

CONTRIBUTIONS
FROM THE
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1967

CONTRIBUTIONS FROM THE CUSHMAN FOUNDATION
FOR FORAMINIFERAL RESEARCH
VOLUME XVIII, PART 2, APRIL 1967
329. ANNOTATED BIBLIOGRAPHY
OF PALEOZOIC NONFUSULINID FORAMINIFERA, ADDENDUM 4

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ABSTRACT

This addendum includes 150 annotated references pertaining to Paleozoic nonfusulinid Foraminifera, and can be considered reasonably complete through the year 1965. As in previous bibliographies, (Toomey, 1959, 1961, 1963, 1965, 1966)¹, the aims are unchanged: (1) to summarize briefly the pertinent data contained in each article, (2) to list all new genera and species described therein, and (3) to denote, by brackets, all taxonomic changes noted from current and subsequent publications, thus making the bibliography a more useful working tool. An attempt is also made to evaluate the literature to date and possibly to delineate trends.

INTRODUCTION

This annotated bibliography consists of 36 references containing original descriptions of genera and species, and taxonomic nomenclature of Paleozoic nonfusulinid Foraminifera. An additional 114 references that utilized smaller foraminifers in stratigraphic subdivision and that mention incidental occurrences are also included for completeness.

The 150 references have been annotated by the compilers. These annotations include geologic age, geographic locality, type of illustrations, original language, new forms described, and comments in brackets on taxonomic changes from the annotated article or noted from subsequent publications.

This bibliography may be considered to be reasonably complete through the year 1965. This includes the Soviet references, which, through the able assistance of Professor Mamet, have been completely up-dated.

Including this addendum, the total number of annotated Paleozoic nonfusulinid foraminiferal references has reached 815. 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.

LITERATURE EVALUATION
AND APPARENT TRENDS

Text Fig. 1 is an attempt to show chronologically the distribution of articles relating to Pale-

ozoic nonfusulinid Foraminifera according to designated geographic provinces. The inclusion of the present 150 references continues to point up the pronounced increase of foraminiferal literature from Europe, Africa, and the Middle East (Column C), during the last five years. Significant additions have also been made in the Soviet Union (Column A), due mainly to their ever increased usage of the endothyroid smaller foraminifers in stratigraphically subdividing the Lower Carboniferous.

In Text Figure 2 the foraminiferal literature output has been plotted according to geologic age. In general, the basic overall trend remains similar, except that there is a distinct increase in Mississippian (Lower Carboniferous) foraminiferal literature. This is primarily due to the addition of so many Soviet references pertaining to Lower Carboniferous endothyroid studies.

ANNOTATED BIBLIOGRAPHY

A. *PRECARBONIFEROUS FORAMINIFERA*

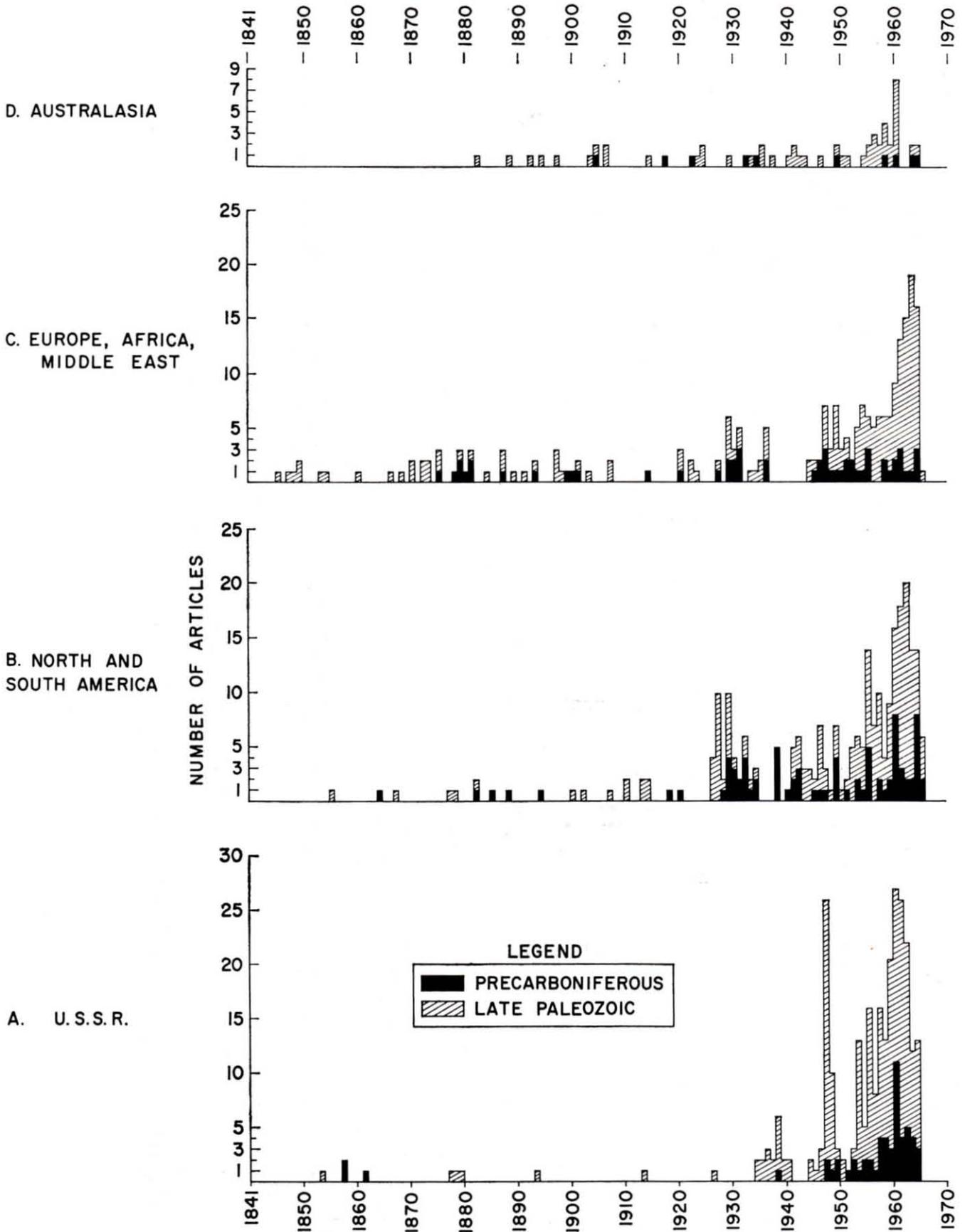
1. BIRINA, L. M., 1949, The boundary between the Devonian and the Carboniferous in the central portion of the Russian Platform in the light of a petrographic study of the bordering layers: Akad. Nauk S.S.S.R., Izvestia, ser. geol. No. 5, p. 67-81, [in Russian with English summary].

The writer notes the occurrence of the foraminifers *Hyperammia minima*, *Bisphaera*, *Endothyra*, and *Umbellina*, in scattered outcrops of Upper Devonian-Lower Carboniferous rocks exposed on the central portion of the Russian Platform, U.S.S.R.

2. CHERNOV, G. A., 1961, New data on the stratigraphy of the Upper Devonian in the eastern part of the Bolshezemelsk Tundra: Akad. Nauk S.S.S.R., Doklady, v. 136, no. 1, p. 183-186, [in Russian; English translation *IN: Doklady ESS, Am. Geol. Inst.*, v. 136, nos. 1-6, p. 42-44].

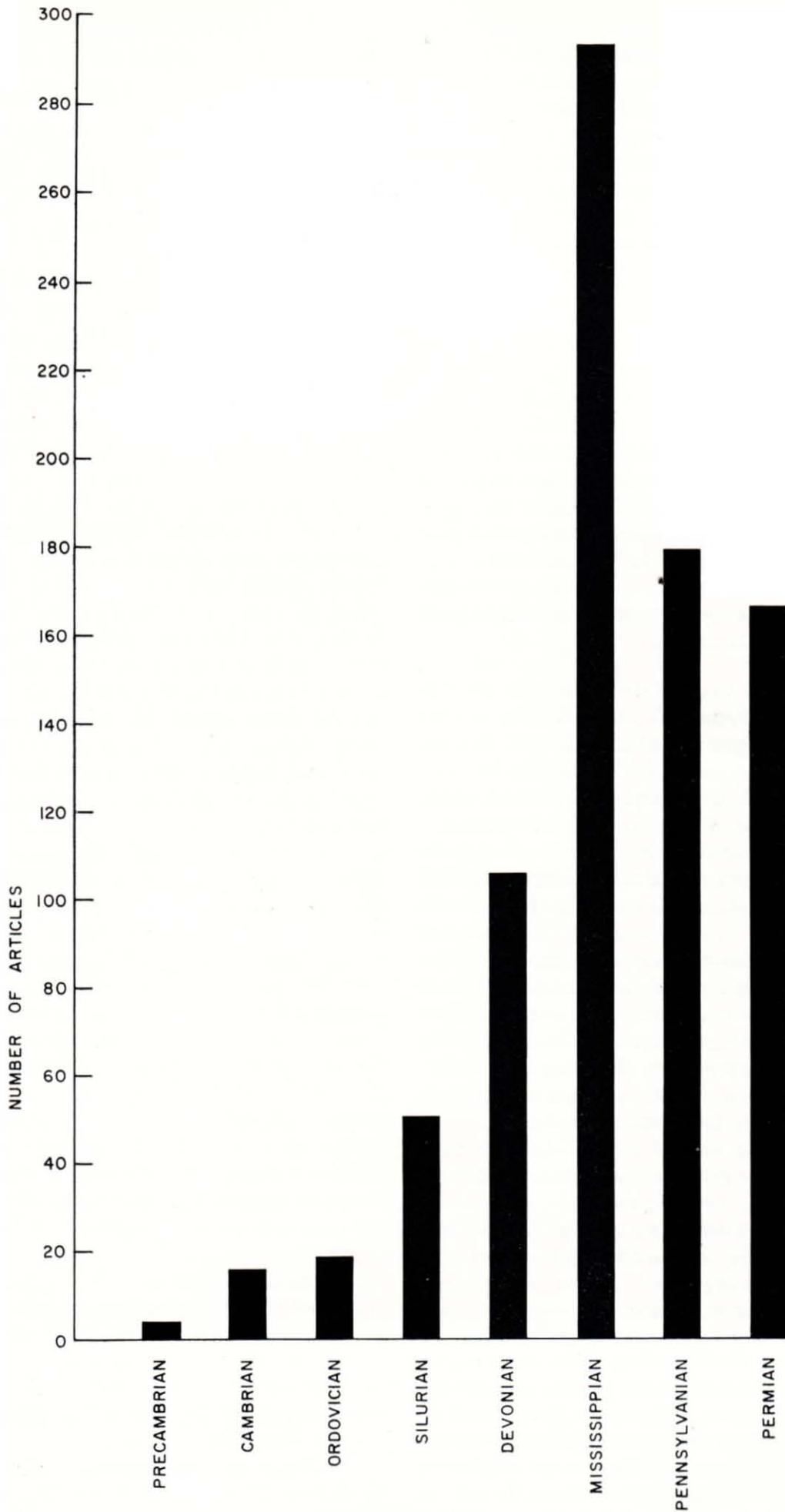
A detailed study of the fauna of the Upper Devonian deposits in the eastern part of the Bolshezemelsk Tundra in the region of the Ayachyaga

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.



TEXT FIGURE 1

Geographic Distribution of Paleozoic Foraminiferal Literature



TEXT FIGURE 2
Geological Distribution of Paleozoic Foraminiferal Literature

River, a tributary of the Vorkuta, and on the Usa River and its tributaries, the Yelets and Lek-Yelets, U.S.S.R., permitted elaborate detailed faunal studies which resulted in the establishment of a number of stratigraphic levels in the Upper Devonian deposits. Previously described typical Frasnian and Fammenian foraminiferal species assemblages are listed from this region, and, in addition, the foraminiferal microfaunas of the transitional boundary beds of the Lower Carboniferous are listed.

3. CHERNOV, G. A., 1964, Silurian deposits of the Chernov Uplift (Bol' shezemel'skaya Tundra): Akad. Nauk S.S.S.R., Doklady, v. 156, no. 4, p. 843-846, 1 text-fig., [in Russian].

Bed-by-bed collections of fossils, primarily brachiopods and ostracodes, support the inference that a thick Silurian carbonate section is present in the Chernov Uplift., U.S.S.R. These beds were once erroneously mapped as Middle and Upper Devonian deposits. Reitlinger identified the foraminifers and asserted that the species assemblage, of previously described forms, is typically Upper Silurian (Lower Ludlovian).

