy of the western side of the northern Urals: akad. Nauk S.S.S.R., Doklady, v. 170, no. 4, p. 919-922, 1 text-fig., [in Russian; English translation *IN*: Doklady ESS, v. 170, p. 112-117, 1 text-fig., American Geol. Inst.].

The following Middle Carboniferous horizons are paleontologically identified (previously described species of smaller foraminifers and fusulinids) and located at sections east of the Pechora River, on the western side of the northern Ural Mountains, U.S.S.R. The delineated intervals are those above the Lower Carboniferous Protva Horizon: Krasnaya Polyana; North Kel'tma; Kama (Prikamskiy Horizon); upper Bashkirian-Vereya; Kashira; Podol'sk; and Myachkovo. Text-fig. 1 shows the correlation of these sections along the right bank of the middle Pechora River.

35. CHERNIAK, G. YU., 1960, On the stratigraphy of the Middle and Upper Carboniferous of the Taimyr Peninsula: Inst. Geol. Arctic, Leningrad, Sbornik, Stat. Pal. i Biostratigraphii, Bull. 18, p. 16-22, [in Russian].

The writer presents a microfaunal and megafaunal biostratigraphic zonation of the Carboniferous rocks of the Russian arctic region. All foraminiferal identifications are referred to previously described forms.

36. CHERNIAK, G. YU., and DEDOK, T. A., 1959, New data on the Upper Paleozoic of the Taree River (central Taimyr): Inst. Geol. Arctic, Leningrad, Sbornik, Stat. Pal. i Biostratigraphii, Bull. 13, p. 20-28, [in Russian].

The writer presents a microfaunal and megafaunal biostratigraphic zonation of a Lower to Middle Carboniferous sequence of rocks from the Taree River area (central Taimyr) of the Russian arctic region.

37. CHUKINA, V. IA., 1961, On the Viséan, Namurian, and Middle Carboniferous stages of northern Kirgiztan: Akad. Nauk S.S.R. Kirgiz, Izvestia, ser. estest. i technik nauk, v. 3, no. 4, p. 5-14, 4 tables, [in Russian].

The writer presents a comprehensive survey of the boundary definitions of the Viséan, Namurian (Lower Carboniferous) and Bashkirian (Middle Carboniferous) Stages based on the biostratigraphic zonation of brachiopods, corals, and smaller foraminifers.

In Kirgiztan, U.S.S.R., the foraminiferal assemblage *Asteroarchaediscus-Globivalvulina* is considered as upper Viséan in age. [In western Europe, such a foraminiferal assemblage is considered as lower Namurian.]

The Bashkirian Stage is characterized by the first appearance of the fusulinid *Pseudostaffella antiqua* associated with *Bradyina* aff. *B. cribrostomata* and *Archaediscus* ex. gr. *mosquensis*. [In western Europe, this foraminiferal assemblage would be regarded as high Namurian in age.]

38. CONIL, R., 1967, Problèmes du Viséen inférieur dans le Condroz: Géol. Soc. Belgium, Ann., v. 90, 1966-67, Bull. 4, p. 413-429, 2 text-fig., 1 table, [in French].

The writer discusses the stratigraphic and micropaleontologic problems relative to biostratigraphically subdividing the Lower Carboniferous (Viséan) rocks of the Condroz region of Belgium. Table 1 shows the stratigraphic occurrence of certain characteristic smaller foraminifers (all previously described) that are useful in recognizing diagnostic stratigraphic intervals. The distribution of the microfossil associations and the position of the *Productus humerosus* beds in the principal reference sections of the Dinant Basin region, from Dinant to the Vesdre Massif, indicate that at Dinant the "black marble of Dinant" is stratigraphically higher than the "Sovet Dolomite." The appearance of primitive Archaediscidae is regarded as marking the boundary between the V1a and V1b substages of the lower Viséan. Several epeirogenic movements affected the bio- and lithofacies of the lower Viséan in the Dinant and Namur Basins.

39. CONIL, R., and LYS, M., 1967, Aperçu sur les associations de Foraminifères Endothyroides du Dinantien de la Belgique: Géol. Soc. Belgium, Ann., v. 90, 1966-67, Bull. 4, p. 395-412, 4 pl., [in French].

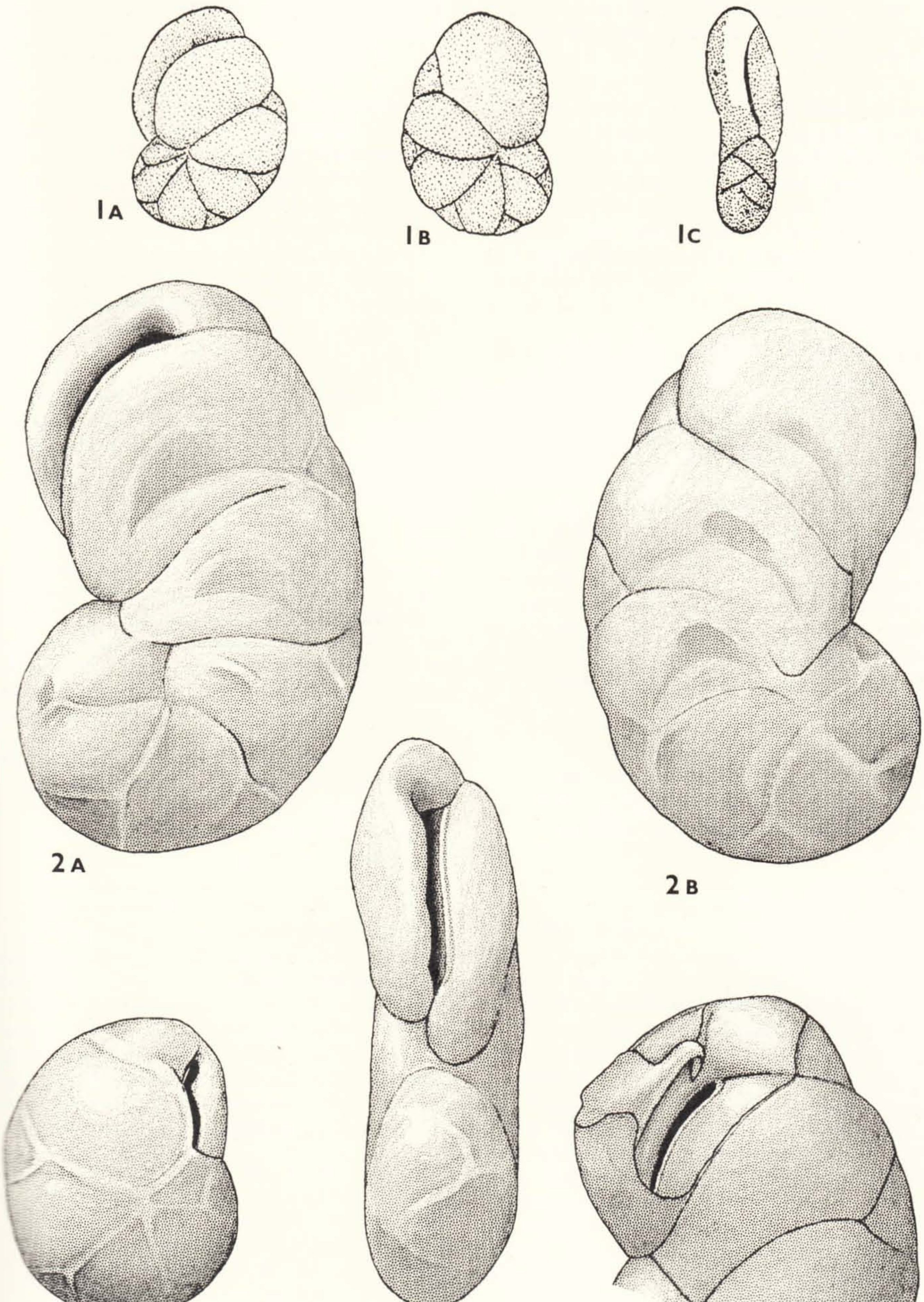
The writers report the occurrence and faunal associations of certain smaller foraminifers useful in biostratigraphically subdividing the Lower Carboniferous (Tournaisian-Viséan) rocks of the Dinant synclinorium of Belgium. Ten species of smaller foraminifers are described and illustrated by thin-section photomicrographs; of these, 5 species and 1 subspecies are regarded as new. The new forms are: *"Mstinia" modavensis, Septatournayella(?) conspecta, Plectogyra hirsuta, P. parakosvensis* (Lipina) *clavaesepta, P. praetuberculata,* and *P. scabra.*

40. CRESPIN, I., 1962, Foraminifera in cores Nos. 1, 2 & 3 from Meda No. 1. *IN*: Pudovskis, V., Meda No. 1 well, Western Australia: Australian Bur. Min. Res., Geol. and Geoph., Petroleum Search Subsidy Acts Pub. No. 7, p. 25-26.

In Western Australia, Permian Foraminifera occur commonly in cores Nos. 1 and 3, with only fragmentary tests of *Hyperammina* in core No. 2. The microfauna in core No. 1 consists of a rich assemblage of well preserved Foraminifera, chiefly calcareous species previously described by Crespin (1958). Many tests of *Frondicularia* and *Nodosaria* were unusually large. The assemblage of species is characteristic of subsurface sections of the Noonkanbah Formation of the Canning Basin. Core No. 3 yielded numerous tests of calcareous imperforate Foraminifera, many of which were entirely replaced by clear calcite, and others partially replaced by glauconite. These forms are: *Hemigordius schlumbergi* (Howchin), *Nodosaria irwinensis* Howchin, *Tetrataxis* sp., and *Trepeilopsis australiensis* Crespin. The above assemblage is characteristic of the Callytharra Formation of the Carnarvon Basin and its equivalents in the Irwin and Canning (including Fitzroy) Basins of Australia.

EXPLANATION OF PLATE 13

FIGS.		PAGE
1.	*Globocassidulina nipponensis* new name. Holotype, after Cushman, 1925. 1A-C, opposite sides and edge view.	65
2.	*Globocassidulina nipponensis* new name. From Recent, off Japan. 2A-C, opposite sides and edge view (N.Z.G.S. Cat. No. FP 2021).	65
3.	*Globocassidulina nipponensis* new name. From Recent, off Japan. Side view of juvenile (N.Z. G.S. Cat. No. FP 2022).	65
4.	*Globocassidulina nipponensis* new name. From Recent, off Japan. Side view with most of last chamber removed, showing internal apertural lip and tooth-plate attached to penultimate chamber wall near septal foramen (N.Z.G.S. Cat. No. FP 2023).	65



Eade: New Name for *Cassidulina orientale* Cushman

41. DANILOV, B. I., 1965, On the age of the terrigenous strata in the Kama-Kinel region: Geologia Nefti i Gasa, v. 9, p. 20-24, 2 text-fig., [in Russian].

A Lower Carboniferous (Tournaisian) terrigenous series of rocks intercalated with normal marine carbonates from the Kama-Kinel region of the Soviet Union is biostratigraphically zoned on the basis of previously described species of ammonites, brachiopods, corals, and smaller foraminifers. The reported smaller foraminifers appear to be a characteristic Tournaisian Kizel microfauna which grades into the lower Viséan. [A good many of the listed generic and specific names are misspelled].

42. DAUGIN, F., 1929, Étude stratigraphique et paléontologique du Carbonifère de la rive droite de l'Oued Guir (Confins Algéro-Marocains de Sud): Service des Mines et de la carte Géologique du Maroc, Notes et Mém. No. 4, 47 p., 8 pl., 4 text-fig., [in French].

The writer reports the occurrence of a Lower Carboniferous (Viséan) microfauna (*Valvulina* sp. [now *Tetrataxis*], *Climacammina,* and *Endothyra*) from Algeria, North Africa. The above forms are illustrated by random thin-section photomicrographs. [This stratigraphic interval was recently re-studied by Pareyn (1960) who found that this unit straddles the Viséan-Namurian boundary.]

43. DAVIS, A. G., 1945, Micro-organisms in the Carboniferous of the Alport boring. Appendix 1, p. 312-318, 1 table. *IN*: Hudson, R.G.S., and Cotton, G., the Lower Carboniferous in a boring at Alport, Derbyshire: Yorkshire Geol. Soc., Proc., v. 25, pt. 4, p. 254-330, pl. 19, 6 text-fig.

The writer reports the occurrence and stratigraphic distribution of a variety of micro-organisms in the Lower Carboniferous (middle and upper Viséan) rocks encountered in a cored interval taken at Alport Dale, north Derbyshire, England. Thirty-five previously described smaller foraminifers are identified and their stratigraphic range within the cored interval shown on Table 1. No foraminiferal systematics or illustrations are included.

44. DELEPINE, G., and LECOINTRE, G., 1933, Études géologiques dans la région paléozoique comprise entre Rabat et Tiflet: Ser. des Mines et de la Carte Géol. du Maroc, Notes et. Mém. No. 28, 80 p., 14 pl., 3 fig., [in French].

The writer illustrates (pl. 8) an *Endothyra* sp. (thin-section photomicrograph) from the Lower Carboniferous (Viséan) rocks of Tiflet, Morocco, North Africa. The endothyroids occur in an oolitic rock in which bryozoans are a conspicuous biotic component.

45. DOUGLASS, R. C., 1967, Permian Tethyan fusulinids from California: U. S. Geol. Survey Prof. Paper 593-A, 13 p., 6 pl., 4 text-fig., 3 tables.

Primarily a paper presenting faunal evidence (fusulinids) to show the existence of a shallow seaway from Japan to California during Early Permian time. One smaller foraminifer, a rather high-coned *Tetrataxis* sp., is described and illustrated by thin-section photomicrographs. This form is from the Early Permian Calaveras Formation of Amador County, in the western foothills of the Sierra Nevada, California.

46. DURKINA, A. V., 1959, On the Devonian and Carboniferous limits in the Timan-Petchora region. *IN*: Stratigraphy of the lower part of the Lower Carboniferous in the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 200-215, 2 text-fig., [in Russian].

The writer notes that in the Timan-Petchora region of the Soviet Union the lower boundary of the Lower Carboniferous is placed at a slight disconformity underlying the *Endothyra communis-E. kobeitusana* assemblage Zone. The Tournaisian Stage is further divided into 7 microfaunal assemblages based upon previously described smaller foraminifers.

47. DURKINA, A. V., 1959, Resolutions of the colloquium on stratigraphic problems of the base of the Lower Carboniferous. *IN*: Stratigraphy of the lower part of the Lower Carboniferous in the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 216-223, [in Russian].

The writer notes that 3 boundaries are commonly used in the Soviet Union to characterize the base of the Lower Carboniferous, these are: (1) the first appearance of *Endothyra communis* (base of the Ozerko-Khovansk Beds), (2) the acme of *E. communis* and first appearance of *E. kobeitusana* (base of Etroeungt), and (3) the extinction of the *E. communis-E. kobeitusana* assemblage (base of the Malevka). No majority agreement is found among the micropaleontologists working in the various regions of the Soviet Union, hence it is believed that additional studies are needed to be able to resolve the problem. They generally agreed on the need for coincidence in the stages and in the systems. The Famennian-Tournaisian boundary should be fixed at the Devonian-Carboniferous level.

48. EFIMOVA, N. A., 1961, On the Foraminifera of the Upper Permian and Lower Triassic of Armenia and Nachitchevan: Bull. M.O.I.P., otdel geol., n.s., v. 36, no. 6, p. 116-117, [in Russian].

The writer briefly summarizes the occurrences of smaller foraminifers (previously described taxa) from the Upper Permian-Lower Triassic passage beds, and in particular that of the Djulfiskian Stage, from Armenia and Nachitchevan, U.S.S.R.

49. EINOR, O. L., 1953, Materials of the All-Union Paleontological Society concerning the passage beds of the Lower to Middle Carboniferous: All-Union Paleont. Soc., Ann., v. 14, p. 264-272, [in Russian].