4. CHUVASHOV, B. I., 1964, Bionomic description of the Fammenian Basin on the western slope of the central and south Urals: Paleont. Zhur., No. 4, p. 10-22, 2 text-fig., [in Russian; English translation IN: Internat. Geol. Rev., v. 7, no. 11, p. 2054-2062, 2 text-fig.].

In the Upper Devonian (Fammenian) basin on the western slope of the central and south Ural Mountains, U.S.S.R., three major facies types are well developed: (1) shoal facies, consisting of thick beds of limestone and dolomite with some anhydrite, (2) depression facies, consisting of black bituminous limestone, cherty mudstone and black shale, and (3) an intermediate facies, consisting of interbedded types from the other two facies. The principal floral and faunal elements of each facies are uniquely tabulated in text-fig. 2.

Among the smaller foraminifers the most widespread are the parathuramminids (*Parathuramina*, *Bisphaera*, *Cribrosphaeroides*, *Eovolutina*, and *Tuberitina*) which lived both in very shallow waters and at the maximum depth occurrences in the Fammenian Basin. These foraminifers have a wide range of salinity tolerance and could exist under conditions of salinity which very few other organisms could endure. The more highly organized foraminifers of the genera *Septaglomospiranella*, *Septatourayella* and *Quasiendothyra* were much more sensitive to depth and salinity variations. In sediments formed under heightened salinity conditions these foraminifers occur only as isolated individuals. The most favorable conditions for these types occurred in the shallow, well-lighted

parts of the basin where normal salinity and an active hydrodynamic regime prevailed.

5. CHUVASHOV, B. I., 1965, Foraminifera and algae from the Upper Devonian sediments in the western slope of the central and southern Urals: Akad. Nauk S.S.S.R., Trudy, Ural Branch, Inst. Geol., Trans., Sverdlovsk, No. 74, Problems of Strat. No. 8, p. 3-153, 29 pl., 3 text-fig., [in Russian].

From the Upper Devonian sediments along the western slope of the central and southern Ural Mountains, U.S.S.R., a microfauna of 116 species, of which one genus and 29 species are new, is described and illustrated by thin-section photomicrographs. The new forms are: *Parathuramina turgida*, *P. scitula*, *P. monstrata*, *P. horrida*, *P. regularis*, *P. obnata*, *Cribrosphaeroides incomptus*, *Uralinella ovalis*, *Rauserina variosa*, *Eotuberitina praecipia*, *Tubeporina? incita*, *Caligella? divida*, *Paracaligelloides abramjanae* n. gen., *P. muriciformis*, *Baituganella serpiensis*, *Paratikhinella insolita*, *P. vizhaica*, *Evlania prava*, *E.? camerata*, *Rectangulina mammata*, *Brunsiina novita*, *Septaglomospiranella (S.) lastica*, *S. nimia*, *Haplophragmella vilvensis*, *Plectogyra asjamica*, *Cornuspira pusilla*, *Nanicella uralica*, *N. suljomica*, and *Umbella effusa* [should be referred to *Umbellina*; see Loeblich and Tappan, 1961; Chuvashov regards the umbellinids as charophytes]. Significant taxonomic changes include the following: *Cribrosphaera simplex* Reitlinger, 1954 = *Cribrosphaeroides simplex* (Reitlinger); *Cribrosphaera crassa* Pronina, 1960 = *Cribrosphaeroides crassus* (Pronina); *Uslonia permira* Antropov, 1959 = *Cribrosphaeroides permirus* (Antropov); *Eonodosaria? multiformis* Lipina, 1950 = *Tikhinella multiformis* (Lipina); *Syniella tortuosa* Antropov, 1950 = *Rectangulina tortuosa* Antropov; *Brunsiina uralica* Durkina, 1959 = *Brunsiina primula* nom. nov.; *Ammobaculites markovskii* Tchernysheva, 1952 = *Quasiendothyra? markovskii* (Tchernysheva); *Tourayella (Eotourayella) jubra* Lipina and Pronina, 1964 = *Cornuspira jubra* (Lipina and Pronina); *Lingulina rauserae* Tchernysheva, 1952 = *Nodosaria rauserae* (Tchernysheva).

6. CONIL, R., and LYS, M., 1964, Matériaux pour l'étude micropaléontologique de Dinantien de la Belgique et de la France (Avesnois). Pt. 1: Algues et Foraminifères and Pt. 2: Foraminifères (suite): Mém. Inst. Géol. Univ. Louvain, v. 23, 335 p., 42 pl., 33 text-fig., [in French].

Primarily a monographic study of the Carboniferous Foraminifera of the Dinant Basin of Belgium and France. However, 19 Late Devonian (Fammenian-Fm2) foraminifers are described and

illustrated by excellent thin-section photomicrographs; of the 19 Devonian species 12 are new species and 3 are new varieties. One new genus, *Disanella*, is also described. The new forms are: *Bisphaera variabilis* var. *variabilis* n. sp., n. var., *Umbella chanxhei*, *U. concentrica*, *U. cutis*, *U. duplex*, *U. gravis*, *U. kornelimünsteri*, *U. parma*, *U. radians*, *U. saccaminiformis* Bykova and Polenova var. *fauces*, *U. spinosa*, *U. vulgaris* [the umbrellas are now referred under the genus *Umbellina*; see Loeblich and Tappan, 1961, p. 248], *Disonella lucens* n. gen., *Septaglomospiranella complanata*, and *Plectogyra parakosvensis* (Lipina) var. *imminuta*.

7. CONKIN, J. E., and CONKIN, B. M., 1965, Ordovician (Richmondian) Foraminifera from Oklahoma, Missouri, Illinois, and Kentucky: Oklahoma Geol. Notes, v. 25, no. 8, p. 207-224, 2 pl., 3 tables.

The writer reports the occurrence of Upper Ordovician (Richmondian) agglutinated Foraminifera from the Sylvan Shale of Oklahoma, Maquoketa and Orchard Creek Shales of Missouri and Illinois, and the Waynesville Formation of Kentucky. This report includes the first description of the genus *Tolypammina* [probably should be referred to the genus *Minammodytes*; see Henbest, 1963] in the Ordovician, and of the genus *Blastammina* in the Ordovician of North America. The foraminifers *Thuramminoides sphaeroidalis* Plummer, 1945, emended Conkin, 1961, and *Tolypammina* sp. are common to all of the sampled units, whereas *Blastammina* sp. is only reported from the Sylvan Shale of Oklahoma. The foraminifers are illustrated by whole-specimen photomicrographs.

8. GARETSKY, R. G., *ET AL.*, 1961, Lower Carboniferous and Upper Devonian deposits of the Zhanasu region: Akad. Nauk S.S.S.R., Doklady, v. 136, no. 6, p. 1418-1421, [in Russian].

From the Upper Devonian (upper Frasnian) deposits of the Zhanasu Region of the Soviet Union, a typical microfaunal assemblage is reported consisting of the following: *Eonodosaria* sp. cf. *E. stalinogorski*, *E. rauserae*, *E. sp.* cf. *E. kikienensis*, *E. evlanensis*, *Eogeinitzina devonica*, and *Nanicella* sp. cf. *N. evoluta*. All forms come from a limestone-argillite sequence.

9. GUTSCHICK, R. C., 1966, Transitional Devonian to Mississippian environmental changes in western Montana: Kansas Geol. Survey Bull. 169, Symposium on cyclic sedimentation, p. 171-181, 5 text-fig.

The writer presents a summary of the generalized biostratigraphy for the Devonian-Mississip-

pian succession in western Montana. Eight informal stratigraphic units have been recognized for the Sappington Formation and three units for the lowermost Lodgepole Limestone. From the algae-sponge biostromal unit (E) of the uppermost Devonian (Famennian) Sappington Formation, an agglutinated microfauna of ammodiscids, minnamodytids, hyperamminids, and reophacids is illustrated by representative whole-specimen photomicrographs [see Gutschick *et al.*, 1962 and 1964 for formal description of this microfauna.]

Text-figure 5 shows the distribution of some agglutinated foraminifers (hyperamminids, minnamodytids, and reophacids) within the Lower Mississippian Lodgepole Limestone at Logan, Montana,

10. HOMOLA, V., 1947, Compte-rendu des Recherches sur le terrain devonien près de Hronice: Vest. Stat. Geol. Inst., C.S.R., no. 2-3, p. 109-110 [in Czechoslovakian].

Mention is made of the occurrence of endothyroid-type smaller foraminifers in the Upper Devonian rocks of Moravia, Czechoslovakia.

11. IRELAND, H. A., 1966, Silurian arenaceous Foraminifera from sub-surface strata of northeastern Kansas: Micropaleontology, v. 12, no. 2, p. 215-234, 1 pl., 2 text-fig., 5 tables.

Foraminifera were extracted from acid residues of well samples of the subsurface Hunton Group of the Salina and Forest City Basins of northeastern Kansas. It is believed that the microfauna is restricted to the Niagaran portion of the Silurian beds and is thought to be the stratigraphic and faunal equivalent of the Clarita Member of the Chimneyhill Limestone of the Arbuckle Mountains, Oklahoma. Twenty agglutinated species representing eleven genera were identified, among which are two new species and one new genus. The microfauna is illustrated by whole-specimen drawings. The new forms are: *Hyperbathoides* (n. gen.) *schwalmi*, and *Glomospirella ellipsoidalis*. Important taxonomic revisions include the following: *Arenosiphon rugosa* Miller, 1956 = *Bathysiphon rugosus* Ireland, 1939; *Lituotuba inflata* Ireland, 1939, and *Lituotuba exserta* Moreman, Dunn, 1942 = *Glomospirella inflata* (Ireland); *Lituotuba elongata* Dunn, 1942 = *Glomospirella elongata* (Dunn); and *Turritellella osgoodensis* Dunn, 1942 = *Turritellella fisheri* Dunn.

12. KOROLYUK, I. K. and LAGUTENKOVA, N. S., 1965, Further finds of problematic microfossils in Bavly sediments: Akad. Nauk S.S.S.R., Doklady, v. 161, no. 2, p. 455-458, 1 pl., [in Russian; English translation *IN*: Doklady ESS Am. Geol. Inst., v. 161, p. 213-216, 1 pl.].

Microfossils and problematic microfossils

from the Lower Bavly Series of Rhiplean age and the Upper Bavly Series of Early Paleozoic age are reported from boreholes in the Volga-Urals region of the Soviet Union. In the Upper Bavly Series a mass of representatives of the groups *Archaeosphaera* Suleimanov, *Palaeosphaeroidina* gr. n., and *Valdella* gr. n., i.e. principally different spheroidal organisms, are reported. A special form of the *Lenticularia* group was also detected. The fact that, like *Archaeosphaera*, they may all be Foraminifera is shown by the character of their walls. *Lenticularia* and *Palaeosphaeroidina* possess the thick vitreous walls specific to Foraminifera rather than to algae. The *Valdella* group has agglutinated foraminiferal-type walls.

The following new foraminiferal types are described and illustrated by thin-section photomicrographs: *Archaeosphaera rossica* f. n., *Palaeosphaeroidina primitiva* f. n., *Lenticularia pulchra* f. n., *L. crassathecata* f. n., and *Valdella valda*, f. n.

13. LE MAITRE, D., 1931, Sur le présence d'*Endothyra* dans le Famennien de Jeumont (Nord): Ann. Soc. Géol. du Nord, v. 56, p. 213-214 [in French].

The writer reports the presence of the foraminifer *Endothyra* from supposed Devonian (Famennian) rocks in the vicinity of Jeumont, France.

14. LEE, W., 1943, The stratigraphy and structural development of the Forest City Basin in Kansas: Kansas Geol. Survey Bull. 51, 142 p., 22 text-fig., 2 tables.

In a section dealing with the Silurian rocks (p. 43-49) of the subsurface of the Forest City Basin of northeastern Kansas, it is noted that four zones are present and can be correlated within the basin. These zones are: (1) oolitic, (2) white chert, (3) foraminiferal, and (4) drusy quartz. The foraminiferal zone is 20 to 50 feet thick and contains agglutinated foraminifers that consist in part of flat, closely coiled, discoidal tests having the aperture at the end of a tube extending sharply at right angles to the coil. These foraminifers, according to the writer, resemble *Lituotuba* and *Ammodiscus* described by Moreman (1930) and Ireland (1939) from the Silurian of Oklahoma. It is believed that the Silurian of the Forest City Basin is correlative to the Chimneyhill Limestone of Oklahoma. [See Ireland (1966) for a complete description of this microfauna.]

15. LEE, W. 1956, Stratigraphy and structural development of the Salina Basin area: Kansas Geol. Survey, Bull. 121, 167 p., 12 pl., 23 text-fig., 19 tables.

In a section dealing with Silurian rocks

(p. 47-53) of the Salina Basin area of Kansas, the writer notes that where the sequence is "normal", the fine-grained dolomites of the foraminiferal zone and their limestone correlatives on the margin of the North Kansas Basin are characterized by the presence of diffusely distributed agglutinated foraminifers resembling *Ammodiscus* and *Lituotuba*; forms present in the Silurian of Oklahoma. It is further noted that on the southern margin of the North Kansas Basin, where dolomite beds are interstratified with limestones, the agglutinated foraminifer *Ammodiscus* has been found in the limestone as well as in the dolomite. [See Ireland, 1966, for further comments on this microfauna].

16. LELESHUS, V. L., 1965, Devonian deposits of the Zeravshan-Gissar Mountains: Akad. Nauk S.S.S.R., Doklady, v. 162, no. 1, p. 158-160, 1 text-fig., [in Russian; English translation IN: Doklady ESS, Am. Geol. Inst., v. 162, nos. 1-6, p. 26-28, 1 text-fig.].

From the Lower Devonian rocks of the northern slope of the Zeravshan Range (Shishkat, Madm, Vashan and Dimnora River Basins), and at the base of the southwestern slopes of the Turkistan Range (Garibak, Shingak, Uchkol', Maykota and Amandora Gorges) of the asiatic portion of the Soviet Union, the smaller foraminifers *Parathurammina devonica* Vissarionova and *Vicinesphaera angulata* Antropov are reported as occurring in deposits of a littoral shallow-water facies associated with an abundant and varied biota.

17. LIPINA, O. A. and PRONINA, T. V., 1964, A new subgenus of *Tournayella* from the upper Frasnian of the Urals: Akad. Nauk S.S.S.R., Paleont. Zhur., No. 3, p. 125-126, 1 text-fig., [in Russian; English translation IN: Int. Geol. Rev., v. 7, no. 10, Oct. 1965, p. 1858-1859].

Under the genus *Tournayella* Dain, 1953, a new subgenus *Eotournayella* is described from the Upper Devonian (upper Frasnian) rocks of the Ural Mountains, U.S.S.R. One new species, *Tournayella (Eotournayella) jubra*, is fully described and illustrated by representative thin-section photomicrographs. [According to Chuvashov, 1965, *Tournayella (Eotournayella) jubra* Lipina and Pronina, 1964 = *Cornuspira jubra* (Lipina and Pronina).]

Eotournayella seems to be transitional from the ammodiscids to the tournayellids and to be ancestral to or to contain marks of characteristic structures in certain tournayellid stocks.

18. LORANGER, D. M., 1965, Devonian paleoecology of northeastern Alberta: Jour. Sed. Petrology, v. 35, no. 4, 818-837, 5 text-fig.

On the basis of a study of the Devonian

rocks (both surface and subsurface) of Alberta, Canada, the writer reports the occurrence of *Endothyra gallowayi* (= *Nanicella gallowayi* (Thomas)) from the Mildred Member of the Waterways Formation (uppermost Givetian) [most workers would regard this stratigraphic horizon as Upper Devonian (Frasnian) in age].

The writer also reports that the Ireton Member of the Woodbend Group (Frasnian) contains the foraminifers *Semitextularia thomasi* Miller and Carmer and *Pseudopalmula palmoides?* Cushman and Waters.

19. LYASHENKO, A. I. and ILINA, N. S., 1962, New data on the Upper Devonian geology of the southeastern side of the Tokmova Arch: Akad. Nauk S.S.S.R., Doklady, v. 143, no. 4, p. 928-930, [in Russian].

The Upper Devonian (Frasnian) Yevlanov Horizon in Mordovian, A.S.S.R., yields the algae (*sic*) *Tikhinella* sp. cf. *T. pirula* Bykova and the foraminifer *Eonodosaria evlanensis* Lipina.

20. MAMET, B., 1965, Etude de faciès carbonatés paléozoïques: Bull. Soc. Belge de Géol., v. 73, no. 2, p. 133-142 [in French].

The genus *Umbellina* is recorded from the Upper Devonian (upper Frasnian) of Golzinne, Belgium.

21. PFLUG, H. D., 1965, Foraminiferen und ähnliche Fossilreste aus dem Kambrium und Algonkium: Palaeontographica, v. 125, no. 1-3, p. 46-60, pl. 10-12, 4 text-fig., 3 tables [in German].

From the Upper Cambrian Alum Shales of Schonen, Sweden, a new genus and species of foraminifer, *Scaniella scaniensis*, is fully described and illustrated by superb high-power ($\times 1800-5000$) thin-section photomicrographs. The writer contends that the new form is closely related to members of the family Palaeotextulariidae. The test is extremely small, but in no sense can it be considered primitive. The initial chambers are roughly arranged in a trochospiral; the adult part of the test is incompletely biserial. The foram wall is two-layered, and consists of an inner fibrous layer and an outer granular layer; the wall is uniformly perforated, a few foreign mineral grains have been incorporated within the outer wall. The aperture appears to have been simply constructed. The holotype could correspond to a megalospheric form, whereas the cotype may possibly correspond to a microspheric form.

This highly organized foraminifer, from an undoubted Cambrian outcrop, gives reason to expect the root of the Foraminifera in rock of Precambrian age. Accordingly, chambered forms as

well as agglutinated fragments which are reminiscent of the Foraminifera have been found in the Precambrian (Algonkian) rocks of the Belt Series of Montana (age somewhere in excess of 1 billion years). Representative material from the Belt Series is illustrated and briefly discussed, but is still not completely evaluated. In general, Cambrian and Precambrian tests are much smaller than those of younger foraminifers and the shell material appears to be less capable of satisfactory preservation. These may be a few of the pertinent reasons for the lack of documented occurrences of Foraminifera from beds as old as these.

The isolation of these foraminifers can only be achieved by utilizing the so-called dry-preparation technique (selective pulverization, electrostatic separation, and air-stream sifting).

22. PONCET, J., 1965, Sur quelques particularités de fixation et d'association présentées par des Foraminifères du Dévonien inférieur (Cotentin); Soc. Géol. France, C. R. Seance 5th avril, p. 116-117, 6 fig., [in French].

The writer presents a number of thin-section photomicrographs clearly showing encrusting foraminifers found in the Lower Devonian reefoid deposits of Baubigny, France. It is believed that the encrusting foraminifers found in this deposit had a definite role in stabilizing organic debris. It is further noted that this particular encrusting foraminifer appears to have had a commensal relationship with the alga *Rothpletzella*. The encrusting foraminifer is neither formally named nor described.

23. POYARKOV, B. V., 1964, First colloquium on the study of fossil *Chara* algae and their importance for stratigraphy: Paleont. Zhur., No. 1, p. 143-144, [in Russian; English translation IN: Internat. Geol. Rev., v. 7, no. 8, p. 1495-1496].

This paper presents a report on a fossil charophyte seminar held by ten Russian paleoalgologists at Moscow, beginning March 29, 1963. Individual papers are discussed and the potential importance of fossil charophytes to stratigraphy is emphasized. One participant (Poyarkov) claims that the Devonian genus *Umbellina*, previously placed in the Foraminifera, are actually charophyte utricles. [See Toomey and Teichert, 1965, for a discussion of the status of *Umbellina* to date.]

24. PRANTL, F., 1948, Recherches stratigraphiques et paléontologiques sur le Dinantien de la colline de Hady près Brno (Moravie): Vest. Stat. Geol. Inst., C.S.R., v. 23, p. 173-178 [in Czechoslovakian].

It is reported that endothyroid-type smaller

foraminifers occur in the Upper Devonian (Famennian) deposits of western Czechoslovakia.

25. TEICHERT, C., 1965, Devonian rocks and paleogeography of central Arizona: U. S. Geol. Survey Prof. Paper 464, 181 p., 32 pl., 40 text-fig., 8 tables.

The writer presents a detailed study of the Devonian rocks of central Arizona. Of especial interest is the reported occurrence of *Umbella* [now generally regarded as *Umbellina*; see Loeblich and Tappan, 1961] in the Jerome Member of the Late Frasnian Martin Formation. There is an excellent discussion and description of the Arizona forms, their local distribution and reported worldwide occurrences on pages 103-105. Also included is a lucid résumé on the nomenclature and possible taxonomic affinities of *Umbellina*. The writer suggests that *Umbellina* is best regarded as an organism of uncertain taxonomic position that may represent either a new group of Protista or may have algal affinities. The writer doubts that *Umbellina* is a foraminifer [see Toomey, 1965, for a divergent opinion].

Thin-section photomicrographs of randomly cut *Umbellina* are shown on plates 20 and 21. There are also drawings of representative thin-section cuts of *Umbellina* and a series of drawings showing a suggested successive growth-stage series on figures 39 and 40.

26. TOOMEY, D. F., 1965, Upper Devonian Foraminifera from the Lime Creek Formation of northcentral Iowa (Abstract): Geol. Soc. America, Program Annual Meeting Kansas City, Missouri, p. 175.

A 40-foot sequence of lower Upper Devonian Lime Creek Formation (Cerro Gordo and Owen Members) near Rockford, northcentral Iowa, has yielded a significant suite of calcareous and agglutinated foraminifers.

The 37 feet of Cerro Gordo silty fossiliferous shale, with thin beds of argillaceous limestone, is dominated by the abundance of *Nanicella gallowayi* (Thomas). Other forms, notably *Semitextularia*, and *Moravammina* occur only rarely. An indeterminate agglutinated foraminifer appears to be restricted to the more argillaceous limestone intervals.

The overlying 3-foot stromatoporoid-bearing limestone of the Owen Member carries a relatively abundant calcareous foraminiferal assemblage dominated by *Eonodosaria* and *Paracaligella*; *Tikhinella* and *Nanicella* occur less commonly. The agglutinated foraminiferal assemblage is composed principally of an undescribed adnate?, subglobose form closely allied to those genera now described under the family Saccamminidae. A few

specimens of *Sorosphaera* and *Minammodytes*? also occur within the Owen foraminiferal suite.

This note marks the first reported occurrence of the Soviet genus *Paracaligella* from North America, and this is only the second instance in which both agglutinated and calcareous Upper Devonian foraminifers have been reported from the same stratigraphic horizon.

27. TOOMEY, D. F., 1965, A unique Upper Devonian *Umbellina* from the Williston Basin of Montana: Contr. Cushman Found. Foram. Research, v. 16, pt. 4, p. 144-147, pl. 24.

Thin-sections prepared from two well cores penetrating the Upper Devonian (Frasnian) Duperow Formation of northeastern Montana have yielded many specimens of a unique Devonian foraminifer that is probably conspecific with the Russian form *Umbellina bella* (Maslov). The Duperow specimens differ from previously described forms by the possession of well developed lateral nodose projections. This unique morphological characteristic has not been mentioned or illustrated in any of the earlier descriptions. It is suggested that these projections may possibly have aided in stabilizing the mature organism for an attached benthonic existence. Only specimens that appear to be mature forms show well developed nodose projections.

The Duperow umbellinids are found in rocks classified as intraclastic lime wackestones. The associated biota consists of amphiporoids, echinodermal debris, brachiopod fragments and ostracodes. Both the biota and lithology are thought to be indicative of shallow water marine conditions.

A brief résumé of reported occurrences of *Umbellina*, a list of described species, and a plate of thin-section photomicrographs are also included. [Conil and Lys, 1964, report *Umbellina* from the Belgian Lower Carboniferous (Tournaisian-Tn1.)]

28. YANG-SHEN, S. 1961, Famennian deposits in the Belety River region: Akad. Nauk S.S.S.R., Doklady, v. 137, no. 2, p. 403-406 [in Russian].

The writer notes that the Upper Devonian (Famennian) silicified and dolomitized limestones from central Kazakhstan, U.S.S.R., contain the following smaller foraminifers: *Parathurammina* ex. gr. *cushmani*, *Tournayella* sp., *Septatournayella* sp. aff. *S. minuta*, *Septaglomospiranella* sp. aff. *S. primaeva*, *Endothyra* sp. aff. *E. antiqua*.

B. LATE PALEOZOIC FORAMINIFERA

29. AISENBERG, D. E. and BRAZHNKOVA, N. E., 1964, Donetz Basin analogues of Etroeungt strata: 5th. Internat. Congr. on the Strat. and

Geol. of the Carboniferous, Paris, 1963, C. R., v. 1, p. 263-272, 3 pl., [in English].