The Namurian rocks of the Second Baku region of the Soviet Union are subdivided into two microfauna horizons based upon previously described smaller foraminifers and Fusulinidae. The lower horizon is characterized by *Endothyra crassa* var. *sphaerica* [now *Endothyranopsis*], *Bradyina cribrostomata,* and *Archaediscus baschkiricus* [now *Asteroarchaediscus*]; the upper horizon is characterized by *Archaediscus gregorii.*

50. EINOR, O. L., 1954, New data on the stratigraphy of the Middle Carboniferous in the southern Fergan: Geol. Sbornik, Lvovskoe Geol. Obschestvo, No. 1, p. 180-190, [in Ukrainian].

The writer describes four Middle Carboniferous microfaunal assemblages from the carbonate rocks of Turkestan, U.S.S.R. The biostratigraphic zonation is based upon previously described species of Endothyridae, Palaeotextulariidae, Bradyinidae, Archaediscidae, and Fusulinidae.

51. EINOR, O. L., 1955, On the stratigraphy of the Viséan of the upper Bashkiria: Akad. Nauk S.S.S.R., Doklady, v. 103, no. 4, p. 689-692, [in Russian].

From the upper Bashkirian region of the Soviet Union, an incomplete Lower Carboniferous (Viséan) sequence rests unconformably on the Tournaisian interval and can be subdivided into seven foraminiferal assemblages. The smaller foraminifers, all previously described, indicate correlation with the Stalinogorsk-Protvae interval of the Russian Platform. [It is noted that the reported occurrences of *Archaediscus* ex. gr. *bashkiricus, Globivalvulina,* and *Eostaffella paraprotvae* would suggest a lower Namurian age for the upper portion of this sequence.]

52. EINOR, O. L., 1955, On the Bashkirian Stage in the mountainous Bashkiria: Akad. Nauk S.S.S.R., Doklady, v. 104, no. 1, p. 130-133, [in Russian].

From the mountainous region of Bashkiria, Soviet Union, the writer reports that four Middle Carboniferous (Bashkirian) microfaunal assemblages are utilized in biostratigraphically subdividing this interval. The microfaunal zonation is based upon previously described species of Archaediscidae, Bradyinidae, Lasiodiscidae, Endothyridae, and Fusulinidae.

53. ELISEEV, A. I., 1958, The stratigraphy of the Carboniferous of the southern part of the Chernychev Ridge: Akad. Nauk S.S.S.R., Doklady, v. 121, no. 2, p. 339-342, 1 text-fig., [in Russian].

From the region of the Chernyshev Ridge, near the Petchora River, U.S.S.R., a complete sequence of rocks ranging in age from Upper Devonian to Lower Permian is subdivided into 17 biostratigraphical units, characterized by previously described forms of smaller foraminifers or fusulinids. The base of the Lower Carboniferous is here regarded as the base of the acme *Endothyra communis* [now *Quasiendothyra*].

54. FEDOROVA, T., 1959, On the Devonian-Carboniferous limit in the Saratov region. *IN*: Stratigraphy of the lower part of the Lower Carboniferous in the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 127-130, [in Russian].

In the Volga region of the Soviet Union, the base of the Lower Carboniferous is placed at the first appearance of the foraminifer *Endothyra communis*. However, the writer notes that an appreciable hiatus could be present in the Upper Devonian sequence of this region.

55. FIEBIG, H., 1954, Der neue Richtschichtenschnitt für die Wittener (Esskohlen) Schichten im niederrheinisch-westfälischen Steinkohlengebiet: Glückauf, v. 90, no. 9/10, p. 260-270, 9 text-fig., [in German].

The writer reports the occurrence of agglutinated Foraminifera (*Ammodiscus, Glomospira, Glomospirella,* and *Hyperammina*) in the marine and limnic Middle Carboniferous cycles of West Germany. The distribution of the foraminifers, in addition to pelecypods and ostracodes, is shown on graphic sections. One thin-section photomicrograph of a hyperamminid foraminifer is shown on text-fig. 8.

56. FRANSSEN, L., 1967, Données nouvelles sur les Foraminifères du Tournaisien et du Viséen: Géol. Soc. Belgium, Ann., v. 90, 1966-67, Bull. 4, p. 571-583, 1 pl., 1 text-fig., 2 tables, [in French].

An examination of the Lower Carboniferous (lower and middle Tournaisian) of the Comblain region, in the eastern part of the Dinant synclinorium, Belgium, establishes a relationship between the rock lithology and foraminiferal content. The appearance, growth, and extinction of the smaller foraminifers are correlated with the decrease of

terrigenous deposits and the petrographic character of the limestone units. This relationship is pronounced for the lower and middle Tournaisian *Quasiendothyra* and *Chernyshinella* faunal Zones. During extinction of these faunal zones, an association of *Plectogyra*? ex. gr. *rudis* and single-chambered foraminifers appeared. The form *Palaeospiroplectammina tchernyshinensis* was discovered in the Tournaisian substages Tn1a and Tn3a. Preliminary data from examination of the middle and upper Tournaisian and the lower Viséan in the Walcourt region of the Dinant synclinorium reveal the presence of two associations of lower Viséan aspect. A few foraminifers are illustrated by representative thin-section photomicrographs on Plate 1, and all of the Viséan forms are listed on table 2.

57. FROMAGET, J., 1952, Études géologiques sur le Nord-Ouest du Tonkin et le Nord du Haut-Laos: Serv. Géol. Indochine, Bull., v. 29, pt. 6, 198 p., 8 pl., 22 text-fig., 1 map, [in French].

A microfauna of *Valvulina bulloides* [now *Globivalvulina*], *Spirillina chinensis*, *Textularia textulariformis* [now *Palaeotextularia*], *Endothyra parva*, *E. globulus* [now *Globoendothyra*] and *E. bowmani* is reported from the Carboniferous (Pennsylvanian) Moscovian limestones of Indochina, southeast Asia.

From the Permian rocks of this region the occurrence of the smaller foraminifer *Pachyphloia* cf. *P. pediculus* is also noted.

58. GALITSKAIA-GLADCHENKO, A, IA., 1960, On the stratigraphy of the Carboniferous in northern Kirgiztan: Akad. Nauk Kirgiz., Izvestia, ser. est. i teknik nauk, v. 2, no. 9, p. 5-22, 1 chart, [in Russian].

The writer describes 8 foraminiferal assemblage zones from the Carboniferous rocks of northern Kirgiztan, U.S.S.R. All taxa appear to be previously described and range in age from Lower Carboniferous (upper Tournaisian) to Middle Carboniferous (middle Namurian). [A number of the listed taxa appear to be *nomina nuda*. These include the following: *Tuberitina reitlingeri* var. *tenuissima*, *Quasituberitina minima*, *Hyperammina paraminima*, *H. paraminima* var. *crassa*, *H. paravulgaris*, *Eotuberitina crassa* var. *minima*, *Quasituberitina magna* var. *minor*, and *Plectogyra paraturrestanica*].

59. GERKE, A. A., 1961, *Rectoglandulina* in the Permian and the Lower Mesozoic of north-central Siberia: Leningrad Nauch.-Issled. Inst. Geol. Arktiki, Sbornik Stat. pal. i biostrat., Bull. 23, p. 5-34, 6 pl., [in Russian].

The author presents a complete revision of the foraminiferal genus *Rectoglandulina* Loeblich and Tappan. Three Lower Mesozoic new species are also described. All described forms (Permian-Lower Mesozoic) are illustrated by whole-specimen drawings. The Permian form *Pseudoglandulina pygmaeformis* Miklukho-Maklai is transferred to the genus *Rectoglandulina*. [The genus *Rectoglandulina* is currently considered to be synonymous with *Pseudonodosaria* Boomgaart.]

60. GOLUBSOV, V. K., and KEDO, G. I., 1959, On the discovery of the Yasnapoliansk Substage of the Lower Carboniferous in the Chernogov borehole: Akad. Nauk S.S.S.R., Doklady, v. 127, no. 1, p. 159-161, 1 text-fig., [in Russian].

The writers report a sparse microfauna of Lower Carboniferous age (Viséan) consisting principally of Archaediscidae and Endothyridae (all previously described) from the Chernigov borehole, U.S.S.R. This microfauna is equivalent to that from the upper Tula horizon of the Russian Platform.

61. GRAY, R. S., 1967, Cache Field- A Pennsylvanian algal reservoir in southwestern Colorado: Am. Assoc. Petroleum Geologists, Bull., v. 51, no. 10, p. 1959-1978, 27 text-fig.

The writer notes that smaller foraminifers are fairly common in the Pennsylvanian (Desmoinesian) foraminiferal-pelletal limestones associated with algal-plate carbonate mounds present in the Cache Field of southwestern Colorado. It is stated that foraminifers are plentiful (50% or more of the rock) and diversified. Encrusting calcareous types such as *Tuberitina*, *Tetrataxis* and *Hedraites*, and calcareous mobile types such as *Climacammina*, *Bradyina*, *Globivalvulina*, *Endothyra*, and fusulinids are abundant. Agglutinated mobile and encrusting types such as *Hyperammina* and *Minammodytes*? are also present. Text-figs. 14 and 16 illustrate some of the above forms.

62. GROZDILOVA, L. P., 1959, On the lower limit of the Carboniferous. *IN*: Stratigraphy of the lower part of the Lower Carboniferous in the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 82-84, [in Russian].

The writer notes that considerable doubt exists concerning the correlations of the calcisphaerid-rich Khovansk beds of the central part of the Russian Platform and the *Endothyra communis*-*E. kobeitusana* beds of the Urals. She therefore believes that the base of the Lower Carboniferous should be drawn at the base of the *Bisphaera* beds, which is the base of the Malevka Horizon.

63. GÜMBEL, C. W., 1879, Geognotische Beschreibung des Fichtelgebirges mit dem Frankenwalde und dem westlichen Vorlande. Pt. 3 of Geognostische Beschreibung des König-

reichs Bayern: 698 p., numerous text-figs. (unnumbered) and tables, 2 maps, [in German].

From the Lower Carboniferous rocks of the Fichtelgebirge (in East Germany) the writer reports the occurrence of the following foraminifers: *Trochammina incerta, Valvulina palaeotrochus, V. bulloides, Endothyra bowmani, E. ornata, E. ammonoides, Nodosinella digitata,* and *N. cylindrica.* [Most of these early names have been placed in synonymy by later workers.]

From the Permian Zechstein rocks near Burggrub, the writer reports the occurrence of *Nodosaria geinitzi, Trochammina pusilla,* and forms referred to the genera *Nodosaria, Dentalina,* and *Textularia.*

64. GUBLER, J., 1934, Traits généraux de la structure du Cambodge Nord-Occidental. Sa position tectonique dans le bâti de l'Indochine du Sud: Bull. Soc. Géol. France, 5ème sér., v. 3, no. 7-8, p. 583-596, 1 map, [in French].

Smaller foraminifers referred to the genus *Endothyra* are reported (p. 586) from the Lower Carboniferous phtanites of Cambodia, southeast Asia.

65. GÜVENC, T., 1966, Representants des Beresselleae (Algues calcaires) dans le Carbonifère de Turquie et description d'un nouveau genre: *Goksuella* n.g.: Bull. Soc. Géol. France, 7ème sér., v. 7, p. 843-850, pl. 32, 1 text-fig., 3 tables, [in French].

Primarily a paper describing Late Paleozoic algal floras, however two Middle Carboniferous microfaunas are reported from algal-bearing horizons in the Taurus Mountains, Turkey. A Bashkirian (Lower Pennsylvanian) horizon is characterized by *Bradyina* sp. aff. *B. nautiliformis, B. venusta, B. sphaeroidea, Archaediscus* sp., *Moravammina carbonica,* and *Eotuberitina reitlingerae.* A younger Moscovian (Middle Pennsylvanian) horizon contains *Bradyina sphaeroidea, Neotuberitina maljavkini, Palaeonubercularia fluxa,* and *Tetrataxis numerabilis.*

66. GÜVENC, T., 1966, Description de quelques espèces d'algues calcaires (Gymnocodiacées et Dasycladacées) du Carbonifère et du Permien des Taurus occidentaux (Turquie): Rev. Micropaléontol., v. 9, no. 2, p. 94-103, 3 pl., 3 tables, [in French].

Primarily a paper describing a number of new Upper Paleozoic algae from the Taurus Mountains of Turkey. The writer notes that the stratigraphic age of the algae-bearing beds is disclosed by the characteristic microfacies associations: *Geinitzina, Glomospira, Glomospirella, Eotuberitina, Pachyphloia,* and *Agathammina* for the Permian, and *Plectogyra* for the Viséan (Lower Carboniferous).

67. ILYNA, N. S., 1953, New data on the stratigraphy of the Lower Carboniferous deposits in the Surs-Mokchinsk Uplift: Akad. Nauk S.S.S.R., Doklady, v. 91, no. 5, p. 1191-1194, [in Russian].

The writer reports an abbreviated Lower Carboniferous (Tournaisian) rock sequence from the Surs-Mokchinsk Uplift region of the Soviet Union. This section is subdivided into 3 foraminiferal horizons based upon the bisphaerids, tournayellids, and problematical forms of unknown affinity. An important hiatus separates the Chernyshinsk from the overlying Viséan sequence which is subdivided into 4 zones based on Archaediscidae and Endothyridae. These are tentatively correlated with the Tula-Serpukhev interval of the Russian Platform. All taxa have been previously described.

68. JODOT, P., 1932, Sur le bassin dinantien de la Tour Margine ruinée dit de Capitello (Corse NW): Soc. Géol. France, Bull., ser. 5, v. 2, p. 605-611, [in French].

The writer reports a microfauna of *Ammodiscus, Nodosinella, Archaediscus,* and *Endothyra* sp. cf. *E. bowmani,* from the Lower Carboniferous Capitello Limestone of northwest Corsica. [The Capitello Limestone is now regarded as Upper Devonian (highest Famennian) or lowermost Tournaisian (Lower Carboniferous).]

69. KAISIN, F., 1926, Les Roches du Dinantien de la Belgique: C.R., 13th Int. Géol. Cong. (1922), Belgium, v. 3, p. 1237-1269, pl. 27-32, [in French].

The writer reports the following smaller Foraminiferal genera as occurring in rocks of the Lower Carboniferous (Tournaisian) Waulsortian facies of Belgium: *Endothyra, Lagena* [probably *Earlandia* or *Earlandinita*], *Textularia* [now *Palaeotextularia*], *Saccammina* [now *Saccamminopsis*], *Climacammina,* and *Valvulina* [now *Tetrataxis*].

The problematical form *Calcisphaera* aff. *C. fimbriata* Williamson is referred to the Foraminifera, and it is noted that these forms commonly occur in sapropelic and lagoonal rock facies.

Excellent microfacies photomicrographs are included, and a few foraminifers are identified in some of the photomicrographs.

70. KILIGINA, M. L., and CHELNOVA, A. K., 1959, On the Devonian-Carboniferous limit in Tataria and on the zonation of the terrigenous sediments of the Lower Carboniferous. *IN*: Stratigraphy of the lower part of the Lower Carboniferous of the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 97-103, 1 text-fig., [in Russian].

The writer notes that the base of the Lower Carboniferous (Tournaisian) in Tataria, Soviet

Union, is drawn at the first appearance of *Endothyra communis, E. antiqua,* and *E. primaeva.* The Kizel Horizon, characterized by *E. latispiralis* [now *Latiendothyra*], *E. spinosa* [now *Spinoendothyra*], and *Spiroplectammina tchernyshinensis* [now *Palaeospiroplectammina*], is considered as Tournaisian age.

71. KNÜPFER, J., 1967, Zur Mikrofauna aus dem unteren Teil des Zechsteins von Rügen: Freiberger Forsch., C-213, p. 73-99, 5 pl., 2 text-fig., [in German].