Donetz Basin analogues of the Etroeungt strata are the deposits of the Novotroitsky Horizon (Zone C₁ta). These deposits contain a mixed Devonian-Lower Carboniferous microfauna and fossil plants. An analysis of the entire fauna and flora of the Novotroitsky Horizon shows that along with the surviving Devonian forms and numerous endemics are a great number of genera and species of Lower Carboniferous aspect. This circumstance, as well as the transgressive nature of the deposits, is evidence of the Carboniferous age of the Novotroitsky Horizon and its analogues. It is significant that typically Devonian forms, unknown in the Lower Carboniferous, *i.e.* representatives of the genera *Rauserina*, *Umbellina*, *Cribrosphaeroides*, *Paracaligella* and the form *Septatournayella rauserae* Lipina, are encountered in the Novotroitsky Horizon.

Excellent thin-section photomicrographs of representative Lower Carboniferous Etroeungt smaller foraminifers are given on Plate I.

30. BARROIS, C., 1902, Sur les Foraminifères des phtanites Carbonifères du Boulonnais: Ann. Soc. Géol. du Nord, v. 31, p. 40-42 [in French].

Chert nodules that have been reworked into Upper Jurassic limestones of France are now dated as Lower Carboniferous (Viséan) on the presence of abundant *Endothyra*, *Textularia* [would now be referred to *Palaeotextularia*], and *Valvulina*.

31. BAYKAL, F. and KAYA, O., 1963, Allgemeine Stratigraphie des Karbons in der Umgebung von Istanbul: Bull. Min. Res. & Explor. Inst. Turkey, No. 61, p. 1-10, 2 pl., [in German].

The writer notes that the Lower Carboniferous silicified shales and limestones of Cebecikoy, in the vicinity of Istanbul, Turkey, contain a rich microfauna consisting of representatives of the following genera: *Tetrataxis*, *Glomospira*, *Ammodiscus*, cf. *Hemigordius*, *Endothyra*, *Bradyina*, *Valvulinella*, *Glomospirella*, *Archaeodiscus*, and the fusulinid *Eostaffella*. No illustrations or descriptions are given.

32. BOGUSH, O. I., 1961, *Lasiodiscus alaicus* n. sp., A Late Carboniferous foraminifer: Paleont. Zhur. No. 3, p. 122-123, 1 text-fig., [in Russian].

One new species of smaller foraminifer, *Lasiodiscus alaicus*, from the Late Carboniferous of the U.S.S.R., is described and illustrated by rather poor thin-section photomicrographs. This new species is reported from the *Triticites-Quasifusulina* Zone.

33. BOGUSH, O. I. and JUFEREV, O. V., 1960, Some new species of Tournaisian Foraminifera from Kara-Tau and the western spurs of Ala-Tau: Paleont. Zhur., No. 4, p. 16-27, 1 pl., 1 table [in Russian].

From the Lower Carboniferous (Tournaisian) rocks of Kara-Tau and the western spurs of Ala-Tau, Soviet Union, a microfauna of 10 new species of smaller foraminifers is described and illustrated by thin-section photomicrographs. The new species are: *Septatournayella praesegmentata*, *Plectogyra baidjansaica*, *P. rectiformis*, *P. orgailysaica*, *P. zakharovi*, *P. belmasarica*, *P. turkestanica*, *P. menneri*, *Quasiendothyra umbonata*, and *Planoendothyra turlanica*.

34. BOGUSH, O. I. and JUFEREV, O. V., 1961, Layers with *Endothyra communis* in Karatau and in the western spurs of the Talass Alatau: Moscow Soc. Nat., Bull., v. 36, no. 3, p. 89-101, 2 tables [in Russian with English abstract].

On the basis of previously described smaller foraminifers, brachiopods, and corals, the writers have been able to delineate accurately the Upper Devonian-Lower Carboniferous boundary in Karatau and in the western spurs of the Talass Alatau, U.S.S.R. The most diagnostic faunal element is the flood occurrence of the smaller foraminifer *Endothyra communis* Rauser-Chernousova. The faunal data, both microfaunal and megafaunal, for this interval is concisely presented on two tables.

35. BOGUSH, O. I. and JUFEREV, O. V., 1962, Foraminifers and stratigraphy of the Carboniferous deposits in Karatau and Talasskiy Alatau: Akad. Nauk S.S.S.R., Dept. of the Siberian Inst. Geology and Geophysics, 234 p., 9 pl., charts, [in Russian].

From the Lower Carboniferous deposits of Karatau and Talasskiy, U.S.S.R., a microfauna of 144 species of smaller foraminifers, of which 21 are new, is fully described and illustrated by thin-section photomicrographs. A diverse fusulinid microfauna is also described and illustrated. The new smaller foraminifers are: *Archaeosphaera sulemanovi*, *Parathuramina bella*, *P. radiosphaerica*, *P. pachysphaerica*, *Bisphaera compressa*, *B. angulata*, *Paracaligella paraspinoza*, *Quasiendothyra compta*, *Planoendothyra planispiralis*, *Plectogyra lata*, *P. parasamarica*, *P. fluctata*, *P. kostobensis*, *P. honesta*, *P. talassica*, *Tetrataxis lata* [synonym; see Spandel, 1901] *Umbella clara*, *U. obscura*, *U. vermiformis* [name *Umbella* pre-occupied; should now be referred to the genus *Umbellina*, see Loeblich and Tappan, 1961] *Multiseptida akkusica*, and *Polyderma akkusica*.

Significant taxonomic changes include the

following: *Eonodosaria? multiformis* Lipina, 1950 = *Tikhinella multiformis* (Lipina); *Glomospirella pseudopulchra* Lipina, 1955 = *Brunsia pulchra* Mikhailov; *Glomospirella irregularis* Lipina, 1955 = *Brunsia irregularis* (Moeller); *Plectogyra baidjansaica* Bogush and Jeferev, 1960 = *Quasiendothyra baidjansaica* (Bogush and Jeferev); and *Ammobaculites? pygmaeus* Malakhova 1954 = *Chernyshinellina pygmaea* (Malakhova).

36. BOZORGNIA, F. and BANAFI, S., 1964, Microfacies and microorganisms of Paleozoic through Tertiary sediments of some parts of Iran: National Iranian Oil Company, 22 p., 156 pl., 1 geol. map, Tehran, Iran.

Primarily an atlas of photomicrographs illustrating representative microfacies and microorganisms from Paleozoic through Tertiary sediments of Iran. Pertinent Permo-Carboniferous illustrations (plates 6-41) contain many random-cut thin-section photomicrographs of commonly occurring calcareous algae, smaller foraminifers and fusulinids from southeast Central Zagros and Assadabad, Iran.

37. CALDWELL, W. G. E. and CHARLESWORTH, H. A. K., 1962, Viséan coral reefs in the Bricklieve Mountains of Ireland: Proc. Geol. Assoc., v. 73, pt. 4, p. 359-382, pl. 14-15, 5 text-fig.

Primarily a paper dealing with the Lower Carboniferous (Viséan) lithostrotionid coral "reefs" in northeastern Ireland. Mention is made that many of the lower limestones of the Bricklieve Group are mainly foraminiferal-polyzoan rocks with ammodiscids, numerous endothyrids, palaeonodosariids, tetrataxids and rare palaeotextulariids interspersed with fragmented polyzoans. Dr. R. H. Cummings, who examined the foraminifers, noted that except for a paucity of palaeotextulariids, the foraminiferal assemblages of the Bricklieve Group compare with those which he has found in mid- to upper Viséan strata in other parts of Ireland and on the British mainland.

38. CHERNYAK, G. Y. and SHVEDOV, N. A., 1960, A framework of the Lower Carboniferous stratigraphy of the Taimyr Peninsula: Paleo. and Biostrat. of the Soviet Arctic, Geol. Res. Inst., Min. Geol. and Nat. Conserv., v. 3, Leningrad, p. 11-23 [in Russian].

The Lower Carboniferous rocks of Taimyr Peninsula, U.S.S.R., can be subdivided into five biostratigraphic zones on the basis of brachiopods and foraminiferal assemblages (all previously described species). It is noted that the lower two zones are particularly rich in foraminifers which suggest a Tournaisian age.

39. CHINA, W. E., 1965, Opinion 724, *Endothyra bowmani* Phillips, [1846] (Foraminifera): validated under the plenary powers: Bull. Zool. Nomencl., v. 22, pt. 1, p. 37-39.

RULING.—(1) Under the plenary powers the following names are hereby suppressed for the purposes of both the Law of Priority and the Law of Homonymy:

(a) the generic name *Endothyra* Brown, 1843;

(b) the specific name *bowmani* Brown, 1843, as published in the binomen *Endothyra bowmani*.

(2) The generic name *Endothyra* Phillips, [1846] (gender: feminine), type-species, by monotypy, *Endothyra bowmani* Phillips, [1846], is hereby placed on the Official List of Generic Names in Zoology with the Name Number 1662.

(3) The specific name *bowmani* (emend. of *bowmanni*) Phillips, [1846], as published in the binomen *Endothyra bowmani*, as interpreted by the neotype designated by Loeblich & Tappan, 1964, (type-species of *Endothyra* Phillips, [1846], is hereby placed on the Official List of Specific Names in Zoology with the Name Number 2060.

(4) The generic name *Endothyra* Brown, 1843 (as suppressed under the plenary powers in (1) above) is hereby placed on the Official Index of Rejected and Invalid Generic Names in Zoology with the Name Number 1755.

(5) The following species names are hereby placed on the Official Index of Rejected and Invalid Specific Names in Zoology with the Name Numbers specified:

(a) *bowmani* Brown, 1843, as published in the binomen *Endothyra bowmani* (as suppressed under the plenary powers in (1) (b) above) (Name No. 812);

(b) *bowmanni* Phillips, [1846], as published in the binomen *Endothyra bowmanni* (an incorrect original spelling for *bowmani*, Phillips [1846] (Name No. 813));

(c) *bowmanii* Brown, 1843, as published in the binomen *Endothyra bowmanii* (an incorrect original spelling for *bowmani*, *Endothyra*, Brown, 1843) (Name No. 814).

40. CONDIT, D. D., RAGGATT, H. G., and RUDD, E. A., 1936, Geology of Northwest Basin, Western Australia: Am. Assoc. Petroleum Geologists, Bull., v. 20, no. 8, p. 1028-1070, 7 text-fig.

From the Permian Callytharra Limestone at its type locality at Callytharra Spring on the Woolamel River, Western Australia, 16 species of smaller foraminifers, all previously described, are listed. Representatives of the following genera are

present: *Dentalina*, *Spandeloides*, *Trepeilopsis*, *Calcitornella*, *Stacheia*, *Ammodiscus*, *Palaeobigenarina*, *Frondicularia*, *Ruditaxis*, *Globivalvulina*, and *Tetrataxis*.

41. CONIL, R., 1960, Le Tournaisien de la gare d'Yvoir: Bull. Soc. Géol. de Belgique, v. 69, no. 2, p. 277-294 [in French].

The writer mentions that *Glomospira*, *Hyperammina*, *Plectogyra* and *Spiroplectammina* occur in the Lower Carboniferous (upper Tournaisian) rocks of the Mollignée Valley, Belgium. [Mamet (personal communication) states that none of these genera are present in this region; correct generic taxa are *Pseudoglomospira*, *Earlandia*, *Endothyra-Spinoendothyra*, and *Palaeospiroplectammina*.]

42. CONIL, R., 1963, Interprétation micropaléontologique de quelques sondages de Campine: Bull. Soc. Géol. de Belgique, v. 72, no. 2, p. 123-135, 1 pl., 2 text-fig., [in French].

In this preliminary note the writer reports the occurrence of abundant smaller foraminifers from wells that penetrated the Lower Carboniferous (Viséan) sediments of Campine, Belgium. It is shown that from the lower Viséan sequence previously described species of the genera *Pachysphaera*, *Plectogyra*, *Glomospirella*, and *Archaeodiscus* are common. In the middle Viséan sediments species of *Plectogyra*, *Archaeodiscus*, *Permodiscus*, and *Propermodiscus* occur only irregularly; in the V2b horizon massive *Archaeodiscus krestovnikovi* Rauser is a conspicuous microfaunal element. The upper Viséan sediments are characterized by an abundance of various species of the genus *Archaeodiscus* in association with species of *Howchina*, *Tetrataxis*, *Lituotubella*, *Endothyranopsis*, *Janischewskina*, and *Valvulinella*. Representative smaller foraminifers are illustrated by excellent thin-section photomicrographs.