Four wells drilled on Ruegen Island (Mecklenburg, north Germany) encountered the Zechsteinkalk Member of the Upper Permian Zechstein Formation in different facies. Three wells found soft, calcareous, shaly, clayey deposit containing ostracodes, foraminifers, scolecodonts, conodonts, and bryozoans. The northeastern-most location had unfossiliferous red-brown and green-gray, clayey sandstone, indicating non-marine Zechstein. The writer lists 22 previously described smaller foraminifers from the marine Zechsteinkalk Member representing the following genera: *Ammodiscus, Ammobaculites, Agathammina, Aschemonella, Ammovertella, Calcitornella* [now *Hedraites*], *Frondicularia, Geinitzina, Glomospira, Glomospirella, Lingulina, Lunucammina, Lituotuba, Nodosaria,* and *Spandelinoides.*

72. KOCHANSKY-DEVIDÉ, V., 1967, Neoschwagerinenschichten einer Tiefbohrung in Istrien (Jugoslawien): N. Jb. Geol. Paläont. Abh., v. 128, no. 2, p. 201-204, pl. 15-16, [in German].

A deep borehole near Rovinj (south of Trieste), Jugoslavia, penetrated a section of Jurassic, Triassic, and Permian rocks. The writer studied the rocks of the Permian interval and from two principal foraminifer-bearing beds she has listed a number of previously described genera of smaller Foraminifera and fusulinids. Some of the microfauna is illustrated by rather poor thin-section photomicrographs of randomly oriented specimens.

73. KRYLATOV, S., and MAMET, B., 1966, Données nouvelles sur les terrains paléozoiques de l'Argentella-Tour Margine (Corse). Attribution à la limite dévono-carbonifère du calcaire de Capitello: Soc. Géol. de France, Bull., 7th ser., v. 8, p. 73-79, 2 text-fig., 1 table, [in French].

The Capitello Limestone of Corsica, originally described as Lower Carboniferous (Viséan) in age, is shown to contain a microfauna dominated by a *Quasiendothyra* of the group *Q. communis-Q. communis communis.* This microfauna appears to be correlative with assemblages observed in the Upper Devonian (Famennian)-Lower Carboniferous (Tournaisian) passage beds of northern France. Table 1 shows the stratigraphic distribution of the Capitello Limestone microfauna on Corsica.

74. LIBROVITCH, L. S., 1961, The lower boundary of the Carboniferous System and criteria for its determination: IV Congrès pour l'advancement de la stratigraphie du Carbonifère, Heerlen (1958), C.R., v. 2, p. 375-379, [in English].

The Etroeungt Zone in the Ural region of the Soviet Union contains the foraminifers *Septatournayella, Quasiendothyra kobeitusana,* numerous *Endothyra communis* [now *Quasiendothyra*], as well as rare *Tournayella, Brunsiina, Brunsia, Chernyshinella, Glomospiranella, Spiroplectammina* [now *Palaeospiroplectammina*], *Klubovella,* and *Cribroendothyra.*

It is emphasized that the Devonian-Carboniferous boundary is to be placed at the base of this zone. However, on the Russian Platform the lower boundary of the Carboniferous should not be drawn higher than at the base of the Khovansk Beds. Whether the Ozerko Horizon belongs to the Devonian or to the Lower Carboniferous remains unsettled.

75. LIPINA, O. A., 1959, On the Devonian-Carboniferous boundary in the oriental part of the Russian Platform and the western slope of the southern Urals. *IN*: Stratigraphy of the lower part of the Lower Carboniferous of the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 31-50, 1 text-fig., 2 tables, [in Russian].

The writer presents a comparison of various biostratigraphic sequences used in discussing the biostratigraphy of the Ural region of the Soviet Union. The Upper Devonian-Lower Carboniferous boundary (Famennian-Tournaisian) is drawn at the acme of *Endothyra communis,* which usually coincides with the first appearance of *E. kobeitusana.* It is noted the *E. communis* appears early within the *Septatournayella rauserae* Zone. The Malevka horizon is drawn at the disappearance of *Endothyra communis,* which usually coincides with the appearance of *Bisphaera.* The Cherepet horizon is recognized with the appearance of *Chernyshinella glomiformis.*

76. LUCAS, G., 1942, Description géologique et pétrographique des Monts de Ghar Rouban et du Sidi el Abed: Serv. Carte Géol. Algérie, Bull. 2ème sér., No. 16, 538 p., 34 pl., 13 text-fig., [in French].

A lower Carboniferous microfauna of *Valvulina* [= *Tetrataxis*], *Ammodiscus* [*Brunsia*?], *Trochamminoides* [now *Forschia* and/or *Forschiella*], and *Endothyra* is briefly noted and illustrated by line drawings. The foraminifers are from the

Viséan Ain Tiliouine Limestones of North Africa (border region of Algeria and Morocco).

77. LUDBROOK, N. H., 1965, Minlation and Stansbury stratigraphic bores, subsurface stratigraphy and micropalaeontology. *IN*: Crawford, A. R., The geology of Yorke Peninsula: Geol. Survey South Australia, Bull., No. 39, Appendix, p. 83-96, 2 tables.

The Minlaton Bore on Yorke Peninsula, South Australia, penetrated 596 feet of Lower Permian (lowermost? Sakmarian) glacigenes containing a typical Permian smaller foraminiferal assemblage, principally agglutinated forms (all previously described).

The Stansbury Bore, in the same general location, penetrated Lower Permian (lowermost? Sakmarian) glacigenes 776 feet thick and contained a microfauna similar to that noted in the Minlaton Bore. It is noted that the foraminiferal assemblage appears to be most nearly related to that recorded by Crespin (1958) from a section in the Lower Permian Quamby Mudstone from near Oonah, Tasmania.

78. MALAKHOVA, N. P., 1941, The stratigraphic section of the deepest bore-hole in the center of the Russian Platform: Akad. Nauk S.S.S.R., Izvestia, ser. geol. No. 4-5, p. 97-111, [in Russian, with English summary].

A borehole in the Polometsk Uplift, in the center of the Russian Platform, U.S.S.R., has disclosed a complete Permo-Carboniferous section. The upper portion is zoned on fusulinids and megafauna. The lower portion of the section is zoned on smaller foraminifers; two Viséan, one Namurian, and one Bashkirian horizon are recognized and zoned on the basis of the enclosed Endothyridae and Archaediscidae. [All taxa have been previously described, with the exception of the foraminifer *Hyperammina intermedia,* which, to the compilers' knowledge, appears to be a *nomen nudum.*]

79. MALAKHOVA, N. P., 1949, On the Chernyshin Limestone of the western slope of the middle Urals: Akad. Nauk S.S.S.R., Doklady, v. 65, no. 3, p. 349-351, [in Russian].

The writer notes that the lower limits of the Chernyshin horizon (Lower Carboniferous) along the western slope of the Ural Mountains, U.S.S.R., is conveniently placed at the first appearance of the foraminifer *Spiroplectammina tchernyshinensis* [now *Palaeospiroplectammina*]. The upper limit of the unit is placed at the first occurrence of *Endothyra spinosa* [now *Spinoendothyra*].

80. MALAKHOVA, N. P., 1950, Some new data on the limestones of the Shartymbo River region of the southern Urals, U.S.S.R.: Akad. Nauk S.S.S.R., Doklady, v. 74, no. 2, p. 349-352, [in Russian].

Five foraminiferal assemblages are reported from the limestones of the Shartymbo River region of the southern Urals, U.S.S.R. These microfaunal assemblages are composed of previously described species of Archaediscidae, Biseriamminidae, Palaeotextulariidae, and Endothyridae. [Analysis of the microfaunal lists indicates that these assemblages range in age from Lower Carboniferous (upper Viséan) to Middle Carboniferous (middle Namurian).]

81. MALAKHOVA, N. P., 1951, Foraminifera of the Carboniferous complex in the western slope of the middle and northern Urals: Akad. Nauk S.S.S.R., Doklady, v. 81, no. 6, p. 1117-1120, [in Russian].

The writer reports that the Lower Carboniferous (Viséan) terrigenous sequence of the western slope of the northern and middle Ural Mountains, U.S.S.R., can be subdivided into four microfaunal assemblages. These microfaunal assemblages are composed of both fusulinids and smaller foraminifers; all taxa have been previously described.

82. MALAKHOVA, N. P., 1953, Some new data concerning the age of the Carboniferous in the Sikhai Log region, on the eastern slope of the middle Urals: Akad. Nauk S.S.S.R., Doklady v. 88, no. 3, p. 535-537, [in Russian].

The writer reports two foraminiferal assemblages, composed principally of previously described taxa of the Archaediscidae and Endothyridae, from the Carboniferous rocks of the middle Urals, U.S.S.R. [Evaluation of the microfaunal lists suggests a probable middle to upper Viséan age for this group of rocks.]

83. MALAKHOVA, N. P., 1956, The most important stages of evolution of the foraminifers in the Lower Carboniferous of the Urals: Akad. Nauk S.S.S.R., Doklady, v. 106, no. 6, p. 1076-1079, [in Russian].

The writer reports that the Lower Carboniferous rocks of the Ural Mountains, U.S.S.R., can be stratigraphically zoned and characterized by distinctive foraminiferal assemblages. The Upper Devonian (Famennian) displays abundant forms of *Caligella, Bisphaera,* and *Archaesphaera.* The uppermost Devonian (Famennian) and lowermost Carboniferous (Tournaisian) passage beds are zoned on species of *Quasiendothyra.* The Tournaisian is recognized by the presence of *Spiroplectammina* [no *Palaeospiroplectammina*], *Tournayella,* and *Biseriammina.* The lower Viséan carries *Haplophragmella, Lituotubella,* and *Tetrataxis,* whereas the middle and upper Viséan are characterized by the development of the Archaediscidae, *Cribrospira, Cribrostomum,* and *Monotaxis* [now

Howchinia]. The upper limit of the Viséan is difficult to ascertain with certainty. [The Viséan-Namurian boundary should perhaps be chosen in a higher horizon, e.g., at the *Eostaffella protvae* level, since such a level is known to occur high in the E_2 of western Europe.]

84. MALAKHOVA, N. P., 1957, New Lower Carboniferous foraminiferal species of the Urals: Akad. Nauk S.S.S.R., Ural Filial, Gorno Geol. Inst., Trudy, Bull. 28, p. 3-8, 2 pl., [in Russian].

Nine species of smaller foraminifers are described from the Lower Carboniferous (Tournaisian and Viséan) rocks of the Ural Mountains, U.S.S.R. Of the 9 described species 7 are new. The new forms are: *Forschiella mikhailovi, Lituotubella einori, Permodiscus reftus, Endothyra*(?) *tschikmanica, E. superlata, Quasiendothyra*(?) *tulensis,* and *Rectocornuspira cumulata*. All described species are illustrated by thin-section photomicrographs. One new fusulinid is also described and illustrated.

85. MALAKHOVA, N. P., 1959, On the lower and upper limits of the Tournaisian in the Urals. *IN*: Stratigraphy of the lower part of the Lower Carboniferous of the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 146-155, 1 text-fig., 1 table, [in Russian].

The writer notes that the base of the Lower Carboniferous (Tournaisian) is placed at the base of the *Endothyra communis-E. primaeva-E. kobeitusana* assemblage Zone in the Ural region of the Soviet Union. The upper limit of the Tournaisian is placed at the top of the Chikman Horizon, marked by the appearance of *Tournayella molleri* and *Palaeotextularia diversa*. [The microfauna of the lower Viséan, *sensu* Malakhova, is observed in the upper Tournaisian of the type-locality; see Mamet, 1965 and Ganelina, 1966.]

86. MAMET, B., CHOUBERT, G., and HOTTINGER, L., 1966, Notes sur le Carbonifère du jebel Ouarkziz Etude du passage du Viséen au Namurian d'après les Foraminifères: Notes du Serv. géol. du Maroc, v. 27 (Notes et mém. no. 198), p. 6-21, 4 pl., 4 text-fig., [in French].

The writers report and discuss the foraminiferal assemblages and associations present in the Lower Carboniferous (Viséan and lower Namurian) rocks of North Africa. The North African foraminiferal sequence is compared and contrasted with that present in northern England and at the type localities in Belgium, and both similarities and differences noted. Four plates of characteristic rock-types (low-power photomicrographs) present in the North African sections are also included.

87. MARUCHKIN, I. A., 1962, New data on the stratigraphy of the Upper Paleozoic sediments of the basin of the Koksu River (Alai Ridge): Univ. Visnyk, Lvov, ser. geol., No. 1, p. 25-31, 2 text-fig., [in Ukrainian].

The writer reports the occurrence of at least five different microfaunal assemblages (fusulinids and smaller foraminifers) from the Middle and Upper Carboniferous and Lower Permian sediments of the Koksu River basin of central Asia. [All taxa have been previously described, with the exception of the foraminifer *Bisphaera tireoularis* Birina, which appears to be a *nomen nudum*; or perhaps, it is a misprint of *B. irregularis*?]

88. MURRAY, F. N., and CHRONIC, J., 1965, Pennsylvanian conodonts and other fossils from insoluble residues of the Minturn Formation (Desmoinesian), Colorado: Jour. Paleontology, v. 39, no. 4, p. 594-610, pl. 71-73, 2 text-fig.

A study of the conodont microfauna derived from acid residues has shown that a thin limestone interval within the Miniturn Formation, exposed in northwestern Colorado, is of Middle Pennsylvanian (Desmoinesian) age. Associated with the conodonts are agglutinated foraminifers referred to the genera *Ammodiscus, Tolypammina* [now *Minammodytes*], and *Ammovertella.*

89. ORLOV, YU. A., RAUSER-CHERNOUSSOVA, D. M., and FURSENKO, A. V., 1959, Fundamentals of paleontology (Osnovy Paleontologii), General Part-Protozoa, Akad. Nauk S.S.S.R., Moscow, [English translation published for the National Science Foundation by the Israel Program for Scientific Translations, Jerusalem, 1962, 728 p., 13 pl., 1088 text-fig.].

Primarily a manual for the use of Soviet paleontologists and geologists. Included are a number of new Paleozoic family and subfamily designations, these include the following; (A) for pre-Carboniferous smaller foraminifers: a new Upper Devonian genus, *Cribrosphaeroides* Reitlinger, for *Cribrosphaera* Reitlinger, 1954; erection of the new family Caligellidae Reitlinger to include 6 Upper Devonian genera (*Caligella, Evlania, Paracaligella, Baituganella, Paratikhinella,* and *Tikhinella*); erection of the new subfamily Colaniellinae Fursenko to include 3 Upper Devonian to Upper Permian genera (*Multiseptida, Colaniella,* and *Wanganella*); erection of the new subfamily Nanicellinae Fursenko to include 5 Upper Devonian to Upper Permian genera (*Nanicella, Gourisina, Robuloides, Pararobuloides,* and *Eocristellaria*); erection of the new family Pseudopalmulidae Bykova to include 3 Devonian genera (*Pseudopalmula, Paratextularia,* and *Semitextularia*); (B) for Late Paleozoic smaller foraminifers: a new name, *Turrispiroides* Reitlinger, for *Turrispira* Reitlinger, 1950; erection of the new subfamily Haplophragmellinae Reitlinger to include 4 Carboniferous genera (*Mstinia, Endothyrina, Haplophragmella,* and *Haplophragmina*); erection of the new family Lasiodiscidae Reitlinger to include 5 Carboniferous and Permian genera (*Howchinia, Monotaxinoides, Eolasiodiscus, Lasiodiscus, and Lasiotrochus*); erection of the new genus *Planoendothyra* Reitlinger with the type species *Endothyra aljutovica* Reitlinger, 1950; erection of the new subfamily Chernyshinellinae Reitlinger which includes 2 Lower Carboniferous genera (*Chernyshinella,* and *Chernyshinellina*); erection of the new genus *Chernyshinellina* Reitlinger with *Ammobaculites pygmeus* Malakhova, 1954, as the type species; erection of the new subfamily Plectogyrinae Reitlinger which includes 5 Carboniferous to Permian genera (*Plectogyra, Plectogyrina, Globoendothyra, Mikhailovella,* and *Endothyranella*); erection of the new genus *Plectogyrina* Reitlinger with *Endothyra? fomichaensis* Lebedeva, 1954, as the type species; erection of the new genus *Globoendothyra* Reitlinger with *G. pseudoglobulus* Reitlinger *nom. nov.* as the type species (= *Endothyra globulus* Moeller, 1878, *non* Eichwald); and erection of the new subfamily Endothyranopsinae Reitlinger which includes 2 Devonian to Lower Carboniferous genera (*Endothyranopsis,* and *Rhenothyra*). Representative thin-section photomicrographs are given for each of the new forms.

90. PETRYK, A. A., 1967, Mississippian Foraminifera of southwestern Alberta: Geol. Survey Canada, Rept. Activities, Paper 67-1, pt. A, p. 105.

The writer announces the beginning of a study of the systematics and distribution of Foraminifera within the Mississippian rocks of southwestern Alberta, Canada. Preliminary examination of about 700 samples from the Livingstone, Mount Head, and Etherington Formations indicates that species of the following genera are represented within these units: *Earlandia, Endothyra, Stacheia, Stacheoides, Tournayella, Brunsia, Palaeotextularia*?, and *Tetrataxis*?.

91. PIRLET, H., 1967, Nouvelle interprétation des carrières de Richelle: le Viséen de Visé: Géol. Soc. Belgium, Ann., v. 90, 1966-67, Bull. 4, p. 299-328, 1 pl., 2 text-fig., 2 tables, [in French].

The microfossils (principally algae and smaller foraminifers, all previously described) from a composite section of the Lower Carboniferous (Viséan) in the Richelle Quarries at Visé, Belgium, indicate that the region underwent several epeirogenic movements. Five stratigraphic breaks are recognized. The stratigraphic section exposed in the Richelle Quarries comprises the Upper Devonian (Frasnian) and the Lower Carboniferous (lower Viséan, parts of the middle Viséan and upper Viséan). The Tournaisian and the Famennian are absent in the quarries, but are present on the Visé Massif and at the "la Folie" Quarry near the village of Berneau. The Viséan rests unconformably on the Devonian of the Visé Massif. A list of the smaller foraminifers and their stratigraphic range is given on table 2.

92. POTIEVSKAIA, P. D., 1964, Some fusulinids and small Foraminifera in the Bashkir sediments of the greater Donets Basin: Akad. Nauk U.S.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. 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.*

93. 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 brief English summary].

This article deals with the distribution of 9 families, 23 genera, and 56 species of smaller foraminifers present in the Upper Devonian (Famennian) and Lower Carboniferous (Tournaisian) carbonates of the Tian-Shan Mountains, asiatic Soviet Union. Five foraminiferal assemblages are recognized and compared with the previously established microfaunal zones of European Russia. [The writer notes two new genera, *Quasituberitina* and *Exseroammodiscus,* plus a number of new species; all are not properly described or illustrated and hence must be regarded as *nomina nuda.* Some of these forms were properly described in a later publication by Purkin, *et al.*, 1961.]

94. RAGGATT, H. G., and CRESPIN, I., 1941, Geological notes on Natural Gas and Oil Corporation's bore at Balmain, city of Sydney, New South Wales: Australian Jour. Sci., v. 4, p. 102-103.

A bore hole into the Permian Upper Coal Measures at Balmain, Sydney, New South Wales, Australia, penetrated a varied sequence of strata. Smaller Foraminifera have been found in a few intervals; at 4,750 feet *Hyperamminoides* sp., productid brachiopod spines, and ostracodes are common, whereas, at 4,760 feet the foraminifer *Trochammina* sp. is a commonly occurring constituent.

95. RAILEANU, G., and RUSU, A., 1963, Contribution à la connaissance du Carbonifère inférieur dans la zone de Drencova (Banat): Revue de Géologie et de Géographie, Acad. Rep. Pop. Romine, v. 7, no. 1, p. 401-408, 4 pl., 1 text-fig., [in French].

The writers briefly describe and illustrate a Lower Carboniferous (Viséan) smaller foraminifer (*Plectogyra* sp.) occurring in a limestone pebble in the Drencova zone, Banat region of Rumania, eastern Europe.

96. RAZNITSIN, V. A., 1959, The lower Tournaisian in the southern Timan. *IN*: Stratigraphy of the lower part of the Lower Carboniferous of the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 177-199, 5 text-fig., [in Russian].

The writer notes that in the southern Timan region of the Soviet Union the Lower Carboniferous (Tournaisian) is subdivided into two microfaunal assemblages. Both of the assemblages are equivalent to the Etroeungt of western Europe and are characterized by the *Endothyra communis-E. kobeitusana* assemblage. [The reported presence of the foraminifer *Forschia* in the lower Tournaisian is probably due to confusion with a tournayellid].

97. REDICHKIN, N. A., 1966, Lower Carboniferous sediments on the southeastern flank of the Azov Swell: Akad. Nauk S.S.S.R., Doklady, v. 170, no. 1, p. 186-188, [in Russian; English translation *IN*: Doklady ESS, v. 170, p. 179-181, American Geol. Inst.].

In 1953, the Peschanokopskoye test hole No. 1 was drilled on the southeastern flank of the Azov Swell of Precambrian rocks, U.S.S.R. This well penetrated terrigenous to extrusive rocks and highly metamorphosed and deformed rocks with thin partings of limestone at a depth of 2516.0 to 2737.9 m. The foraminiferal microfauna from this interval consists of previously described species of smaller foraminifers that tend to suggest a Lower Carboniferous (middle Viséan) age for this horizon. These deposits can be correlated with the middle Viséan Bobrikovka Horizon of the standardized scheme for the Carboniferous.

98. REITLINGER, E. A., 1959, On the Ozerkho-Khovansk beds in the central part of the Russian Platform. *IN*: Stratigraphy of the lower part of the Lower Carboniferous of the Volga-Ural district of the Russian Platform: V.N.I.G.R.I., No. 14, p. 51-73, 3 text-fig., 1 table, [in Russian].

The writer stresses the difficulties encountered in extending the *Quasiendothyra* zonation into regions outside the Urals. It is noted that the limestones of the central part of the Russian Platform are devoid of multilocular foraminifers, hence the zonation in this region must, by necessity, be based entirely on calcisphaerids and simple monolocular foraminifers.

The writer advocates that the Devonian-Carboniferous boundary should be drawn at the stratigraphic interval in which *Quasiendothyra kobeitusana-Endothyra communis* become extinct.

99. REITLINGER, E. A., 1965, On the development of the Foraminifera of the Upper Permian and Lower Triassic in Transcaucasia: Akad. Nauk S.S.S.R., Voprosy Mikropaleontologii No. 9, p. 45-70, 2 pl., 4 text-fig., 2 tables, [in Russian].

A lucid discussion of the development of foraminiferal assemblages from Late Permian time into the Lower Triassic as seen in the Transcaucasia region of the Soviet Union. It is noted that the Lower Triassic is characterized by the elimination of most Paleozoic foraminiferal genera, although there are a few genera that cross the Permo-Triassic boundary, among which are: *Eoendothyra, Cornuspira, Hemigordius, Nodosaria, Dentalina, Lingulina, Geintzina,* and *Spandelina*.

Four new genera and 5 new species are described and illustrated by thin-section photomicrographs and some whole-specimen photomicrographs. The new forms are: *Neoendothyra reicheli* in the Endothyridae, *Dagmarita chanakchiensis* and *Paraglobivalvulina mira* in the Biseriamminidae, *Baisalina pulchra* in the Miliolidae, and *Pseudotristix solida* in the Lagenidae.

100. REITLINGER, E. A., 1966, Some problems of classification and evolution of endothyrids and primitive fusulinids: Voprosy Mikropaleontologii, Akad. Nauk S.S.S.R., Otdel, nauk o zemle, Geol. Instit., v. 10, p. 39-67, 3 pl., 3 text-fig., 2 tables, [in Russian].

The writer presents a lucid discussion of the problems involved in the systematic classification and study of evolutionary lineages of Lower Carboniferous endothyroid smaller foraminifers and Lower and Middle Carboniferous fusulinid foraminifers. Significant forms are illustrated by thin-section photomicrographs.

101. RENZ, C., and TRIKKALINOS, J., 1948, Foraminiferenfunde im Oberkarbon und Perm des Ägaleos-Gebirges bei Athen: Schweiz. Naturfor. Gessel. Verhand., v. 128, p. 147-148, [in German].

The writers report an Upper Carboniferous fauna of smaller foraminifers (*Bradyina, Globivalvulina, Hemigordius, Endothyra, Glomospira, Climacammina, Agathammina,* and *Tetrataxis*) and fusulinids, and a Lower Permian fauna of both smaller foraminifers (*Colaniella, Padangia, Pachyphloia,* and *Hemigordius*) and fusulinids from the rocks of the Agaleos Mountains near Athens, Greece.

102. RZEHAK, A., 1884, Paläontologische Notiz: Verhandl. des naturforschenden Vereins in Brünn, v. 21, p. 36, [in German].

A brief note mentioning the occurrence of the smaller foraminifers *Endothyra* sp., *Climacammina* sp., *Tetrataxis* sp., and *Archaediscus* sp. in the Lower Carboniferous (upper Viséan) rocks (Kohlenkalk) of Krakau, Poland.

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

Primarily a paper on the fusulinid microfauna of the Carboniferous and Permian rocks of the Atetsu Limestone of western Japan. One smaller foraminifer identified as *Quasiendothyra* sp., from the Lower Pennsylvanian Kodani Formation, is illustrated by thin-section photomicrographs on plate 21. [The genus *Quasiendothyra* Rauser-Chernoussova is restricted to rocks of Upper Devonian-Lower Carboniferous age. The Japanese form noted above appears to be misidentified; most likely, it is a random section through an *Endothyra*].

104. SADA, K., 1967, Fusulinids of the *Millerella* Zone of the Taishaku Limestone (Studies of the stratigraphy and the microfossil faunas of the Carboniferous and Permian Taishaku Limestone in west Japan, No. 1): Palaeont. Soc. Japan, Trans. Proc., n. s., No. 67, p. 139-147, pl. 13-14, 4 tables.

From the Lower Pennsylvanian *Millerella* Zone of the Taishaku Limestone of western Japan, the writer reports the occurrence of the smaller foraminifers *Endothyra* sp., and *Chernyshinella* sp., illustrated by representative thin-section photomicrographs. [To the compilers' knowledge the foraminifer *Chernyshinella* is a characteristic Tournaisian genus; it is believed that reported occurrences of this form in Upper Carboniferous rocks result from mis-identification.]

105. SANSCHAGRIN, R., 1964, Magdalen Islands: Geol. Rept. 106, Prov. Quebec, Canada, 58 p., 12 pl., 5 text-fig., 3 tables.

The writer reports the presence of the smaller foraminifer *Nodosinella* sp. [misidentified; probably an earlandiid-type] in the Lower Carboniferous Upper Windsor limestones (Bassin-aux-Huîtres Member) of the Magdalen Islands in the Gulf of St. Lawrence. [The form *Nodosinella clarkei,* originally identified by Beede in 1910 and mentioned in the present paper, is probably not a foraminifer.]

106. SAURIN, E., 1935, Études géologiques sur l'Indochine du Sud-Est (Sud Annam-Cochinchine-Cambodge orittal): Serv. Géol. Indochine, Bull., v. 22, pt. 1, 419 p., 15 pl., 50 text-fig., 1 map, [in French].

The writer mentions the occurrence of the smaller foraminifers *Spirillina* cf. *S. plana, Trochammina incerta, Climacammina* sp., *Endothyra* sp., and *Lagena* sp., from the Moscovian (Pennsylvanian) rocks of Kratjé Province, French Indo-China, southeast Asia.

107. SHRUBSOLE, G. W., 1885, On the occurrence of *Calcisphaera* (Williamson) in the Mountain Limestone of the Eglwyseg rocks, near Llangollen: Chester Soc. Nat. Sci., Lit., and Art, Proc., v. 3, p. 106-110.

The writer discusses the origin and affinity of the problematic form *Calcisphaera* that he found in the Lower Carboniferous Mountain Limestones of north Wales. He attempts to refute the arguments expressed by Williamson who regarded these small spherical bodies as radiolarians. Quite prophetically the writer notes: "that among the species of *Calcisphaera* which he has described [Williamson], future research will show that there are included both Foraminifera and Radiolaria." [The exact type locality of Williamson's material is unknown, but rock samples from the region of Mold, Flintshire, show that the original *Calcisphaera* include *Calcisphaera, Parathurammina,* and *"Radiosphaera."*]

The writer also notes the occurrence of the foraminifer *Saccamminopsis* in a higher Mountain Limestone horizon at Minera, north Wales.

108. SOLOVIEVA, M. N., and KRASHENINIKOV, V. A., 1965, Some general comparisons of foraminiferal complexes and stratigraphy of the Middle Carboniferous of Africa and of the Russian Platform: Akad. Nauk S.S.S.R., Voprosy Mikropaleontologii, No. 9, p. 3-44, 3 pl., range chart, correl. table, [in Russian].

The Um-Bogma Formation near Suez, Egypt, formerly dated as Lower Carboniferous (Viséan) is now thought to be Middle Carboniferous Westphalian C and correlative to the Kachira Horizon of the Moscovian. A microfauna of 17 smaller foraminifers, of which 6 are new, is described and illustrated by thin-section photomicrographs. The new forms are: *Trepeilopsis mollis, Glomospiroides nuperus, Hemigordius saidi, H. exsertus, Plectogyra futila,* and *Bradyina ponikarovi.* Some fusulinids are also described and illustrated.

This microfauna shows many similarities to that observed on the Russian Platform.

109. SOSIPATROVA, G. P., 1967, Complexes of Foraminifera from the Upper Paleozoic deposits of the Spitsbergen Islands: Akad. Nauk S.S.S.R., Doklady, v. 176, no. 1, p. 182-185, 1 text-fig., [in Russian].

Upper Paleozoic deposits crop out in a wide area in the Spitsbergen Archipelago. Age determinations have been based upon foraminiferal assemblages, both fusulinids and smaller foraminifers. Thirteen foraminiferal complexes (all previously described taxa) have been identified and used in the biostratigraphic correlation of numerous measured sections. The foraminiferal microfaunas show similarities with those described from the Ural Mountains and the Russian Platform.

110. TCHERBACHOV, O. A., GARAN, I. M., POSTOIALKO, M. V., BURYLOVA, R. V., VOSHAKIN, M. A., and PIROZKHOVA, Z. A., 1964, On the stratigraphy of the Tournaisian and Viséan boundary in the middle Urals (recent data on the profile along the railway between the lower and upper Gubakha): Akad. Nauk S.S.S.R., Doklady, v. 158, no. 1, p. 112-115, 1 text-fig., [in Russian].

The writers present an accurate listing of the occurrences of previously described smaller foraminifers, corals, brachiopods, and spores encountered in the Lower Carboniferous passage beds of the Kizel and Kosva Formations, middle Urals, U.S.S.R. The lower Viséan interval, previously thought to be restricted to the Kizel region, is now recognized within the Gubakha region. The lowermost Viséan beds are characterized by the appearance of *Haplophragmella* sp., *Globoendothyra* sp., *Dainella chomatica,* and *D. elegantula.*

111. TOMLINSON, C. W., 1929, The Pennsylvanian System in the Ardmore Basin: Oklahoma Geol. Survey, Bull. 46, 79 p., 20 pl., 3 text-fig.