43. CONIL, R. and LYS, M., 1964, Matériaux pour l'étude micropaléontologique du Dinantien de la Belgique et de la France (Avesnois). Pt. 1-Algues et Foraminifères and Pt. 2-Foraminifères (suite): Mem. Inst. Geol. Univ. Louvain, v. 23, 335 p., 42 pl., 33 text-fig., [in French].

A monographic study of the Foraminifera (both smaller Foraminifera and Fusulinidae) of the Dinant Basin of Belgium and France. A total of 338 species are considered. Of these there are 195 new forms, of which 2 are new genera, 126 are new species, 67 are new varieties, and 2 are new names. All of the foraminifers are illustrated by superb thin-section photomicrographs. The microfauna is dominantly from rocks of Lower Carbon-

iferous age; however, a few forms are described from the Upper Devonian (Fammenian) and the Namurian. The stratigraphic significance of the microfauna is discussed in detail and excellent phylogenetic-lineage charts are given for the Endothyridae and the Archaeodiscidae.

The new forms are: *Bisphaera irregularis* Birina var. *gigantea* n. var., *B. oblonga*, *B. ovoidea*, *B. variabilis* var. *variabilis* n. sp., n. var., *B. variabilis* var. *bulbosa* n. var., *Eotuberitina firmata*, *Umbella cutis*, *U. globosa* [now referred under the genus *Umbellina*; see Loeblich and Tappan, 1961, p. 284; this marks the first reported occurrence of this genus in post-Devonian rocks (Tn1)] *Pachysphaera dervillei* n. gen., *P. polydermoides*, *Diplosphaerina* (?) *denticulata*, *D. insignis*, *D. lamproderma*, *D. varians*, *Quasipolyderma* n. gen., *Earlandinella* (?) *deformis*, *Paracaligella antropovi* Lipina var. *florennensis* n. var., *Ammodiscus bellus* Malakhova var. *tenuis* n. var., *Glomospira brevissima*, *G. (?) crassa*, *G. flexuosa*, *G. jactata*, *G. ovalis* Malakhova var. *persecuta* n. var., *G. recessa*, *G. versa*, *Glomospirella spirillinoides* (Grozdilova and Glebovskaia) var. *longa* n. var., *G. (?) valida*, *Ammobaculites* (?) *dinantii*, *Glomospiranella endothyroides* Dain var. *avesnensis* n. var., *G. (?) exigua*, *G. horioni*, *Lituotubella glomospiroides* Rauser-Chernousova var. *scalaeformis* n. var., *Septabrunkiina* (?) *comblaini*, *S. crassisepta*, *S. krainica* (Lipina) var. *globosa* n. var., *S. multivoluta*, *S. producta*, *Septaglomospiranella complanata*, *Cribrostomum lecomptei* new name, *C. obliquum*, *C. strictum*, *Palaeotextularia lipinae* new name, *Spiroplectammina tarda*, *Tetrataxis barkhatovae* Grozdilova and Lebedva var. *condrusiana* n. var., *T. barkhatovae* Grozdilova and Lebedva var. *pigra* n. var., *T. compactus*, *T. depressus*, *T. elegans*, *T. exornatus*, *T. fluxus*, *T. gradi*, *T. mirus*, *T. obliquus*, *T. pallae*, *T. paraminimus* Vissarionova var. *aperta* n. var., *T. petasi*, *T. pressulus* Malakhova var. *gigantea* n. var., *T. pusillus*, *T. rugosus*, *T. subcylindricus*, *Valvulinella latissima*, *V. (?) primaeva*, *Archaeodiscus celsus*, *A. clarus* var. *clara* n. sp., n. var., *A. clara* var. *lata* n. var., *A. complanatus*, *A. componens*, *A. convexus* Grozdilova and Lebedva var. *declinata* n. var., *A. cornua*, *A. crux*, *A. cyrtus*, *A. decussatus*, *A. demaneti*, *A. depressus*, *A. gigas* Rauser-Chernousova var. *angusta* n. var., *A. gigas* Rauser-Chernousova var. *densaspira* n. var., *A. gigas* Rauser-Chernousova var. *seroflexa* n. var., *A. gigas* Rauser-Chernousova var. *subangusta* n. var., *A. globosus* var. *globosa* n. sp., n. var., *A. globosus* var. *magna* n. var., *A. gracilis*, *A. inflexus*, *A. karreri* Brady var. *aucta* n. var., *A. karreri* Brady var. *spira* n. var., *A. krestovnikovi* Rauser-Chernousova var. *ampla* n. var., *A. krestovnikovi* Rauser-Chernousova var.

- ovata* n. var., *A. krestovnikovi* Rauser-Chernousova var. *piesis* n. var., *A. krestovnikovi* Rauser-Chernousova var. *redita* n. var., *A. macer*, *A. mohae*, *A. molleri* Rauser-Chernousova var. *grandis* n. var., *A. mutans*, *A. pulvinus*, *A. solei* var. *solei* n. var., *A. solei* var. *hirta* n. var., *A. teres*, *A. triangulus*, *A. valens*, *A. vertens*, *Neoarchaediscus incertus* (Grozdilova and Lebedva) var. *carnosa* n. var., *Permodiscus bucculentus*, *P. rotundus* N. Cernyseva var. *elongata* n. var., *P. rotundus* N. Cernyseva var. *inflata* n. var., *Planoarchaediscus concinnus*, *Propermodiscus deflectens*, *P. lenitortus*, *P. (?) mixtus*, *P. nudatus*, *P. oblongus*, *P. rigens*, *Chernyshinella (?) aspera*, *C. (?) depressa*, *C. (?) yvoiri*, *Globoendothyra delmeri*, *G. (?) ordinata*, *Planoendothyra aljutovica* (Reitlinger) var. *egregia* n. var., *Plectogyra acantha*, *P. agathis*, *P. arctata*, *P. blatoni*, *P. bradyi* (Mikhailov) var. *alta* n. var., *P. bradyi* (Mikhailov) var. *submissa* n. var., *P. bulbisepta*, *P. calcar*, *P. callosa*, *P. campinei*, *P. chariessa*, *P. compacta*, *P. concavacamerata* Lipina var. *alta* n. var., *P. concavacamerata* Lipina var. *globosa* n. var., *P. convexa* (Rauser-Chernousova) var. *brevisepta* n. var., *P. convexa* (Rauser-Chernousova) var. *crescens* n. var., *P. convexa* (Rauser-Chernousova) var. *stricta* n. var., *P. cummingsi*, *P. cuneisepta*, *P. delepinei*, *P. demissa*, *P. dendrei*, *P. directa*, *P. exelikta* var. *ampla* n. sp., n. var., *P. exelikta* var. *exelikta* n. var., *P. (?) exuberans*, *P. (?) fleronensis*, *P. foeda*, *P. freyri*, *P. fusca*, *P. gibbera*, *P. honesta* Slykova var. *dilatata* n. var., *P. humulifornix*, *P. introjactans*, *P. kaisini*, *P. kosvensis* (Lipina) var. *mosana* n. var., *P. kuhnei*, *P. laxa*, *P. lensi*, *P. librans*, *P. limburgi*, *P. michoti*, *P. mobilis*, *P. mucronata*, *P. munita*, *P. obtrita*, *P. paracostifera* (Lipina) var. *plagia* n. var., *P. parakosvensis* (Lipina) var. *imminuta* n. var., *P. parakosvensis* (Lipina) var. *nigra* n. var., *P. parakosvensis* (Lipina) var. *struniana* n. var., *P. pauli*, *P. perundata*, *P. pietoni*, *P. prisca* (Rauser-Chernousova and Reitlinger) var. *denticulata* n. var., *P. prisca* (Rauser-Chernousova and Reitlinger) var. *devia* n. var., *P. prisca* (Rauser-Chernousova and Reitlinger) var. *intricata* n. var., *P. prisca* (Rauser-Chernousova and Reitlinger) var. *parva* n. var., *P. prisca* (Rauser-Chernousova and Reitlinger) var. *pressa* n. var., *P. prisca* (Rauser-Chernousova and Reitlinger) var. *scansa* n. var., *P. prisca* (Rauser-Chernousova and Reitlinger) var. *undata* n. var., *P. producta*, *P. pseudorotayi*, *P. rostrata*, *P. rotayi* (Lebedva) var. *stricta* n. var., *P. (?) rudis*, *P. saleti*, *P. samsoni*, *P. similis* (Rauser-Chernousova and Reitlinger) var. *crustata* n. var., *P. similis* (Rauser-Chernousova and Reitlinger) var. *inops* n. var., *P. similis* (Rauser-Chernousova and Reitlinger) var. *porrecta* n. var., *P. similis* (Rauser-Chernousova and Reitlinger) var. *turgescens* n. var., *P. solida*, *P. spira*, *P. superba* (Malakhova) var. *varva* n. var., *P. uva*, *P. valida*, *P. (?) versata*, *P. waulsorti*, and *Quasiendothyra kobeitusana* (Rauser-Chernousova) var. *substricta* n. var.
44. CONIL, R., LYS, M. and MAUVIER, A., 1964, Critères micropaléontologiques essentiels des Formations-Types du Carbonifère (Dinantien) du bassin Franco-Belge: 5th. Internat. Congr. on the Strat. & Geol. of the Carboniferous, Paris, 1963, C.R., v. 1, p. 325-332, 2 text-fig., [in French].
A brief discussion and a series of listings of the characteristic microfossils utilized in identifying Lower Carboniferous stratigraphic horizons within the Dinant Basin of France and Belgium. The microfossils found to be most useful for stratigraphic zonation are: algae, smaller foraminifers, fusulinids, ostracodes, and conodonts [see Conil and Lys, 1964, for a monographic treatment of this microfauna].
45. CONIL, R., LYS, M. and PAPROTH, E., 1964, Localités et coupes types pour l'étude du Tournaisien Inférieur: Roy. Acad. Belgium Mém., v. 15, pt. 4, 87 p., 14 pls., 5 text-fig. [in French].
An initial micropaleontological study of the Lower Carboniferous (Lower Tournaisian) type sections of Belgium, and related areas in France and West Germany. Particular attention is paid to the use of smaller foraminifers in stratigraphic delineation of these sections. One plate of thin-section photomicrographs of characteristic smaller foraminifers is given (pl. 12). [See Conil and Lys, 1964, for a monographic treatment of the Lower Carboniferous microfauna of this region.]
46. CONIL, R. and LYS, M., 1965, Précisions complémentaires sur la Micropaléontologie du Dinantien: Géol. Soc. Belgique, Ann., v. 88, Bull. 3, p. 23-44, 3 pls. [in French].
The writers describe seven new species and varieties of smaller foraminifers from the Lower Carboniferous (Upper Tournaisian-Viséan) rocks of Belgium. All forms are illustrated by excellent thin-section photomicrographs. This microfauna gives added preciseness to the stratigraphic correlations and distribution of nine other Carboniferous foraminifers previously described from Belgium, France, Soviet Union, and England, as well as to the distribution of the blue-green alga *Girvanella ducii* Wethered.
The new forms are: *Lituotuba (?) gravata*, *Haplophragmella tetraloculi* Rauser-Chernousova var. *modica*, *Spiroplectamina brevicula*, *Tetrataxis emaciatas*, *Valvulinella conciliata* (Ganelina)

var. *pulla*, *Archaediscus rhombus*, and *Criboospira pansa*.

Taxonomic changes include the following: *Palaeotextularia diversa* Malakhova, 1956, and *Spiroplectammina* aff. *mirabilis* Conil and Lys, 1964, = *Spiroplectammina brevicula*.

47. CONIL, R. and DUPONT, H., 1965, Remarques sur l'extension verticale des faciès Waulsortiens: Géol. Soc. Belgique, Ann., v. 88, Bull. 3, p. 45-49, 1 text-fig., 1 chart [in French].

A study of the Lower Carboniferous (Viséan) smaller Foraminifera (all have previously been described) present in the "black mottled limestones" of Belgium, has shown that they are correctly placed within the Waulsortian facies. The age of these limestones varies from the base of the Viséan to V1b (Zone of *Permodiscus rotundus* N. Cern. var. *elongata* Conil - *Plectogyra inflata* (Lipina) var. *analoga* Malakhova).

48. CONKIN, J. E., CONKIN, B. M., and PIKE, J. W., 1965, Mississippian Foraminifera of the United States. Part 2 - The Hannibal Formation of northwestern Missouri and western Illinois: Micropaleontology, v. 11, no. 3, p. 335-359, 2 pl., 14 text-fig., 27 tables.