The writer presents an overall discussion of the Pennsylvanian rocks of the Ardmore Basin of south-central Oklahoma. Lists of occurrences of smaller foraminifers in some of the Pennsylvanian formations from this region are given in the Appendix (p. 70-72). All of the foraminifers have been previously described.

112. TOOMEY, D. F., 1967, Calcispongea (Sphinctozoa) from the Pennsylvanian (Desmoinesian) Pawnee Limestone of northeastern Oklahoma (Abstract): Geol. Soc. America, Program Annual Meeting, New Orleans, Louisiana, p. 222-223.

The writer reports the occurrence of encrusting agglutinated and calcareous smaller foraminifers (*Hedraites, Plummerinella?, Tuberitina, Polytaxis, Tetrataxis, Ammovertella,* and *Minammodytes*) epizoic on algal crusts in the sponge-bearing Pennsylvanian (Desmoinesian) Coal City Member of the Pawnee Limestone exposed in Nowata County, northeastern Oklahoma. Agglutinated hyperamminid foraminifers are also abundant, although no fusulinids and only rare calcareous vagile smaller foraminifers are present within the sponge horizon.

113. TURYK, O. S., 1966, The distribution of Foraminifera in the Carboniferous deposits of Kharkov test hole: Mezhvedom. Respublick. Nauchn. Sbornik, Izdatel. L'vov. Univ., Paleont. Sbornik No. 3, vyp. vtoroj, p. 14-18, 6 pl., [in Russian with English summary].

An assemblage of Middle Carboniferous smaller foraminifers and fusulinids from the Kharkov test hole, U.S.S.R., range in age from C_1^4-C_3^2. All of the taxa have been previously described and are illustrated by thin-section photomicrographs. It is thought that this interval correlates with the established foraminiferal assemblages of the Bashkirian Stage of the western part of the Donets Basin and of the Moscovian Stage of the Donbass and the Russian Platform.

114. WILSON, J. L., 1967, Cyclic and reciprocal sedimentation in Virgilian strata of southern New Mexico: Geol. Soc. America, Bull., v. 78, no. 7, p. 805-818, 4 pl., 4 text-fig.

The writer briefly notes the presence of calcareous encrusting (*Tuberitina* sp.) and vagile smaller foraminifers in the Upper Pennsylvanian (Virgilian) cyclic carbonates of the Holder Formation exposed in Beeman Canyon, Sacramento Mountains, southern New Mexico.

115. WOSZCZYNSKA, S., 1967, Foraminifers of the Lower Carboniferous from Walbrzych and from certain areas of Sowie Mountains: Poland Instyt. Geol., Kwart. Geol., v. 11, no. 1, p. 76-90, 1 pl., 1 text-fig., [in Polish with English and Russian summaries].

Fourteen previously described species of smaller foraminifers are reported from the Lower Carboniferous (upper Viséan) marine deposits at Walbrzych and at certain locations in the Sowie Mountains (Sokolec, Jugow, and Kamionki) of Poland. All of the foraminifers are described and illustrated by representative whole-specimen line drawings.

116. ZIEGLER, J. H., *IN*: HORSTIG, G., and VOGLER, H., 1956, Die Alterstellung der Dolomite von Hof an der Saale: Neues Jahrb. f. Geol. u.

Paläont., Monatshefte B, No. 90, p. 471-488, 4 text-fig., [in German].

The writers report the occurrence of the following smaller foraminifers in the Lower Carboniferous Hof Dolomite, Eastern Germany: *Plectogyra* sp., [probably *Endothyra*], *Nummulostegina schuberti* Lange [probably *Eostaffella*], *Placopsilina ciscoensis* Cushman and Waters, *Lagena plummerae* Harlton [probably mis-identified; *Lagena* ranges from Mesozoic to Recent], *Globivalvulina* sp., *Dentalina* sp. [probably mis-identified; usually regarded as a Permian form], and *Psammosphaera* sp.

DISTRIBUTION OF ARTICLES ACCORDING TO GEOLOGIC AGE AND CATEGORY

PRECAMBRIAN
3, 10

ORDOVICIAN
4

SILURIAN
4, 7, 12, 14

DEVONIAN
1, 2, 5, 6, 7, 8, 9, 11, 13, 15, 17, 18, 23, 26, 27, 47, 53, 54, 62, 68, 70, 73, 74, 75, 83, 89, 93, 98

MISSISSIPPIAN
2, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 36, 37, 38, 39, 41, 42, 43, 44, 46, 47, 49, 51, 53, 54, 56, 58, 60, 62, 63, 64, 66, 67, 68, 69, 70, 73, 74, 75, 76, 78, 79, 80, 81, 82, 83, 84, 85, 86, 89, 90, 91, 93, 95, 96, 97, 98, 100, 102, 105, 107, 110, 115, 116

PENNSYLVANIAN
21, 23, 27, 28, 29, 30, 34, 35, 36, 37, 49, 50, 52, 53, 55, 57, 58, 61, 65, 78, 87, 88, 89, 92, 100, 101, 103, 104, 106, 108, 109, 111, 112, 113, 114

PERMIAN
29, 40, 45, 48, 53, 57, 59, 66, 71, 72, 77, 87, 89, 94, 99, 101, 109,

GENERAL
7, 11, 15, 21, 22, 89, 100

CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME XX, PART 2, APRIL, 1969

364. *GLOBOCASSIDULINA NIPPONENSIS* NEW NAME FOR *CASSIDULINA ORIENTALE* CUSHMAN, 1925, PREOCCUPIED

JAMES V. EADE
N. Z. Oceanographic Institute, Department of Scientific and Industrial Research, Wellington

ABSTRACT

Cassidulina orientale Cushman, 1925, from abyssal depths off Japan, is a separate species and belongs to a different genus from **Cassidulina orientalis** Cushman, 1922, from the continental shelf off New Zealand and Chile; it is here given the new name **Globocassidulina nipponensis**.

INTRODUCTION

In 1922 Cushman proposed the name *Cassidulina orientalis* n. sp. for specimens from 110 meters depth off Poor Knights Islands, New Zealand, previously recorded as the Atlantic species *Cassidulina bradyi* Norman (Cushman, 1919). He noted that the specimen figured by Brady (1884) as *C. bradyi* in the *Challenger* Reports, plate 54, figure 10 (from off West Patagonia, East Pacific), was very similar to his New Zealand specimens. Without referring to his 1922 species, Cushman later (1925) described *Cassidulina orientale* n. sp. from 3804 meters depth south of Japan. He considered this species to be widespread in the Pacific and included in synonymy the same figured specimen of *C. bradyi* in the *Challenger* Reports (plate 54, figure 10).

Since then, the only references to *C. orientalis* Cushman 1922 have been from the Tertiary and Recent of New Zealand (see Hornibrook, 1961; Eade, 1967). Similarly restricted in its distribution is *C. orientale* Cushman, 1925, which has only been recorded from the Upper Tertiary and Recent of Japan (Asano and Nakamura, 1937; Matsunaga, 1963). However, in a study of New Zealand intertidal forms Hedley *et al.* (1967) include *C. orientale* in the synonymy of *C. orientalis.*

During a study of Recent New Zealand species of the families Islandiellidae and Cassidulinidae (Eade, 1967), *C. orientalis* was found to be restricted to the continental shelf off New Zealand between latitudes 32°30'S and 50°30'S. It also occurs off Chile at latitude 47°48'S. *C. orientale* occurs in Recent sediments at abyssal depths off eastern and southern Japan. It is a separate species and belongs to a different genus from *C. orientalis.*

The correct Latin form for the trivial name "oriental" to agree with the feminine generic ending *ina* is *orientalis* and not *orientale* (International Code of Zoological Nomenclature, 1961, Example Art. 30a, ii). *Cassidulina orientale* is therefore a junior homonym of *Cassidulina orientalis* and requires a new name.

SYSTEMATICS

Family CASSIDULINIDAE

Genus **Globocassidulina** Voloshinova, 1960

Globocassidulina nipponensis new name

Plate 13, figures 1-4

Cassidulina orientale CUSHMAN, 1925, p. 37, pl. 7, figs. 6a-c.

Cassidulina orientale ASANO and NAKAMURA, 1937, p. 147, pl. 14, figs. 6a-c, text figs. 8a-b.

Cassidulina orientale MATSUNAGA, 1963, pl. 48, figs. 7a-b.

Type Description.—"Test much compressed, the periphery rounded; usually 5 or 6 pairs of chambers in the last-formed coil, tending in adult specimens to show a slight uncoiling in latest growth; sutures distinct but very slightly depressed, nearly straight, wall smooth finely punctate, the periphery near the aperture with a clear space without punctae; aperture an elongate, narrow slit, parallel to the periphery. Length, 0.4 mm; Breadth, 0.32 mm."

Type Locality.—*Nero* station 1264, south of Japan (latitude 32°22'N, longitude 141°02'30"E), 3804 meters.

Remarks.—Four specimens, from a slide labelled "Recent, Japan" kindly loaned by Mr. N. de B. Hornibrook of the New Zealand Geological Survey, agree in all features with Cushman's type description and figure of *C. orientale.* Additional features to those described by Cushman include wall structure, apertural shapes in the juvenile stage and internal apertural structure.

The wall structure of one specimen, examined crushed under polarized light, is clearly granular. The other three, examined whole, also appear to be granular.

The aperture in the juvenile is trifid consisting of a slit-like opening extending from the basal margin into the apertural face with similar slits on either side of this along the basal margin. The peripheral end of the basal-margin slit is present as a slight indentation which disappears in the adult. The areal portion of the aperture is moderately short in the juvenile but only just discernible in the adult. The umbilical end of the basal-margin slit forms most of the aperture in both juvenile and adult.

The chamber wall along the upper part of the basal-margin slit is folded into the test to form a large lip. The tooth-plate, formed by an infolding of the peripheral end of the aperture, is attached to this lip and, at its base, to the penultimate chamber wall near the septal foramen.

G. nipponensis is similar to species placed in *Cassidulinoides* Cushman, 1927 and *Evolvocassidulina* Eade, 1967, in its tendency to uncoil in the adult stage. However, it differs from the former in being granular instead of radial and from the latter in possessing an internal tooth-plate instead of an external one. *G. nipponensis* possesses the three main characteristics of the genus *Globocassidulina*: a globular non-keeled test, a trifid aperture, and an internal tooth-plate attached to the penultimate chamber wall near the septal foramen.

G. nipponensis differs from other species of *Globocassidulina* in its tendency to uncoil. *Evolvocassidulina orientalis* differs from *G. nipponensis* in having a loop-shaped aperture covered by an external plate-like tooth and in possessing a peripheral keel.

REFERENCES

ASANO, K., and NAKAMURA, M., 1937, On Japanese species of *Cassidulina*: Jap. J. Geol. Geogr., vol. 14, nos. 3-4, pp. 143-153, pls. 13, 14.

BRADY, H. B., 1884, Report on the Foraminifera dredged by HMS *Challenger* during the years 1873-1876: Rep. Scient. Res. Challenger Exped. Zool., vol. 9, pp. 1-814, pls. 1-115.

CUSHMAN, J. A., 1919, Recent Foraminifera from off New Zealand: Proc. U. S. Natl. Mus. 56, pp. 593-640, pls. 74, 75.

———, 1922, The Foraminifera of the Atlantic Ocean. Part III - Textulariidae: Bull. U. S. Natl. Mus., vol. 104, no. 3, pp. 1-149.

———, 1925, New Species of *Cassidulina* from the Pacific: Contr. Cushman Lab. Foram. Res., vol. 1, no. 2, pp. 36-38, pl. 7.

EADE, J. V., 1967, New Zealand Recent Foraminifera of the families Islandiellidae and Cassidulinidae: N. Z. Journ. Mar. Freshwater Res., 1(4): 421-454.

HEDLEY, R. H., HURDLE, C. M., and BURDETT, I. D. J., 1967, The marine fauna of New Zealand: Intertidal Foraminifera of the *Corallina officinalis* zone. Bull. N. Z. Dep. Scient. Ind. Res. 180 (N. Z. Oceanogr. Inst. Mem. 38), pp. 1-86, pls. 1-12.

HORNIBROOK, N. DE B., 1961, Tertiary Foraminifera from Oamaru District (N. Z.). Part I. Systematics and Distribution: Paleont. Bull., Wellington, vol. 34, no. 1, 1-192, pls. 1-28.

MATSUNAGA, T., 1963, Benthonic Smaller Foraminifera from the oil fields of Northern Japan: Scient. Rep. Tohoku Univ. Geol., vol. 35, no. 2, pp. 67-122, pls. 24-52.

CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME XX, PART 2, APRIL, 1969

365. *CIBICIDES, CARIBEANELLA* AND THE POLYPHYLETIC ORIGIN OF *PLANORBULINA*

DETMAR SCHNITKER
S.N.P.A., Centre de Recherches de Pau, Département Stratigraphie, Pau, France

ABSTRACT

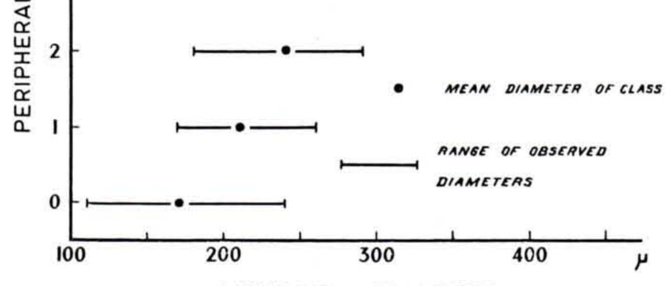
In material from the North Carolina continental shelf, the genus **Caribeanella** develops from a **Cibicides**-like juvenile form and, in turn, gives rise to a planorbulinid form. These **Planorbulina** differ from material from the Mediterranean and from forms described by Nyholm (1961) and Cooper (1965). It is assumed that the genus **Planorbulina** is of polyphyletic origin.

INTRODUCTION

Cibicides Montfort is a well-known genus with a cosmopolitan distribution and a long geologic history, dating from the Cretaceous to the Recent. Throughout geologic time this genus has given rise to other genera, judging from the fact that numerous genera possess a *Cibicides*-like juvenarium. However, some of the genera which are normally considered to be descendants of *Cibicides* may be regarded as merely morphological variants of certain species of *Cibicides*, as was particularly well illustrated by Nyholm (1961). In the light of these seemingly conflicting concepts, it appeared opportune to demonstrate the developmental sequence—which by deduction may be considered evolutionary—of three genera of the foraminiferal family Cibicididae and to compare the results with previous studies on members of the same group.