The agglutinated foraminiferal microfauna of the Lower Mississippian (Kinderhookian) Hannibal Formation composed of siltstones and shales is described from 8 localities in Missouri and 5 localities in Illinois and is found to consist of 30 species. Only one species is new — *Blastammina eisenacki*; and the genus *Blastammina* Eisenack, 1932, is for the first time recognized outside of the Baltic Region, its geologic range extended upward into the Lower Mississippian. On the basis of the contained agglutinated foraminifera the Hannibal Formation is thought to be Kinderhookian in age and is most closely related to the Northview Formation of southwestern Missouri.

One new taxonomic change is included: *Psammospaera?* sp. B. Conkin and Conkin, 1964, is now placed under the new species *Blastammina eisenacki* Conkin, Conkin, and Pike, 1965.

The microfauna is illustrated by whole-specimen photomicrographs.

49. DELEAU, P., AND MARIE, P., 1954, Les calcaires oolithiques du Namurien du Sud-Oranais et leur faune de Foraminifères: Soc. Géol. de France, C. R., No. 2, p. 225-226, [in French].

A few previously described smaller foraminifera (*Endothyra* sp. cf. *E. bowmani*, *Spirillina* sp. cf. *S. radiata*, *Orobias* sp. [probably *Eostaffella* or *Pseudoendothyra*], and *Archaediscus* sp.) are

mentioned as occurring in scattered Carboniferous outcrops in southern Algeria, North Africa.

50. DERVILLE, H., 1950, De quelques Calcisphères de nature végétale: Bull. Géol. Soc. France, Paris, 5th ser., v. 20, p. 467-478, pl. 24, 2 tables [in French].

From the Viséan rocks (Calcaire de Bachant) of Avesnois, France, 2 new genera and 6 new species of "calcispheres" are described and illustrated by thin-section photomicrographs. The new forms are: *Diplosphaera mastophora*, *D. sphaerica*, *D. ovoidea*, *D. mucronata* [the name *Diplosphaera* preoccupied; Derville, 1952, renamed form *Diplosphaerina*], *Cancellus cancellatus*, and *C. robustus* [the name *Cancellus* preoccupied; Derville, 1952, renamed form *Palaeocancellus*]. [Conil and Lys, 1964, regard the above forms as foraminifera. Significantly, however, is the striking resemblance of *Diplosphaerina* to *Tuberitina*.]

51. DERVILLE, H., 1952, A propos de Calcisphères (Rectification): C.R.S. Soc. Géol. France, 6th ser., v. 2, p. 236-237 [in French].

The writer notes that the genera *Diplosphaera* and *Cancellus*, as described in 1950, are preoccupied. He now redefines them as *Diplosphaerina* and *Palaeocancellus* [see Conil and Lys, 1964, who regard them as foraminifera].

52. DUNHAM, R. J., 1955, Pennsylvanian conglomerates, structure and orogenic history of Lake Classen area, Arbuckle Mountains, Oklahoma: Am. Assoc. Petroleum Geologists, Bull., v. 39, no. 1, p. 1-30, 8 text-fig.

The Pennsylvanian (late Desmoinesian) upper Black Chert Member of the Deese Formation in the Arbuckle Mountains, southern Oklahoma, contains *Bradyina*, *Glyphostomella*, *Tetrataxis*, *Polytaxis*, *Deckerella*, *Cribrostomum*, *Cribrogenerina*, *Climacammina*, and *Tolypammina*.

53. EASTON, W. H., 1943, The fauna of the Pitkin Formation of Arkansas: Jour. Paleontology, v. 17, no. 2, p. 125-154, pl. 21-24, 7 text-fig.

Endothyra sp. is shown on a faunal listing of the Upper Mississippian (Chesterian) Pitkin Formation of northern Arkansas.

54. GLINTZBOECKEL, C. and RABATÉ, J., 1964, Microfaunes et microfacies du Permo-Carbonifère du sud Tunisien: Int. Sed. Petrographical Ser., v. 7, 45 p., 108 pl., 6 text-fig., Brill, Leiden, Netherlands [in French with English and German abstracts].

Primarily a summary of the microfacies and microfaunas encountered in deep wells that penetrated the Upper Paleozoic rocks of southern Tunisia, Africa. The rock types are illustrated by

numerous thin-section photomicrographs containing characteristic smaller foraminifers. Three Permo-Carboniferous microfaunal provinces have been distinguished in southern Tunisia. These are as follows: (1) the Upper Permian of the Djebel Tebaga in which algae and fusulinids are abundant in addition to numerous smaller foraminifers of the genera *Hemigordius*, *Ammodiscus*, *Globivalvulina*, *Tetrataxis*, *Lingulina*, *Geinitzina*, *Padangia*, *Span-delina*, *Glomospira*, *Climacammina*, *Lasiodiscus* and *Lasiotrochus*; (2) the Reef Facies of the Upper Permian as found in the Bir Soltana Area where fusulinids and algae are very abundant in addition to many of the smaller foraminiferal genera as listed above; (3) the Permo-Carboniferous in the Marginal Gefara where one zone in the Upper Permian carries *Streblospira*, *Hemigordius*, and *Globivalvulina*, and where the Middle Permian microfauna is not characteristic but does contain *Hemigordius*, *Agathammina*, *Calcitornella* [probably *Hedraites*; see Henbest, 1963], and *Globivalvulina*; the Lower Permian is distinguished by representative fusulinid genera, whereas the Upper Carboniferous is characterized by Textulariidae, *Globivalvulina*, *Bradyina*, and *Tuberitina*; the Muscovian yields a very rich and abundant microfauna consisting of *Globivalvulina*, *Endothyra*, *Plectogyra*, *Tetrataxis*, *Ammovertella*, *Climacammina*, *Palaeotextularia*, and *Tuberitina*; and the Namurian is characterized by the occurrence of *Archaediscus* accompanied by representative Palaeotextulariidae, *Endothyra*, *Plectogyra*, and *Globivalvulina*.

55. GOODMAN, A. J., 1945, Limestone reservoir conditions in Turner Valley Oil Field, Alberta, Canada: *Am. Assoc. Petroleum Geologists, Bull.*, v. 29, no. 8, p. 1156-1168, 10 text-fig.

The Mississippian "black limestones", composed primarily of crinoid and bryozoan fragments, contains *Endothyra*, *Ammodiscus* [probably *Tournayella*], and *Glomospira*. Thin-section photomicrographs of a few specimens are included (text-fig. 6, 7, and 9).

56. GROZDILOVA, L. P., 1953, Fossil Foraminifera in the U.S.S.R.-Archaeodiscidae: All-Union Petroleum Scientific-Research Geol. Exploration Inst., Trudy, Publ. 74, p. 67-115, 4 pl., 5 text-fig., 1 table [in Russian].

A discussion pertaining to the phylogeny and stratigraphic distribution of the Lower Carboniferous smaller foraminifers of the family Archaeodiscidae found in the Soviet Union is presented, along with the description of 52 species and varieties presently referred under this family. Of these, 9 species and 3 varieties are regarded as new. The new forms are: *Archaediscus convexus*, *A. velgur-*

ensis, *A. vischerensis*, *A. donetzianus*, *A. angulatus*, *A. bashkiricus* Krestovnikov and Theodorovitch var. *pressula*, *A. latispiralis*, *A. gregorii* var. *gregorii* n. sp., n. var., *A. gregorii* var. *acutiformis*, *A. stilus*, and *A. minimus*. All species are illustrated by representative thin-section photomicrographs.

57. HARTLEY, J. J., 1936, On the occurrence of *Saccaminopsis fusulinaformis* in Northern Ireland: *Irish Nat. Jour.*, v. 6, p. 95-97.

The writer reports the occurrence of the foraminifer *Saccaminopsis fusulinaformis* (M'Coy) in rocks of Lower Carboniferous age (approximate D₂ Horizon) in County Tyrone and County Down, Northern Ireland. It is noted that *S. fusulinaformis* (M'Coy) is found in association with *Archaediscus karreri* (Brady). It would appear that *S. fusulinaformis* (M'Coy) is a fairly reliable "index fossil;" the writer suggests that in such an area as north-eastern Ireland, where the coral-brachiopod assemblage is poorly developed and where shales and sandstones frequently replace the more calcareous types of rock, this form may be of definite zonal value.

58. IRELAND, H. A., 1963, Insoluble residues for research: *Internat. Geol. Congr., Rept. 21st Session Norden, Pt. 27*, p. 233-241, 3 text-fig.

The writer describes the history of and the techniques involved in preparing insoluble residues for their contained microfauna, *i.e.*, principally agglutinated foraminifers, conodonts, and scolecodonts. Attention is called to the large suites of agglutinated Pennsylvanian and Silurian foraminifers that the writer has previously described (Ireland, 1939, 1955). Two text-figures of drawings illustrating representative Pennsylvanian and Silurian Foraminifera from Kansas and Oklahoma respectively are also given.

59. ISHII, K., 1961, Fusulinids from the middle Upper Carboniferous Itadorigawa Group in western Shikoku, Japan. Pt. 3 Stratigraphy and concluding remarks: *Osaka City Univ., Inst. Polytechnics, Jour.*, ser. G, v. 5, p. 31-52, 3 text-fig., 1 table.

The Middle Upper Carboniferous Itadorigawa Group of western Shikoku, Japan, has been subdivided into three fossil zones on the basis of distinctive fusulinid assemblages; however, the writer reports the following smaller foraminifers as also occurring within this interval:

It₁ fossil zone contains *Endothyra* sp., *Bradyina nautiliformis* Möller, *Cribrostomum* sp., and *Textularia* sp.

It₂ and It₃ fossil zones contain *Endothyra* sp., *Bradyina* sp. A, *Cribrostomum* sp., and *Textularia* sp.

Both the fusulinids and the smaller foram-

inifers are found in association with a relatively common calcareous algal flora.

60. JOHNSON, J. H., 1944, Paleozoic stratigraphy of the Sawatch Range, Colorado: *Geol. Soc. America, Bull.*, v. 55, no. 3, p. 303-378, 11 pl., 7 text-fig.

The smaller foraminifer *Endothyra baileyi* (Hall) [identified by Henbest] is reported from the Mississippian Leadville Limestone of the Sawatch Range, Colorado.

61. JOHNSON, J. H., 1945, Calcareous algae of the upper Leadville Limestone near Glenwood Springs, Colorado: *Geol. Soc. America, Bull.*, v. 56, no. 9, p. 829-848, 5 pl., 1 text-fig.

Representatives of the genus *Endothyra* are the most abundant foraminifer represented in thin-sections of the Mississippian Leadville Limestone near Glenwood Springs, Colorado. A number of other smaller foraminifers are also present in the algal limestones, but not identified. A few endothyrids are shown in some of the thin-section photomicrographs of the algal specimens.

62. JOHNSON, J. H., 1946, Mississippian algal limestones from the vicinity of St. Louis, Missouri: *Jour. Paleontology*, v. 20, no. 2, p. 166-171, pl. 30.

Endothyra sp. is recorded from a Mississippian measured section of the lower Ste. Genevieve (Meramecian) algal limestones at Maplewood, St. Louis, Missouri.

63. JOHNSON, J. H. and DANNER, W. R., 1966, Permian calcareous algae from northwestern Washington and southwestern British Columbia: *Jour. Paleontology*, v. 40, no. 2, p. 424-432, pl. 55-56, 1 text-fig., 6 tables.

The smaller foraminifers *Textularia*, *Glomospira*, and *Tetrataxis* are reported from the Late Permian (early Ochoan?) Marble Canyon Formation, Marble Range, British Columbia.

The foraminifer *Pachyphloia* is reported, in association with a Late Permian (Guadlupian) fusulinid fauna, from the Stillaguamish Group (Division I) San Juan Island, Washington.

64. JUFEREV, O. W. and BOGUSH, O. I., 1965, Basic regularities in the foraminiferal distribution through Eurasia in Lower Carboniferous time: *Akad. Nauk S.S.S.R., Izvestia, Ser. Geol. No. 11*, p. 98-108 [in Russian].

The Lower Carboniferous of the Eurasian territory has been subdivided into 3 zoogeographic regions on the basis of foraminiferal evidence. These are: (1) *Eurasian* — widespread development of *Quasiendothyra*, and *Septatournayella*; (2) *Russian* — with calcispheres and unilocular foram-

inifers, and (3) *Siberian* — with widely distributed unilocular foraminifers and rare *Endothyra*. The second zone disappeared during the end of the Tournaisian, whereas the Eurasian and Siberian zones preserved their distinct faunal assemblages, although differing somewhat from earlier types. During Viséan time the Eurasian region was distinguished by abundant *Endothyra*, primitive fusulinids, and *Archaeodiscus*; the Siberian zone was characterized by diverse *Endothyra*, *Archaeodiscus*, and rare primitive fusulinids. A newly delineated West-European zone contains *Archaeodiscus*, *Eostaffella*, *Mediocris*, and *Calcitornella* [= *Hedraites*].

65. KALMYKOVA, M. A., 1965, Biostratigraphic subdivision of the Permian of the Pinega River Basin by Foraminifera: *Akad. Nauk S.S.S.R., Doklady*, v. 163, no. 5, p. 1221-1224, 1 table [in Russian; English translation *IN: Doklady ESS, Am. Geol. Inst.*, v. 163, no. 1-6, p. 61-64].

The Lower Permian of the Pinega River Basin has been stratigraphically subdivided into six members on the basis of foraminifers (largely fusulinids, although a few previously described smaller foraminifers are also used) and distinctive sedimentation rhythms. The lower four members are assigned to the Asselian Stage, and the upper two to the Sakmarian Stage.

66. KAMALETDINOV, M. A., 1965, More facts about the geologic structure of the southern Urals: *Akad. Nauk S.S.S.R., Doklady*, v. 162, no. 6, p. 1356-1359, 1 text fig., [in Russian; English translation *IN: Doklady ESS, Am. Geol. Inst.*, v. 162, no. 1-6, p. 97-99, 1 text-fig.].

Tectonic features of the southern Urals are complicated and deep drilling indicates that the Upper Devonian-Lower Carboniferous sequence on the left bank of the Bol'shoy Ik has been thrust westward over the Middle Carboniferous carbonate rocks. Previously described smaller foraminifers of Upper Devonian (Fammenian), Lower Carboniferous, and Middle Carboniferous ages are utilized in subdividing the sequence into a meaningful stratigraphic succession.

67. KAPSTAN, V. KH., and SAFAROV, E. I., 1965, Discovery of indigenous Carboniferous sediments in Moldavia: *Akad. Nauk S.S.S.R., Doklady*, v. 161, no. 3, p. 659-662, 2 text-fig. [in Russian; English translation *IN: Doklady ESS Am. Geol. Inst.*, v. 161, March-April, 1965, p. 57-59, 2 text-fig.].

The first certain identification of Lower Carboniferous sediments in Moldavia, U.S.S.R., has been made by deep drilling in the area of the Late Paleozoic foredeep of the Russian Platform.

On the basis of a previously described smaller foraminiferal assemblage, identified by Reitlinger, the sediments are probably upper Tournaisian in age.

68. KELLETT, B., 1943, Permian ostracodes: *Jour. Paleontology*, v. 17, no. 6, p. 615-628.

Along with abundant Lower Permian ostracode faunas, the smaller foraminifers *Climacammina*, *Bradyina*, and *Tetrataxis* are noted as faunal associates. The distribution of the ostracodes and foraminifers is designated for specific areas of Kansas, Oklahoma, and Texas.

69. KHVORVA, I. V., 1939, The Lower Carboniferous deposits of the occidental Urals within the limits of southern Bashkiria and northern Kazakhstan: *Bull. Soc. Nat. de Moscou*, n.s., v. 47, ser. geol., v. 17, no. 2-3, p. 58-84, 1 pl. [in Russian].

The writer notes that the Bukharcha Series in the Sakmara, U.S.S.R., contains *Archaediscus karreri*, *Endothyra* ex. gr. *bowmani*, *E. crassa*, *E. globulus*, *Hyperammina elegans*, and *H. vulgaris*, all of which are characteristic of a Lower Carboniferous (Viséan) age.

The Syzran beds, which contain abundant *Archaediscus bashkiricus*, are dated as Namurian in age.

70. KING, P. B., 1965, Geology of the Sierra Diablo region, Texas: U. S. Geol. Survey Prof. Paper 480, 185 p., 16 pl., 8 text-fig., 14 tables.

An excellent discussion of the geology of the Sierra Diablo region of west Texas. Tabulated lists of Permian smaller Foraminifera, identified by Henbest, are given on Table 2 (Hueco Limestone), and Table 8 (Victorio Peak Limestone). Measured sections of the Permian sequence are also given, and smaller foraminifers and fusulinids are noted when present.

71. KLUBOV, B. A., 1965, Discovery of Permian sediments on Barents Island (Spitsbergen Archipelago): *Akad. Nauk S.S.S.R.*, v. 162, no. 3, p. 629-631 [in Russian; English translation *IN: Doklady ESS, Am. Geol. Inst.*, v. 162, no. 1-6, p. 49-50.].

The discovery of Permian sedimentary rocks on Barents Island, as reported earlier (1963), is verified by an analysis of a diversified brachiopod fauna. The previously described smaller foraminifers *Nodosaria krotovi*, *N. sp. cf. N. farcimen*, and *Geinitzina spandeli* are also reported from this sequence. It is believed that these rocks can be assigned to the base of the Upper Permian and are of somewhat older age than the Kazanian Stage of the Russian Platform.

72. KOCHANSKY-DEVIDÉ, V., 1964, Die Fusuliniden und Kalkalgen des Jugoslavischen Karbons: 5th. Internat. Congr. on the Strat. and Geol. of the Carboniferous, Paris, 1963, C.R., v. 2, p. 513-518, 3 pl., 1 text-fig. [in German].

Primarily a résumé on the occurrence of calcareous algae and fusulinids from the Middle Carboniferous rocks of Yugoslavia. Floral and faunal lists are included in which a number of previously described smaller foraminifers are also recorded.

73. KONOVALOVA, M. V., 1962, New Sakmarian species of small foraminifers from the Timan-Petchora region: *Paleont. Zhur.*, No. 3, p. 16-23, pl. 2, 3 [in Russian].

Fifteen new species of smaller foraminifers are described from the Lower Permian (Sakmarian-Wolfcampian) rocks of the Timan-Petchora region of the Soviet Union. All forms are illustrated by thin-section photomicrographs. The new species are: *Glomospira aquilonaris*, *G. ovalis* [preoccupied; see Malakhova, 1956, p. 90], *G. insigna*, *Bradyina delicata*, *B. omrica*, *B. ordinata*, *B. turgida*, *B. grandiosa*, *Climacammina obesa*, *C. longa*, *C. rara*, *C. durabilis*, *Globivalvulina paula*, *G. arguta* and *G. pergrata*. [The legend for Plate 3 is not given.]

74. LAPKIN, I. YU., 1961, The stratigraphy of the Lower Permian south of the Russian Platform: *Akad. Nauk S.S.S.R., Doklady*, v. 137, no. 1, p. 143-145, 1 table [in Russian; English translation *IN: Doklady ESS, Am. Geol. Inst.*, v. 137, no. 1-6, p. 260-263, 1 table].

The stratigraphy of the Lower Permian deposits south of the Russian Platform, U.S.S.R., is briefly summarized. The characteristic rock types present in this region and their included diagnostic microfauna (previously described species of fusulinids and smaller foraminifers) are listed.

75. LETAVIN, A. I. and REDICHKIN, N. A., 1962, On the Upper Carboniferous and Lower Permian deposits in western Cis-Caucasus: *Akad. Nauk S.S.S.R., Doklady*, v. 142, no. 4, p. 903-905 [in Russian].

The Hercynian basement rocks near Chelbas, Cis-Caucasus, U.S.S.R., are dated as Upper Carboniferous to Lower Permian on the basis of the discovery of the following smaller foraminifers: *Tetrataxis* ex. gr. *hemisphaerica*, *Hemigordius discoideus* f. *lata*, *Spiroplectammina* sp. cf. *S. bulboides*, *Dentalina* ex. gr. *bradyi*, and *Glomospira* sp.

76. LETAVIN, A. I., REDICHKIN, N. A., and SAVEL'YEVA, L. M., 1964, Lower Permian deposits in the Crimean Steppe: *Akad. Nauk S.S.S.R.*,

Doklady, v. 156, no. 2, p. 324-327, 1 text-fig., [in Russian].

Fossiliferous Lower Permian rocks in the Crimean Steppe indicate that the Late Paleozoic Ciscaucasian Geosyncline extended far to the west, embracing a considerable part of the Crimean Mountains. From boreholes taken in the northern Crimean Peninsula a typical Lower Permian foraminiferal assemblage, of previously described species, underlies Lower Cretaceous claystones. The Foraminifera occur in limestones dated as Lower Permian, and are similar to that from the northwestern margin of the Donbas.

77. LIPINA, O. A., 1960, Tournaisian Foraminifera of the Russian Platform and the Urals: International Geol. Congress, 21st. Session, Repts. of Soviet Geologists, Doklady sovet-skikh geologov problema, p. 48-55, 1 text-fig., [in Russian with English abstract].

The Lower Carboniferous (Tournaisian) Stage is characterized by the first appearance of abundant multilocular foraminifers with calcareous-granular walls (Tournayellidae and Endothyridae). During Late Devonian time the planispiral Tournayellidae developed two distinct evolutionary lines: (1) *Tournayella*, with a primary septation stage characterized by constriction of the wall, and (2) *Septatournayella*, with short pseudosepta in the final volutions. The tournayellids show progressive increase in size, so that by the end of Tournaisian time gigantic forms with coarsely granular walls are relatively common. During Viséan time a sieve-like aperture was developed. The septatournayellids also show progressive increase in size by the end of Tournaisian time but do not develop a sieve-like aperture in the Viséan. Instead, an offshoot — the carbonellids — with an aperture displaced towards the center of the septa develops from this line.

The separation of the Endothyridae from the Tournayellidae occurred in the Late Devonian (Fammenian), but their respective origins are unknown.

Endothyridae with unfixed generic indices are widespread in the Upper Devonian. The quasi-endothyroids and the plectogyroids developed from this group. The plectogyroids developed two parallel lines: (1) a group with low volutions and a relatively large number of chambers, and (2) another group with high volutions and a relatively small number of chambers.

It is thought that the development of all enumerated forms depends upon facies and mode of sedimentation.

78. LIPINA, O. A., 1962, A comparison of the foraminifers of the Tournaisian Stage in the

U.S.S.R. and in West Germany: Akad. Nauk S.S.S.R., v. 145, no. 1, p. 164-165 [in Russian].

The writer briefly discusses and lists the similarities and differences of the Lower Carboniferous (Tournaisian) foraminiferal assemblages present in the Soviet Union with those reported from West Germany.

79. LIPINA, O. A., 1963, On the evolution of the Tournaisian Foraminifera: Akad. Nauk S.S.S.R., Voprosy Mikropaleontologii, No. 7, p. 13-21, 3 text-fig., 1 table, [in Russian].

The writer lucidly discusses the evolution and phylogeny of the Lower Carboniferous foraminiferal representatives of the families Tournayellidae and Endothyridae.

80. LIPINA, O. A., 1964, Stratigraphie et limites du Tournaisien en U.R.S.S. d'après les Foraminifères: 5th. Internat. Congr. on the Strat. and Geol. of the Carboniferous, Paris, 1963, C.R., v. 2, p. 539-551, 5 text-fig. [in French].

The writer presents a comprehensive discussion of the stratigraphy and foraminiferal assemblages of the Lower Carboniferous (Tournaisian) of the Soviet Union and compares the Soviet sequence with that published for western Europe and North America. Accordingly, two zoogeographic microfaunal provinces are delineated: (1) a province embracing eastern and western Europe, and (2) a province comprising North America and a great part of Siberia. It is noted that there are three foraminiferal complexes present within the Tournaisian; these are: (1) *Septaglomospiranella-Quasiendothyra*, (2) *Chernyshinella*, and (3) *Tournayella-Plectogyra*. These foraminiferal complexes evolved through a beginning developmental stage followed by rapid expansion and ultimately culminating in extinction.

One excellent intercontinental Tournaisian correlation chart is also presented (text-fig. 2).

81. LIPINA, O. A., 1965, Taxonomy of the Tournayellidae: Akad. Nauk S.S.S.R., Trudy, Geol. Inst., Trans., v. 130, Nauka Publ. Office, Moscow, 115 p., 24 pl., 4 text-fig., [in Russian].