OBSERVATIONS

During a survey of the foraminiferal fauna of the continental shelf of North Carolina *Caribeanella polystoma* Bermudez was found together with a small unidentified species of *Cibicides*. *C. polystoma* was easily recognizable by its coarse perforations and by the presence of supplementary apertures on the peripheral backward margin of each chamber. The *Cibicides* was characterized by its small size, imperforate wall on the involute side and by its yellow-brown color which was not exhibited by any other species of the study. Inspection of large amounts of material later revealed that these two forms represented an intergrading series of developmental stages of *C. polystoma*. Small specimens of *C. polystoma* did not possess a complete whorl of chambers with perforated walls and supplementary apertures and exhibited an early portion which bore all the characteristic features of the small *Cibicides*. To test this developmental series, 266 specimens of one sample were grouped into seven categories, according to the number of chambers which showed the *Caribeanella* characteristics and then their maximum diameter was recorded. The results of these measurements are shown in text fig. 1, in which the maximum diameter is plotted against the number of peripheral apertures. Theoretically, this plot should result in a sigmoid curve; all specimens with no peripheral apertures (*Cibicides*) are telescoped into the first category, resulting in a small mean for the group. Then there should be an even increase of diameter with the addition of chambers possessing peripheral apertures. The curve should flatten out where the maximum number of chambers per whorl is reached, as each additional chamber will still increase the diameter of the specimen but also cover up peripheral apertures of the preceding whorl. The curve in text fig. 1 is an approximation to this sigmoid curve. Since the sample was washed on a screen of 140μ mesh diameter, a portion of the "*Cibicides*" population was eliminated. Important as an argument for the lineage problem is the fact that seemingly all "*Cibicides*" make their transition into *C. polystoma*, that there are none whose maximum diameter exceeds that of the following phase of *C. polystoma*. Besides this evidence based on a series of separate specimens, other evidence was furnished by the dissection of large specimens of



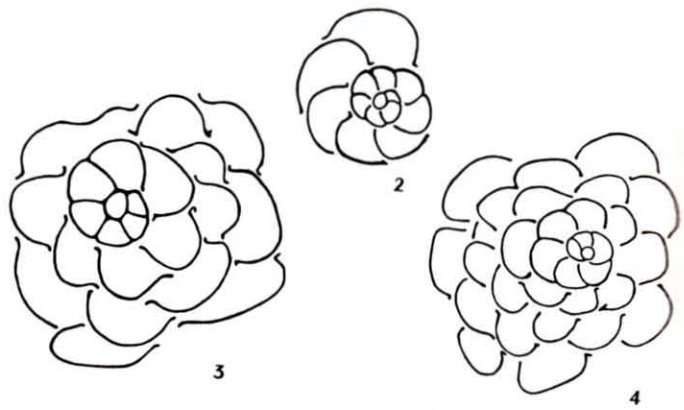
TEXT FIGURE 1

Growth sequence of one population of *Caribeanella polystoma*. Maximum diameter of tests is plotted against growth stages as expressed by the number of peripheral apertures.

C. polystoma. Successive removal of chambers revealed always the same developmental sequence, with a juvenile portion identical to the small "*Cibicides.*" A few stages of this developmental sequence are shown in figs. 1 to 7 on plate 14.

Very large specimens of *C. polystoma,* in addition to the supplementary apertures on the evolute side and on the periphery, develop supplementary apertures also on the involute side of the test (plate 14, figs. 8-9). The existence of this fourth aperture has not been noted either in the original description by Bermudez (1952) or in the generic diagnosis by Loeblich and Tappan (1964). Specimens of this type are rare; in the one sample that was counted out completely only 5% of the *C. polystoma* population was composed of these specimens.

A small number of *C. polystoma* specimens continue their development at a late stage by adding chambers that no longer follow the expanding series of the coil (plate 15, figs. 1-3). This development leads to specimens which are externally similar to *Planorbulina mediterranensis* d'Orbigny. Thin-sections and observations in clarifying liquids of these planorbulinids showed that they always incorporated about one whorl of regularly added chambers that possess the peripheral apertures of the intermediate *Caribeanella* stage (text figs. 2-3). Numerous specimens of *P. mediterranensis* from the Mediterranean coast of NE Spain (Cadaquez) were examined for comparison. These showed a *Cibicides*-like early stage, followed immediately by the irregularly added *Planorbulina*-type chambers (text fig. 4). An additional dissimilarity between the two types of *Planorbulina* is the development of the periphery, which is always sharply angled in the Mediterranean specimens, of which about 200 were examined. The nearly 80 specimens examined from the North Carolina area possessed without exception a rounded periphery. But this dissimilarity may very well be accidental, depending on whether the specimens had been living attached to flat substratum or not. The Mediterranean material was collected from an area with abundant vegetation (*Posidonia*), whereas it is not known whether bottom vegetation was present in the North Carolina sampling area or not (no evidence of it was brought up by the sampling mechanism).



TEXT FIGURES 2 - 4

Fig. 2. Section of *C. polystoma*, showing nearly complete whorl of chambers with peripheral apertures; $\times 50$.

Fig. 3. Section of "*P. mediterranensis*" from the North Carolina shelf, showing intermediate *Caribeanella* stage; $\times 50$.

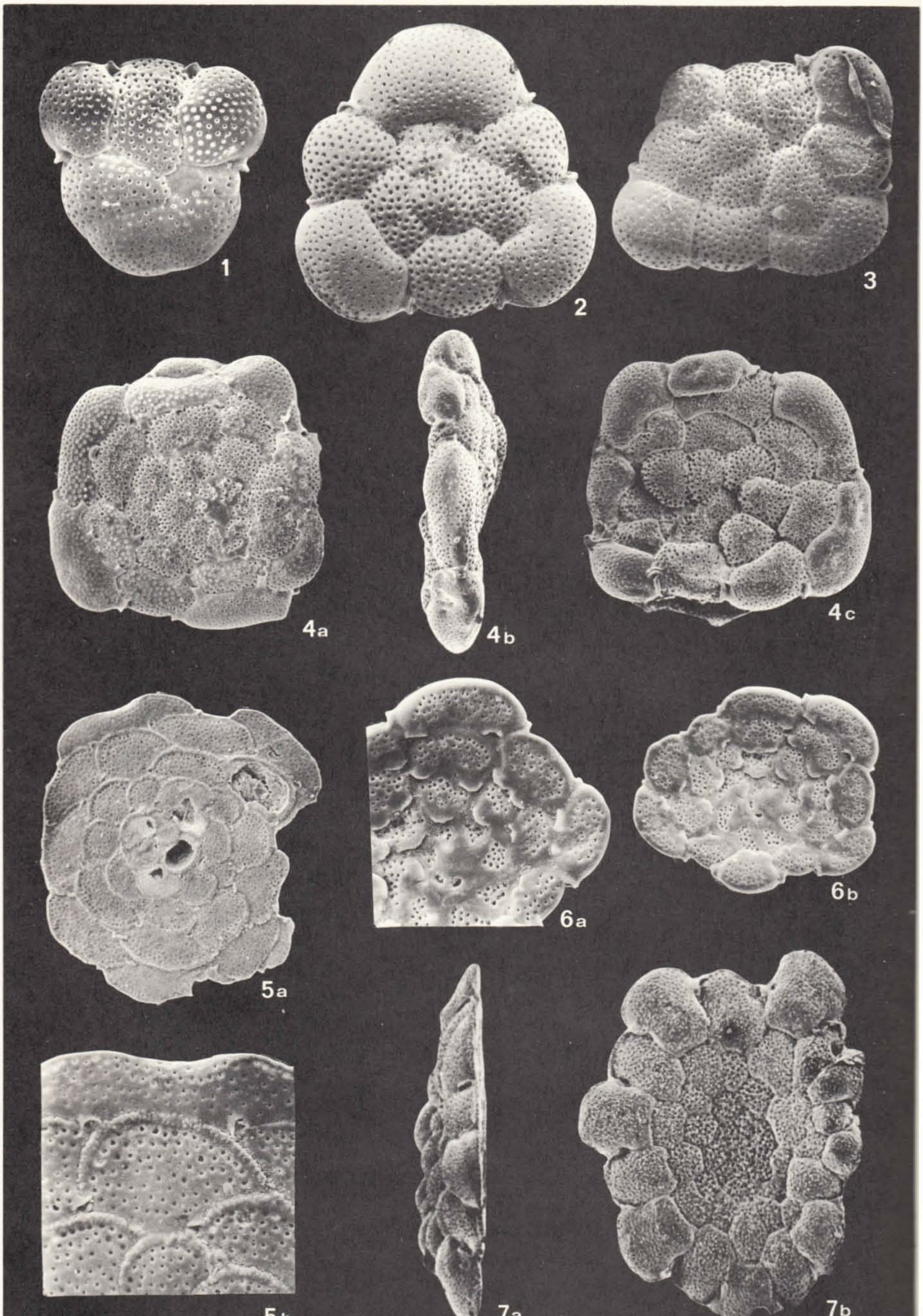
Fig. 4. Section of *P. mediterranensis* from Spain, showing no *Caribeanella* stage; $\times 25$.

DISCUSSION

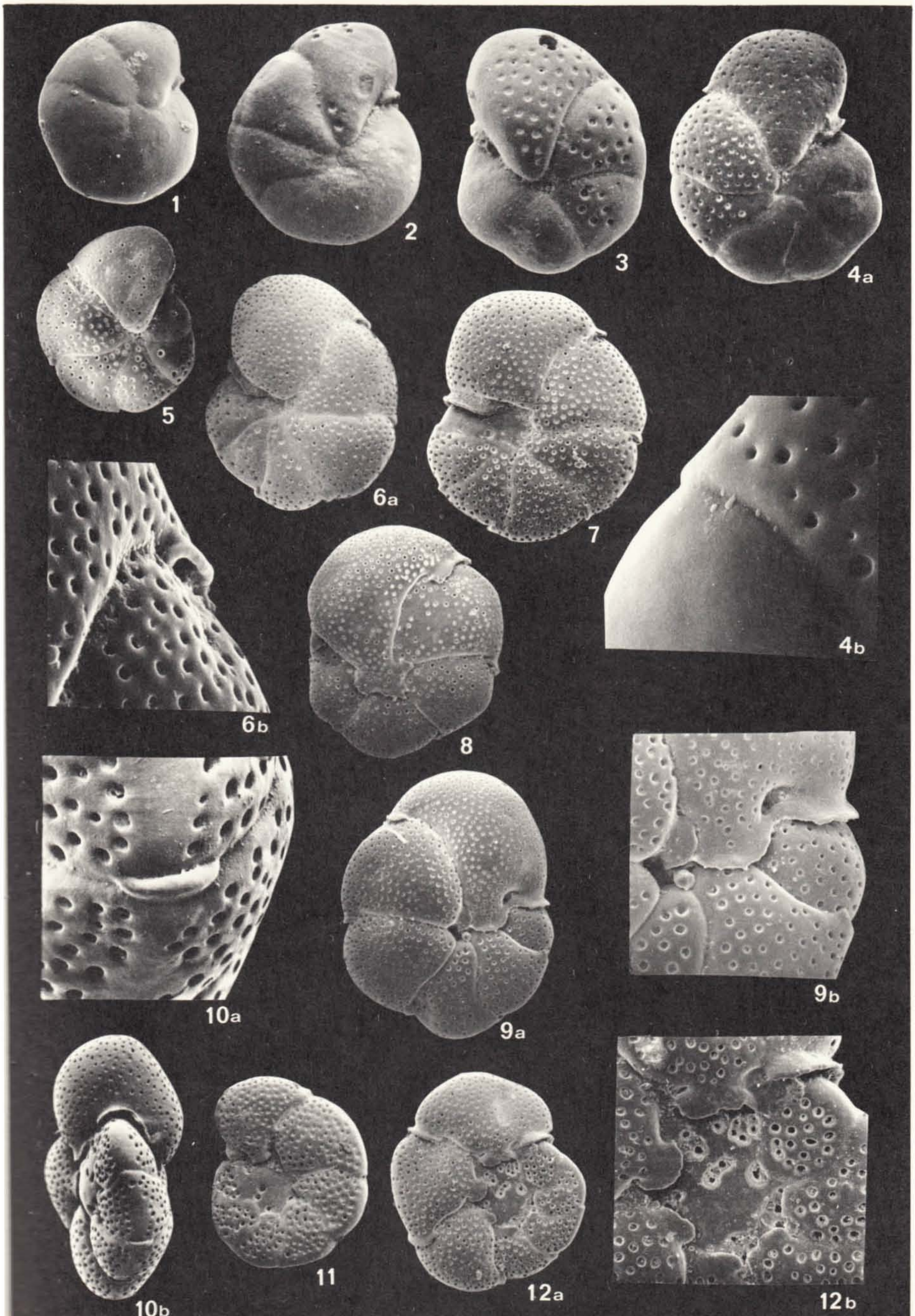
It was shown by Nyholm (1961) that the species *Cibicides lobatulus* exhibited such a range of morphological variation that it encompassed the concept of several genera of the family Cibicididae, e.g., *Dyocibicides, Annulocibicides, Cyclocibicides, Stichocibicides, Rectocibicides,* and *Planorbulina.* Cooper (1965) also reported on morphological variants of *Cibicides lobatulus,* including a form which is *Planorbulina*-like. LeCalvez (1938), however, observed that in laboratory cultures of *P. mediterranensis* only planorbulinids were produced during the life-cycles of successive sexual and asexual generations, with no indication of an intervening *Caribeanella*-like form. In the material of this study, the regularity with which the genus *Caribeanella* develops from its embryonic *Cibicides* stage and the subsequent formation of *Planorbulina* make it unlikely that this development can be equated

EXPLANATION OF PLATE 14

FIGS.		PAGE
1.	*Cibicides*-like juvenile, imperforate involute side; $\times 200$.	68
2.	*Cibicides*-like juvenile, beginning of *Caribeanella* phase indicated by perforations in wall of ultimate chamber; $\times 200$.	68
3-4.	Intermediate growth stages; $\times 150$. 4b, detail of imperforate juvenile and perforate adult wall type; $\times 570$.	68
5-7.	Typical adult stages; $\times 100$. 6b, detail of peripheral aperture; $\times 340$.	68
8-9.	Adult stages with supplementary apertures on involute side; $\times 100$. 9b, detail of supplementary aperture; $\times 210$.	68
10.	Peripheral view of adult stage. 10b, $\times 100$. 10a, detail of peripheral aperture; $\times 420$.	68
11-12.	Evolute side of adult stages; $\times 100$. 12b, detail of primary and supplementary apertures; $\times 200$.	68



Schnitker: *Cibicides, Caribeanella* and *Planorbulina*



Schnitker: *Cibicides, Caribeanella* and *Planorbulina* with the type of variation observed by Nyholm and Cooper.

It appears therefore that three types of *Planorbulina* exist at present: 1) *Planorbulina* s.s., with *P. mediterranensis* d'Orbigny as type, 2) *Planorbulina* in the sense of Nyholm and Cooper, which seems to be a variant of *Cibicides lobatulus* (Walker and Jacobs), and 3) *Planorbulina* of this study, a descendant of *C. polystoma* Bermudez.

It may be significant that these three types of *Planorbulina* are widely separated geographically. The studies of Nyholm and Cooper are based on material from high northern latitudes (Scandinavia and the NW coast of North America), LeCalvez's material came from the Mediterranean, and the material containing the *Caribeanella* sequence from the shelf of North Carolina. Also, *C. polystoma* and its associated *Planorbulina* were found only south of Cape Hatteras, a region which is influenced by the warm Gulf Stream water, whereas the few specimens of *Planorbulina* which were found north of Cape Hatteras were forms with a sharply angular periphery and did not possess the *Caribeanella* stage in their early portions. Whether they were of the Mediterranean type or of the type of Nyholm and Cooper cannot be said.

The existence of these three types of *Planorbulina* poses a taxonomic problem. If they are really biologically different, they should be named accordingly. The Mediterranean type should continue to carry the name *Planorbulina mediterranensis*, Nyholm's and Cooper's type should be called *Cibicides lobatulus*, and the North Carolina form should be placed in synonymy with *Caribeanella polystoma*. Of the three forms, only the Mediterranean type has been investigated sufficiently; the other two are based on associations in their respective environments. Even though this circumstantial evidence appears to be very strong, it seems to be best to await detailed biological studies before definite judgment is made.

ACKNOWLEDGEMENTS

Samples from the North Carolina continental shelf were obtained through the use of the R/V EASTWARD in the Cooperative Oceanographic Program of the Duke University Marine Laboratory. This program is supported through NSF Grant G-17669 to Duke University. The permission of the Société Nationale des Pétroles d'Aquitaine to use their Scanning Electron Microscope is sincerely appreciated.

REFERENCES

BERMUDEZ, P. J., 1952, Estudio sistemático de los foraminíferos rotaliformes: Venezuela Minist. Minas & Hidrocarb., Bull. Geol., v. 2, no. 4, p. 1-230, pl. 1-35.

COOPER, S. C., 1965, A new morphologic variation of the foraminifer *Cibicides lobatulus*: Contributions from the Cushman Foundation for Foraminiferal Research, v. 16, pt. 4, p. 137-140, pl. 21, 22.

LECALVEZ, JEAN, 1938, Recherches sur les foraminifères - I. Développement et réproduction: Archives Zool. Expér. et Générale, v. 80, pt. 3, p. 163-333, pl. 2-7.

LOEBLICH, A. R., and TAPPAN, HELEN, 1964, Protista 2, Sarcodina, chiefly "Thecamoebians" and Foraminiferida, *in*: Treatise on invertebrate Paleontology, Moore, R. C., Ed., Geol. Soc. America and Univ. Kansas Press, p. 1-900.

NYHOLM, K. G., 1961, Morphogenesis and biology of *Cibicides lobatulus*: Zoologiska Bidrag från Uppsala, Bd. 33, p. 157-196, pl. 1-5.

EXPLANATION OF PLATE 15

FIGS.		PAGE
1.	*C. polystoma* with one supplementary chamber; $\times 100$.	68
2.	Early stage of "*P. mediterranensis;*" $\times 100$.	68
3.	Small "*P. mediterranensis*" with *Caribeanella*-stage still visible; $\times 75$.	68
4.	"*P. mediterranensis*" typical for the North Carolina shelf, note rounded periphery; $\times 60$.	68
5.	*P. mediterranensis* from Spain. 5a, $\times 45$. 5b, detail showing raised sutures; $\times 107$.	68
6.	*P. mediterranensis* from Spain, note subrounded periphery. 6a, $\times 107$. 6b; $\times 80$.	68
7.	*P. mediterranensis* from Spain, note angular periphery; $\times 47$.	68

CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME XX, PART 2, APRIL, 1969

CORRECTION

An error in text-fig. 3 in the recent paper by D. Graham Jenkins, entitled "Acceleration of the evolutionary rate in the *Orbulina* lineage" (paper no. 353, Volume XIX, Part 4, October, 1968), has been called to the editor's attention. The extremely fine lines indicating the stratigraphic range of certain species were lost during the printing process, and the loss was not detected prior to completion of the issue. The printer's plate for the figure has been altered, and it is here reprinted (page 71). For further clarification, the following verbal description of the ranges (in reference to the species names appearing on the figure itself), is given:

MUDDY CREEK SECTION

G. trilobus bisphericus—the range extends over a distance slightly less than the rightmost half of the terminal "s" in *bisphericus.*

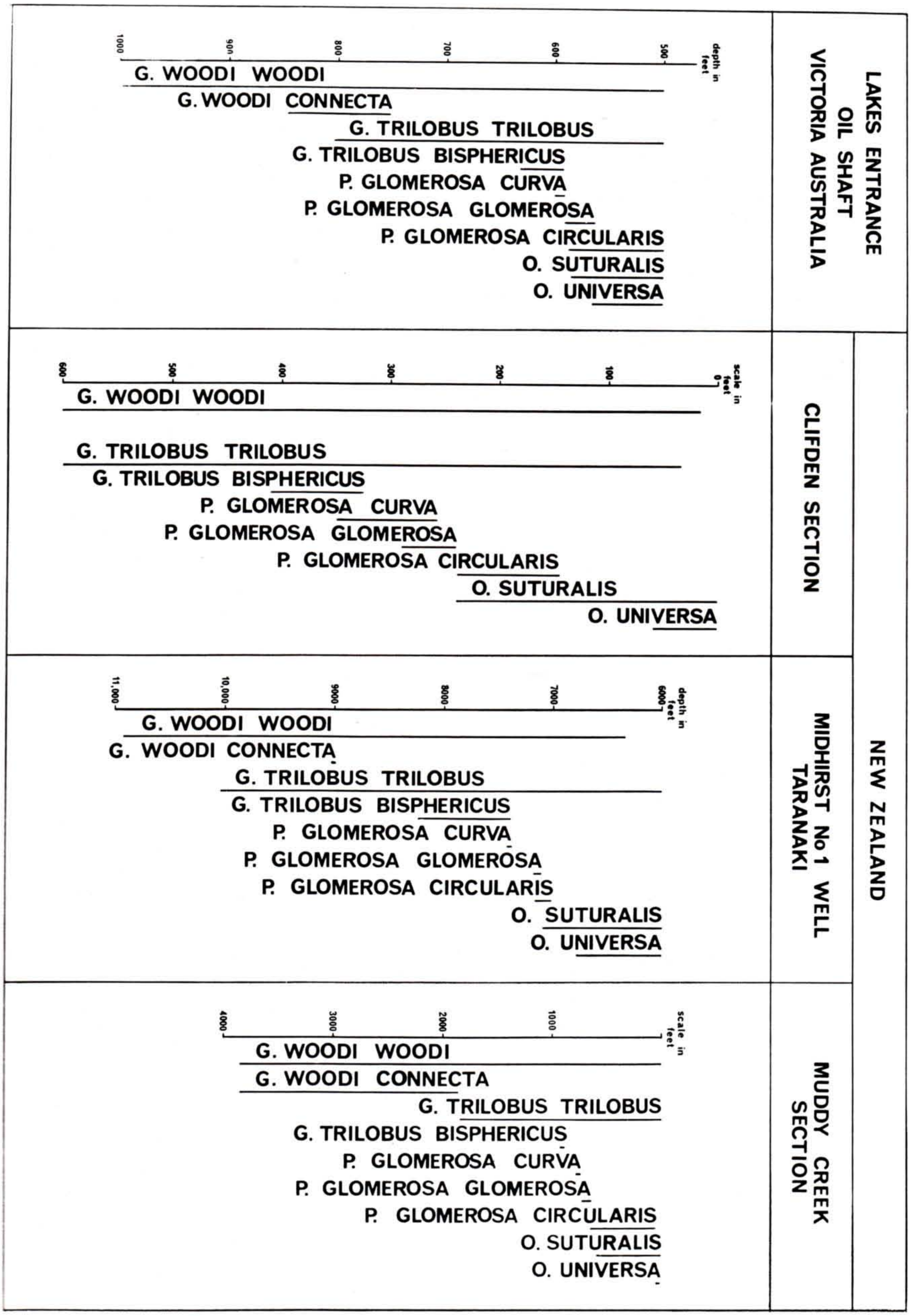
P. glomerosa curva—the range extends only the width of the right arm of the "a" in *curva.*

P. glomerosa glomerosa—the range extends from the rightmost tip of the right arm of the "a" in *glomerosa* to the right tip of the left arm of the same letter.

Orbulina universa—the range extends from the rightmost tip of the right arm of the letter "a" in *universa* to a point slightly less than half the width of the same letter along its base.

MIDHIRST NO. 1 WELL TARANAKI

G. woodi connecta—the range extends only the width of the right arm of the "a" in *connecta.*



TEXT FIGURE 3

Stratigraphic ranges of 9 named taxa of the *O. universa* lineage from 4 Australasian Miocene sequences.

CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME XX, PART 2, APRIL, 1969

RECENT LITERATURE ON THE FORAMINIFERA

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

BARBIERI, F., and MEDIOLI, F. Osservazioni di dettoglio su alcuni gusci di "Orbulina" del Neogene dell'Italia settentrionale allo "Scanning Electron Microscope."—"L'Ateneo Parmense," Acta Naturali, v. 4, fasc. 1, 1968, p. 1-20, pls. 1-7.—Photomicrographs of wall structure.

BARTLETT, GRANT A. Mid-Tertiary stratigraphy of the continental slope off Nova Scotia.—Maritime Sediments, v. 4, No. 1, April 1968, p. 22-31, pls. 1-3, text figs. 1, 2 (map, correl. chart).—Oligocene and Miocene sediments, dated by planktonics, in cores and dredge hauls. Twenty-six species listed and illustrated.

Planktonic Foraminifera—new dimensions with the Scanning Electron Microscope.—Canadian Jour. Earth Sci., v. 5, 1968, p. 231-233, pls. 1-6.—Views of wall surface, pores, spines.

BASSOV, V. A. O sostave Foraminifer v Volzhskikh i Berriasskikh Otlozhenijakh Severa Sibiri i Arkticheskikh Ostrovov, *in* Mezozoiskie Morskie Fauny Severa i Dal'nego Vostoka SSSR i ikh stratigraficheskoe znachenie.—Akad. Nauk SSSR, Sibirskoe Otdel., Trudy Instit. Geol. i Geofiz., vyp. 48, 1968, p. 108-141, pls. 20-23, tables 1, 2 (range chart, correl. chart).—Twelve species, 11 new, from the Volgian and Berriassian. *Bojarkaella* gen. nov. (type species *B. firma* sp. nov.) erected in the Nodosariidae.

BELFORD, D. J. Paleocene planktonic Foraminifera from Papua and New Guinea.—Australia Bureau Min. Res., Geol., and Geophysics, Palaeont. Papers, 1966, Bull. 92, 1967, p. 1-33, pls. 1-4, text figs. 1-4 (maps, columnar section, check list).—Thirteen species and 1 subspecies, none new, indicating upper Paleocene.

Additional Miocene and Pliocene planktonic Foraminifera from Papua and New Guinea.—Australia Bureau Min. Res., Geol., and Geophysics, Palaeont. Papers, 1966, Bull. 92, 1967, p. 35-48, pl. 5.—Three more species.

BHALLA, S. N. Foraminifera from the type Raghavapuram Shales, East Coast Gondwanas, India.—Micropaleontology, v. 15, No. 1, Jan. 1969, p. 61-84, pls. 1, 2, text figs. 1-9 (maps, drawings), table 1 (check list).—Fifteen arenaceous species from the Lower Cretaceous.

BOLTOVSKOY, ESTEBAN. Hidrologia de las aguas superficiales en la parte occidental del Atlantico Sur.—Rev. Museo Argentino Ciencias Nat. "Bernardino Rivadavia," Hidrobiol., v. 2, No. 6, 1968, p. 199-224, 2 text figs., tables 1, 2.—Six water masses recognized off coastal Argentina by means of Foraminifera biological indicators are plotted on maps.

BRAZHNIKOVA, N. E., VAKARCHUK, G. I., VDOVENKO, M. V., VINNICHENKO, L. V., KARPOVA, M. A., KOLOMIETH, JA. I., POTIEVSKAJA, P. D., ROSTOVTHEVA, L. F., and SHEVCHENKO, G. D. Mikrofaunisticheskie Markirujuschchie Gorizonty Kamennougol'nykh i Permskikh Otlozhenij Dneprovsko-Donethskoj Vpadiny.—Kiev, 1967, 224 p., 59 pls. (systematic descriptions, p. 139-181).—Eighteen species (15 new), 3 subspecies (all new), 3 varieties (2 new), and 17 formae from the Carboniferous and Permian.

BUZAS, M. A., and GIBSON, THOMAS G. Species diversity: Benthonic Foraminifera in western North Atlantic.—Science, v. 163, No. 3862, Jan. 3, 1969, p. 72-75, text figs. 1, 2 (map, graphs).

CATI, FRANCO, COLALONGO, MARIA LUISA, CRESCENTI, UBERTO, D'ONOFRIO, SARA, FOLLADOR, UMBERTO, PIRINI RADRIZZANI, CAMILLA, POMESANO CHERCHI, ANTONIETTA, SALVATORINI, GIANFRANCO, SARTONI, SAMUELE, PREMOLI SILVA, ISABELLA, WEZEL, CARLO FORESE and BERTOLINO, DI VERA, BIZON, GERMAINE, BOLLI, HANS M., BORSETTI CATI, ANNA MARIA, DONDI, LUCIANO, FEINBERG, HENRY, JENKINS, D. GRAHAM, PERCONIG, ENRICO, SAMPÒ, MARIO, and SPROVIERI, RODOLFO. Biostratigrafia del Neogene Mediterraneo basata sui Foraminiferi planctonici.—Boll. Soc. Geol. Ital., v. 87, 1968, p. 491-503, tables 1, 2 (correl. charts).—For the Mediterranean, one Miocene zonation and 3 Pliocene zonations and comparisons with zonations for New Zealand, the Caribbean, and Java.

CHIJI, MANZO. Foraminiferal faunules from the upper part of Osaka group in the deep boring (OD-1), Osaka City (in Japanese with English abstract).—Bull. Osaka Mus. Nat. Hist., No. 21, March 1968, p. 55-61, pls. 2, 3, text figs. 1-3 (columnar section, graphs), tables 1, 2.—Illustrations of Pleistocene Foraminifera.

CHIJI, MANZO, and LOPEZ, SILVIO M. Regional foraminiferal assemblages in Tanabe Bay, Kii

Peninsula, central Japan.—Publ. Seto Marine Biol. Lab., v. 16, No. 2, Sept. 1968, p. 85-125, pls. 6-15, text figs. 1-8 (maps, graphs), tables 1-3.—Based on 14 samples between 7 and 38 meters. Quantitative records of over 250 species, none new, many illustrated.

CIMERMAN, FRANC. The genus *Pavonitina* Schubert (Foraminiferida) and its systematic position.—Micropaleontology, v. 15, No. 1, Jan. 1969, p. 111-115, pl. 1, text fig. 1 (map).—Examination of sufficient material shows the initial stages are biserial, not triserial, hence the genus belongs in the Textulariidae.

CONKIN, JAMES E., and CONKIN, BARBARA M. A revision of some Upper Devonian Foraminifera from western Australia.—Palaeontology, v. 11, pt. 4, Nov. 1968, p. 601-609, pls. 114-117, text fig. 1 (drawings).—Re-description and re-illustration of 8 species, 5 being placed in different genera.

ERICSON, DAVID B., and WOLLIN, GOESTA. Pleistocene climates and chronology in deep-sea sediments.—Science, v. 162, No. 3859, Dec. 13, 1968, p. 1227-1234, text figs. 1-7 (map, graphs).—Study based on 10 cores from the Atlantic and Caribbean. Through correlation of variation in abundance of the *Globorotalia menardii* complex, of changes in coiling direction of *G. truncatulinoides,* of paleontological boundaries, and of paleomagnetic stratigraphy, a continuous time scale is set up indicating that the Pleistocene lasted about 2 million years.

FOLDVARI, A., and SZABO-SOMOGYVARI, K. Studies on the "Schlier" Formation. IV. Foraminiferal biofacies zones of the "Schlier" in North Hungary.—Acta Geologica, Acad. Sci. Hungaricae, tom. 12, fasc. 1-4, 1968, p. 193-197, maps 1-4, text fig. 1 (graph), table 1.—*Globigerina* content mapped in Chattian and Helvetian.

FURSENKO, A. V., and FURSENKO, K. B. Ekologicheskie Nabljudenija nod Foraminiferami Laguny Busse (o. Sakhalin).—Doklady Akad. Nauk SSSR, tom 180, No. 5, 1968, p. 1231-1234, text fig. 1 (diagram).—Foraminifera under lagoonal conditions.

GIBSON, THOMAS G., HAZEL, JOSEPH E., and MELLO, JAMES F. Fossiliferous rocks from submarine canyons off the northeastern United States.—U. S. Geol. Survey Prof. Paper 600-D, 1968, p. 222-230, text fig. 1 (map), tables 1, 2.—Foraminifera and Ostracoda listed from 74 samples, indicating ages from Late Cretaceous to Pleistocene.

GORBACHIK, T. N. Homeomorphism in foraminifers.—Paleont. Zhurnal (translation), v. 2, No. 1, 1968, p. 1-8, pls. 1, 2, text figs. 1-3.—In the Lower Cretaceous *Tonasia* gen. nov. (type species *T. evoluta* sp. nov.) possibly derived from *Melathrokerion.*

GUVENC, TUNCER. A propos de la structure de la paroi des Nodosariida et description d'un nouveau genre *Alanyana* et de quelques nouvelles espèces du Permien de Turquie.—Bull. Min. Res. Explor. Instit. Turkey, Foreign Ed., No. 69, Oct. 1967, p. 34-43, pl. 1.—Four new Permian nodosarid species, one in the new genus *Alanyana* (type species *A. reicheli* n. sp.).

HAGN, HERBERT. *Haddonia heissigi* n. sp., ein bemerkenswerter Sandschaler (Foram.) aus dem Obereozän der Bayerischen Kalkalpen.—Mitt. Bayer. Staatssamml. Paläont. hist. Geol., München, Band 8, Dec. 15, 1968, p. 3-50, pls. 1-3, text figs. 1-8 (map, outcrop drawing, drawings).—Gigantic arenaceous encrusting species in a typical reefal association in the upper Eocene.

HOFKER, J. SEN. Studies of Foraminifera. Part I, General Problems.—Publ. Natuurhist. Genootschap in Limburg, Reeks XVIII, Afl. 1, 2, 1968, p. 1-135, pls. 1-24, text figs. 1-15 (graphs, drawings).—It is inappropriate to make generic separations where the only difference is that the wall structure changes from granular to radial. Among planktonics, such forms as *Globigerapsis, Globigerinatheka,* and *Porticulasphaera* are not true genera, but developmental stages of a species.

HUANG, TUNYOW. Smaller Foraminifera from Miyako-jima, Ryukyu.—Sci. Repts. Tohoku Univ., Sendai, 2nd Ser. (Geol.), v. 40, No. 1, Aug. 31, 1968, p. 47-63, pls. 10-13, text figs. 1-3 (map, graphs), table 1.—List and illustrations of 128 species from the Pliocene Shimajiri Formation.

JENKINS, D. GRAHAM. Planktonic Foraminiferida as indicators of New Zealand Tertiary paleotemperatures.—Tuatara, v. 16, No. 1, April 1968, p. 32-37, text fig. 1 (graph).—Presence or absence of keeled *Globorotalia* and coiling direction of *Globigerina pachyderma* are used to interpret temperatures in the Tertiary.

KANOMATA, NOBUO, and MIYAWAKI, AKIRA. On the Fusulinids at Kamiyatsuse District in Kesennuma City, Miyagi Prefecture, Northeast Japan.—Jour. College Arts Sci. Chiba Univ., v. 5, No. 1, Nov. 1967, p. 159-165, pl. 1, text figs. 1, 2 (maps), tables 1-7.—Eight species, 2 new.

KASIMOVA, G. K. O Spirillinidakh Jurskikh Otlozhenij Azerbaidzhana.—Izvest. Akad. Nauk

Azerbaidzh. SSR, ser. nauk o zemle, 1968, No. 3, p. 27-34, 1 pl.—Six Jurassic spirillinids, 2 new.

LEWIS, K. B., and JENKINS, CHRISTINE. Geographical variation of *Nonionellina flemingi*.—Micropaleontology, v. 15, No. 1, Jan. 1969, p. 1-12, pl. 1, text figs. 1-9 (graphs), tables 1, 2.—The species is found from north of New Zealand south to the Subantarctic Islands. Those from the coldest environments are the largest and longest, have more chambers, and are planispiral; those from the warmest environments are the smallest and are trochospiral. Tertiary and Quaternary temperature fluctuations can be elucidated by size measurements.

LLOYD, A. R. Foraminifera from HBR Wreck Island No. 1 well and Heron Island bore, Queensland: their taxonomy and stratigraphic significance. 1—Lituolacea and Miliolacea.—Australia Bureau Min. Res., Geol., and Geophysics, Palaeont. Papers, 1966, Bull. 92, 1967, p. 69-113, pls. 9-15, text fig. 1 (map), table 1 distrib. chart).—Twenty-six species from the Miocene parts of the wells.

LUTZE, GERHARD F. Ökoanalyse der Mikrofauna des Aptium von Sarstedt bei Hannover.—Beih. Ber. Naturh. Ges., Band 5, Keller-Festschrift, Hannover, 1968, p. 427-443, text figs. 1-4 (correl. chart, range chart, graphs), table 1.—Quantitative analysis of Foraminifera in an upper Aptian section.

Jahresgang der Foraminiferen-Fauna in der Bottsand-Lagune (westliche Ostsee).—Meyniana, v. 18, Oct. 1968, p. 13-30, pl. 1, text figs. 1-21 (maps, diagrams, range chart, graphs), table 1.—Two species dominate in the lagoon and six others are also present in the vegetation zone of the lagoon.

Siedlungs-Strukturen rezenter Foraminiferen.—Meyniana, v. 18, Oct. 1968, p. 31-34, text figs. 1-8 (graphs), table 1.—Distribution patches of benthonic Foraminifera in Kiel Bay.

MAMET, BERNARD L. Foraminifera, Etherington Formation (Carboniferous), Alberta, Canada. —Bull. Canadian Petr. Geology, v. 16, No. 2, June 1968, p. 167-179, text figs. 1-4 (map, zone chart, range chart, graphs).—Four assemblages in the Upper Mississippian.

MAMET, B. L., and MASON, D. Foraminiferal zonation of the Lower Carboniferous Connor Lakes section, British Columbia.—Bull. Canadian Petr. Geology, v. 16, No. 2, June 1968, p. 147-166, text figs. 1-5 (map, diagrams, range chart).—Ten zones between middle Tournaisian and early Namurian.

MARGEREL, JEAN-PIERRE. Les Foraminifères du Redonien. Systématique, Répartition stratigraphique, Paléoécologie. Tomes I, II.—Impremerie Faculté des Sci., Nantes, 1968, 207 p., 44 pls., 10 tables, 41 text figs.—Illustrated systematic catalog includes 256 species and varieties, 34 species and 2 varieties new and 3 given new names. Forty-one are indeterminate. Age is Pliocene.

MORIKAWA, ROKURO. The Upper Permian Schwagerininae of Japan.—Sci. Repts. Saitama Univ., ser. B (Biol. and Earth Sci.), v. 5, No. 2, 1968, p. 155-160, pls. 16, 17, table 1.

MURRAY, JOHN W. Living foraminifers of lagoons and estuaries.—Micropaleontology, v. 14, No. 4, Oct. 1968, p. 435-455, text figs. 1-20 (map, graphs), tables 1-12.—Study of Buzzards Bay and comparison with faunas of hypersaline, normal, and brackish areas.

PERCONIG, ENRICO. Sobre la proposicion del nuevo termino estratigrafico "Andaluciense" para indicar la fase terminal del Mioceno de facies marina.—Notas y Comns. Inst. Geol. y Minero Espãna, No. 91, Ano 1966, p. 13-40, text figs. 1, 2 (maps), table of occurrence and abundance.—Abundance of Foraminifera indicated in Tortonian, Andalusian, and lower Pliocene in western Andalusia.

PESSAGNO, EMILE A., JR., and BROWN, WALTER R. The microreticulation and sieve plates of *Racemiguembelina fructicosa* (Egger).—Micropaleontology, v. 15, No. 1, Jan. 1969, p. 116, pl. 1.—Shown by scanning electron micrographs, lacelike meshwork covers costae and even extends down into pores where it forms sieve plates.

PLOTNIKOVA, L. F. Milkovodni Verkhn'okrejdovi Foraminiferi Platformenoj Chastini URSR.—Akad. Nauk Ukrains. RSR, Instit. Geol. Nauk, Kiev, 1967, p. 1-108, pls. 1-15, range chart.—Over 80 species (25 species and 2 varieties new and 1 species given a new name) from the Upper Cretaceous.

POAG, C. WYLIE, and SKINNER, HUBERT C. Correction of the type species of *Globulina* d'Orbigny.—Tulane Studies in Geol., v. 6, Nos. 2, 3, Nov. 22, 1968, p. 127, 128, text figs. 1, 2 (drawing, photomicrographs).—Type species is *G. caribaea* and it has a round aperture surrounded by radiating slits.

PROSNIAKOVA, L. V. Planctonic Foraminifera (*Praeglobotruncana* and *Rotalipora*) from the Cenomanian of the Crimea Plain (in Russian). —Paleont. Sbornik, No. 4, vyp. 2, 1967, p. 3-

9, 1 pl.—Three species and 2 varieties, none new.

ROBINSON, E. *Chubbina*, a new Cretaceous alveolinid genus from Jamaica and Mexico.—Palaeontology, v. 11, pt. 4, Nov. 1968, p. 526-534, pls. 101-103, text fig. 1 (graphs), table 1. —Three species, 2 new.

ROMEO, MARIA. Stratigrafia micropaleontologica del Messiniano di Rossano (Cosenza).—Palaeontographia Italica, v. 63 (n. ser. v. 33), 1967, p. 1-74, pls. 1-4, text figs. 1-16 (map, geol. sections, columnar sections, graphs), table 1 (occurrence and abundance chart).—Illustrated systematic catalog of 115 species, none new.

RUZICKA, BOHUSLAV, HAJKR, OLDRICH, and GRMELA, ARNOST. Study of the growth spiral of *Ammonia beccarii tepida* (Cushman).—Trans. Instit. Mining and Metallurgy Ostrava, Mining and Geol. Ser., roc. 12, cis. 1, 1966, p. 85-93, text figs. 1, 2 (diagram, graph).—After reproductive maturity progressivity of growth declines.

SAIDOVA, KH. M. Preservation of Foraminifera in water, sediment and intestine of soileaters (in Russian).—Doklady Akad. Nauk SSSR, tom 182, No. 2, 1968, p. 453-455, text figs. 1, 2 (graphs).

SEIGLIE, GEORGE A. Bibliografia sobre los Foraminiferos bentonicos recientes de la provincia Caribe-Antillana, con observaciones.—Boletin Informativo, Asoc. Venez. Geol., Min. Petrol., v. 11, No. 1, Jan. 1968, p. 5-15 (mimeo.).

Foraminiferal assemblages as indicators of high organic carbon content in sediments and of polluted waters.—Bull. Amer. Assoc. Petr. Geol., v. 52, No. 11, Nov. 1968, p. 2231-2241, text figs. 1-4 (maps).—Based on examples from the Caribbean, certain genera and species favor polluted environments and those of high organic carbon. Similar fossil assemblages may suggest oil basins.

SLITER, WILLIAM V. Shell-material variation in the agglutinated foraminifer *Trochammina pacifica* Cushman.—Tulane Studies in Geol., v. 6, Nos. 2, 3, Nov. 22, 1968, p. 80-84, text fig. 1 (photomicrographs).—Specimens continue to grow and add chambers (of an organic membrane) even though access to sediment is cut off.

SMITH, PATSY B., and DURHAM, DAVID L. Middle Miocene Foraminifera and stratigraphic relations in the Adelaida Quadrangle, San Luis Obispo County, California.—U. S. Geol. Survey Bull. 1271-A, 1968, p. 1-14, text figs. 1, 2 (maps), table 1 (check list).—Foraminifera listed.

SRINIVASAN, M. S., and SHARMA, V. The status of the Late Tertiary Foraminifera of Car Nicobar described by Schwager in 1866.—Micropaleontology, v. 15, No. 1, Jan. 1969, p. 107-110.—Topotypes have been selected from newly-collected material. Each species is listed with its current generic assignment.

SRIVASTAVA, S. S. Foraminifera from the basal Sylhet limestone of the Mawmluk quarry, Cherrapunji, and their stratigraphic significance.—Bull. Geol. Soc. India, v. 5, No. 3, July 1968, p. 91-93, text figs. 1, 2 (thin sections).—Paleocene species in Assam.

STEWART, WENDELL J. The stratigraphic and phylogenetic significance of the fusulinid genus *Eowaeringella*, with several new species.—Spec. Publ. No. 10, Cushman Found. Foram. Res., Nov. 20, 1968, p. 1-29, pls. 1-7, text figs. 1, 2 (map, columnar sections), tables 1-14.—Emendation of *Eowaeringella* with 14 species (11 new) and 2 new varieties.

SULEIMANOV, I. S. K Sistematike Foraminifer Rodov *Arenoparrella* i *Trochamminula*.—Akad. Nauk SSSR, Paleont. Zhurnal, No. 3, 1968, p. 117-122, text figs. 1, 2, tables 1, 2.—Two new species of *Trochamminula* from the Aptian.

TEWARI, B. S., and SINGH, M. P. Two new planktonic Foraminifera from Kutch.—Res. Bull. Panjab Univ., n. ser., v. 18, pts. 3-4, Dec. 1967 (June 1968), p. 425-427, text figs. 1, 2.—*Globigerinatheka kutchensis* and *Globigerapsis indica* from the Lutetian-Auversian.

TRÜMPER, ERWIN. Variationsstatistische Untersuchungen an der Foraminiferen-Gattung *Stensioeina* Brotzen.—Geologie, Zeitschr. Gesamt. Geol. Wissenschaft., Berlin, Jahrg. 17, Beiheft 59, Feb. 1968, p. 1-103, pls. 1-17, text figs. 1-17 (drawings, diagrams, graphs, phylogenetic chart), Anlage 1-17 (graphs).—Species are combined into 3: *S. granulata, S. pommerana,* and *S. exsculpta,* the latter with 2 subspecies.

TZANKOV, V., TZANEVA, P., VAPTZAROVA, J., MIHAILOVA-JOVTCHEVA, P., DIKOVA, P., TRIFONOVA, EK., BAYNOVA, EK., and BUDUROV, K. Les associations microfossiles en Bulgarie.—Direction Generale de Geologie, Instit. Sci. Recherches Geol., Sofia, 1965, p. 1-75, pls. 1-175.—Photomicrographs of assemblages from Middle Devonian to upper Sarmatian, most of them Foraminifera.

VAN DER VLERK, I. M. Stratigraphie du Tertiaire des Domains Indo-Pacifique et Mesogeen. Essai de correlation.—Proc. Kon. Nederl. Akad. Wetenschappen, ser. B, v. 69, No. 3, 1966, p. 336-344, text figs. 1-5 (diagrams, graphs, map).—Revision of correlation between Far East and Europe.

VAN DER VLERK, I. M., and GLOOR, H. Evolution of an embryo.—Genetica, deel 39, afl. 1, 1968, p. 45-63, text figs. 1-10 (drawings, diagrams, graphs).—History of evolution of *Lepidocyclina*, in particular the degree of curvature of the dividing wall between the protoconch and deuteroconch. Rate of evolution was inconstant, changing from slow to fast to slow to fast again.

VILKS, G. Foraminiferal study of the Magdalen Shallows, Gulf of St. Lawrence.—Maritime Sediments, v. 4, No. 1, April 1968, p. 14-21, pl. 1, text fig. 1 (map), table 1.—Quantitative analysis of 23 samples between 13 and 77 meters, 43 species.

Recent Foraminifera in the Canadian Arctic.—Micropaleontology, v. 15, No. 1, Jan. 1969, p. 35-60, pls. 1-3, text figs. 1-5 (maps, graph), tables 1-4.—Illustrated systematic catalog of 77 species, none new. Study based on 48 samples taken through ice from depths of 17 to 458 meters, and 2 core samples. A bathymetric boundary found at about 200 meters.

WELZEL, ERHARD. Foraminiferen und Fazies des fränkischen Domeriums.—Erlanger geol. Abh., Heft 69, March 12, 1968, p. 3-79, pls. 1-3, text figs. 1-14 (graphs, drawings, maps), tables 1-7.—Illustrated systematic catalog of 145 species and subspecies, 1 subspecies new and 1 new name, from the Domerian.

WOLOSCHYNA, A. M. Novyj Kampanskij Vid Roda *Orbignyna*.—Akad. Nauk SSSR, Paleont. Zhurnal, No. 3, 1968, p. 122, 123, text fig. 1. —*Orbignyna dolosa* sp. nov. from the upper Campanian.

WOSZCZYNSKA, STANISLAWA. Preliminary results of microfaunistic examinations of Zechstein deposits (English summary of Polish text).—Kwart. Geol., Instyt. Geol., Warszawa, tom 12, No. 1, 1968, p. 92-103, pl. 1, table 1.—Ten species, none new, not previously found in the Polish Permian.

RUTH TODD
U. S. Geological Survey
Washington, D. C. 20560