A monographic study on a complete revision of the systematics of the Lower Carboniferous Tournayellidae. All forms are illustrated by excellent thin-section photomicrographs. In this revision 1 genus, 9 subgenera, 19 species, 4 subspecies, and 1 variety are newly described. The new forms are: *Septatournayella* (*Eoseptatournayella*) *recida*, *S. (Rectoseptatournayella) caucasica*, *S. (R.)? aksautensis*, *Neobrunsiina* n. subgen. of *Brunsiina*, *Septabrunsiina kingirica chusovensis* n. subsp., *S. donica*,

S. (Rectoseptabrunsiina) postchusovens n. subgen. n. sp., *Septaglomospiranella (S.) compressa*, *S. (S.) crassa uralica*, *S. (S.) romanica*, *Neoseptaglomospiranella* n. subgen. of *Septaglomospiranella*, *Septaglomospiranella (Rectoseptaglomospiranella) posturalica*, *S. (R.) postromanica*, *Tournayellana? (Eotournayellina) primitiva* n. subgen. n. sp., *T. (T.) septata*, *T. (Rectotournayellina) postprimitiva* n. subgen., n. sp., *T. (R.) lobata*, *R. (R.) elegans*, *Chernyshinella (Eochernyshinella) crassithec*, *C. (E.) triangula*, *C. (Chernyshinella) tumulosa* var. *multicamerata* n. subgen. n. var., *C. (Rectochernyshinella) kinelensis* n. subgen. n. sp., *C. (R.) distorta*, *C. (R.) kipchakensis*, *Birectochernyshinella* n. subgen. of *Chernyshinella*, *Palaeospiroplectamina tchernyshinensis rectoseptata* (Lipina) n. gen. n. subsp., *P. tchernyshinensis globata* (Lipina) n. subsp. Numerous taxonomic changes are also included in this superb work.

82. LYS, M., 1964, La Microfaune dans ses Applications a la stratigraphie du Carbonifère: 5th. Internat. Congr. on the Strat. and Geol. of the Carboniferous, Paris, 1963, C.R., v. 1, p. 189-202, 5 text-fig. [in French].

A discussion of the use and value of microfossils, primarily smaller foraminifers and fusulinids (all previously described), in establishing sound stratigraphic correlations for the Carboniferous rocks of Belgium, France and West Germany.

83. LYS, M., MAUVIER, A., and SERRE, B., 1962, Notes préliminaire sur les microfaunes du Namurien du Nord de la France: *Ann. Soc. Géol. du Nord*, v. 82, p. 117-121 [in French].

It is noted that *Ammodiscus*, *Septabrunsiina?*, *Archaediscus*, and *Tuberitina* are conspicuous components in the Lower Carboniferous (upper Viséan) limestones of northern France. In the Namurian *Homoceras* Zone the following smaller foraminifers are found: *Plectogyra*, *Tetrataxis*, *Ammodiscus*, and *Septabrunsiina*. The *Reticoceras* limestones and shales contain *Eostaffella*, *Archaediscus*, *Plectogyra*, *Tuberitina*, *Pseudoendothyra*, and *Tetrataxis*.

84. MALAKHOVA, N. P., 1961, Morpho-functional analysis of the inner structure of the *Bradyina* shell: *Paleont. Zhur.*, No. 3, p. 14-18, 2 text-fig., [in Russian].

A complete revision of the morphological nomenclature used in describing the Middle Carboniferous foraminifer *Bradyina*. Comparison of *Bradyina* to related forms such as *Janischewskina*, *Pseudobradyna*, and *Glyphostomella* is also included. Particular emphasis is given to the classification of the apertures, pores, and the lamellae of the bradyinid-type shell.

85. MALAKHOVA, N. P., 1965, Permian Foraminifera in the eastern slope of the Urals: *Akad. Nauk S.S.S.R., Trudy, Ural Branch, Inst. Geol., Trans., Sverdlovsk*, No. 74, Problems of Strat. No. 8, p. 155-173, 3 pl., 1 text-fig., [in Russian].

Fourteen species, of which one is new, are described from the Permian rocks of the eastern slope of the Urals, U.S.S.R. All forms are illustrated by thin-section photomicrographs. The new form is *Endothyra miassica*. A rather lengthy discussion of the genus *Hemigordius* Schubert, 1908, is included, with especial emphasis on the coiling process.

86. MAMET, B., 1962, Remarques sur la microfaune de Foraminifères du Dinantien: *Bull. Soc. Belge Géol.*, v. 70, no. 2, p. 166-173, [in French].

The writer lucidly outlines the practical usage of calcareous smaller Foraminifera for worldwide Lower Carboniferous stratigraphic correlations. It is noted that phylogenetic development among a number of the important foraminiferal families is strikingly similar in western Europe, the Urals, northern Siberia, and North America. There appears to be little microfaunal provincialism, and the major faunal outbursts can be correlated within the northern hemisphere. The writer also points out the influence of facies in relationship to foraminiferal distribution and draws attention to taxonomic duplication due to random thin-sectioning.

87. MAMET, B., 1964, Sédimentologie des Faciès "Marbres Noirs" du Paléozoïque franco-belge: *Mem. Roy. Inst. Sci. Nat. de Belgique*, No. 151, 131 p., 5 pl., [in French].

The writer notes that Carboniferous foraminifers occur abundantly in biosparitic and biomicritic rocks of the Belgian and French Platform. However, the most favorable rock type appears to be a rather pure carbonate, usually of a size-range of from 50 to 500 microns, and an associated algal-brachiopodal biota. Intraclastic limestones also carry many smaller foraminifers, but there is a conspicuous decline in abundance of endothyroids and palaeotextulariids in true oolitic rocks.

88. MAMET, B., 1965, Remarques sur la Microfaune du Marbre Noir de Dinant (Vla): *Géol. Soc. Belgique, Ann.*, v. 88, *Bull.* 5, p. 187-219, 1 pl., 5 text-fig., [in French].

The Lower Carboniferous Black Marble sediments of the Dinant Synclinorium of Belgium contains the boundary contact between the Tournaisian (Osagian) and Viséan (Meramecian) rocks of this region. To establish this boundary with more preciseness the sedimentation, depositional

environment, rock sequence, microfacies, and the micro- and megafaunal distribution have all been studied in detail. The significant limestone types recognized consist of: (1) microcrystalline limestone, (2) oolitic and organic fragmental limestone with microcrystalline limestone, and (3) a recrystallized cemented fragmental limestone. All appear to have been deposited in a barred shallow-water basin. The distribution of the Foraminifera indicates two distinctive assemblages: (1) free or pseudo-planktonic benthos (Archaediscidae) and (2) semipelagic benthos (Ozawainellidae). The former reflects the changes of facies within the basin while the latter appears to delineate specific zones throughout the basin. The litho- and biofacies help interpret depth of water, salinity, diagenesis, and original precipitation. The foraminiferal plots indicate a repeated and "explosive" development of characteristic assemblages above the Tournaisian boundary.

89. MERRIAN, C. W. and BERTHIAUME, S. A., 1943, Late Paleozoic formations of central Oregon: Geol. Soc. America, Bull., v. 54, no. 2, p. 145-172, 1 pl., 1 text-fig.

The smaller foraminifer *Tetrataxis* sp., is listed as occurring in the Lower Carboniferous (Viséan?) Coffee Creek Formation of central Oregon.

90. MEUNIER, S., 1885, Existence du calcaire à Fusulines dans le Morvan: Acad. Sci. Paris, C. R., p. 921-923 [in French].

From the Lower Carboniferous oolitic limestones of Cussy, France, the writer mentions the occurrence of *Saccamina carteri* [now referred under the genus *Saccaminopsis*; see Sollas, 1921], *Fusulina* [possibly *Eostaffella* or *Pseudoendothyra*], *Lituola*, *Endothyra*, and *Climacammina*. [With the exception of the "*Fusulina*" this microfauna was described and illustrated by Meunier in 1888.]

91. MICHEL-LEVY, A., 1908, Les terrains primaires du Morvan et de la Loire: Bull. Carte Géol. France, v. 18, no. 120, p. 193-489, 7 pl., 51 text-fig. [in French].

Scattered outcrops of Lower Carboniferous rocks in France have yielded relatively abundant *Saccamina* [now *Saccaminopsis*], *Cribrospira*, *Endothyra*, *Valvulinella*, *Nodosinella* [probably *Earlandinita*], *Trochammina* [now *Cyclogyra*], *Valvulina* [now *Tetrataxis*] and *Septamina* [now referred to *Haplophragmina*].

The above microfauna is illustrated (pl. 1) by representative thin-section photomicrographs.

92. MICHEL-LEVY, A., 1936, Présence de mylonites dans un conglomérat viséen au Sud de Tarare et interprétation des terrains anciens dans les Monts du Lyonnais: Acad. Sci.

Paris, C. R., v. 202, p. 1203-1204 [in French].

A polygenic conglomerate from France is dated as Lower Carboniferous (Viséan) on the basis of the occurrence of the smaller foraminifer *Endothyra* in the contained limestone pebbles.

93. MIKLUKHO-MAKLAY, A. D., 1957, New information concerning the systematics of phylogeny of the Archaediscidae: Leningrad Univ. Bull., ser. Geol. and Geophys., No. 24, p. 34-46, 4 text-fig., 2 tables [in Russian with brief incomprehensible English summary].

In a study of the systematics and phylogeny of the Lower Carboniferous family Archaediscidae from the Soviet Union, one new subfamily name (Asteroarchaediscinae) is proposed and 3 new genera and 2 new species are described and illustrated by rather generalized line drawings. The new forms are: *Hemiarchaediscus planus* n. gen. and sp., *Rugosarchaediscus* n. gen. with *Archaediscus akchimensis* Grozdilova and Lebedeva, 1954, as the genotype, and *Lensarchaediscus ovalis* n. gen. and sp. One excellent phylogenetic diagram of the family Archaediscidae is also given.

94. MIKLUKO-MAKLAY, A. D., 1964, Kazanian Lagenidae from the Russian Platform: All-Union Geol. Inst., Trudy, n. s., Paleont. & Strat., v. 93, p. 3-20, 2 pl. [in Russian].

Twelve previously described Permian (Kazanian) lagenidae from the Russian Platform are described and illustrated by rather poor drawings and thin-section photomicrographs. Pertinent taxonomic changes include the following: *Dentalina striatella* Paalzow, 1936 = *Nodosaria* cf. *N. striatella* (Paalzow); *Lingulina clavata* Paalzow, 1936 = *Lingulonodosaria clavata* (Paalzow); *Geinitzina spandeli* Tcherdynzev, 1914, and *G. cuneiformis* Paalzow, 1936 = *G. postcarbonica* Spandel; *Fronicularia parri* Crespin, 1945 and 1958 = *Spandelina* cf. *S. parri* (Crespin); and *Lingulinopsis rotaliaeformis* Tcherdynzev, 1914 = *Lenticulina (Astacolus) rotaliaeformis* (Tcherdynzev).

95. MILON, Y., 1923, Sur la microfaune du calcaire Briovérien (Précambrien?) de Saint-Thurial (Ille-et-Vilaine): Soc. Géol. France, C. R., No. 7, p. 73-74 [in French].

The Precambrian limestone breccia of St. Thurial, France, yields abundant smaller foraminifers of the genus *Endothyra* (13 specimens per 2 cm.²) mixed with calcispheres. [Mentioned microfauna is due to an obvious mix-up of thin-section material; this lower Viséan assemblage was later described by Milon in 1928.]

96. MILON, Y., 1923, Sur la fauna et l'âge du Calcaire Carbonifère de St. Segal: Acad. Sci. Paris, C. R., v. 176, p. 591 [in French].

The writer reports that a foraminiferal assemblage composed of species of *Endothyra*, *Valvulina*, *Trochammina*, and *Textularia* [would now probably be referred to *Palaeotextularia*] is associated with a Lower Carboniferous (upper Viséan to Namurian) brachiopod fauna at St. Segal, France.

97. MOORE, R. C., 1966, Paleocological aspects of Kansas Pennsylvanian and Permian cyclothems: Kansas Geol. Survey Bull. 169, Symposium on cyclic sedimentation, p. 287-380, 52 text-fig.

A very detailed discussion of the paleoecological aspects of Kansas Pennsylvanian and Permian cyclothems. Approximately 20 representative ecologic communities (ecosystems) are characterized briefly and their stratigraphic occurrence is illustrated diagrammatically. Both calcareous and agglutinated foraminiferal microfaunas are reported from the following units: (1) Permian (Wolfcampian) Speiser Shale (*Derbyia* assemblage), (2) Permian (Wolfcampian) Threemile Limestone Member of the Wreford Limestone (*Composita-Fenestrellina* assemblage), and (3) from the Late Pennsylvanian (Virgilian) Leavenworth Limestone (*Isogramma* assemblage). [The Speiser Shale and Threemile Limestone foram identifications are from Hattin, 1957, and the Leavenworth Limestone identifications are from Toomey, 1966.]

98. MORTON, G. H., 1904, The Carboniferous limestone fossils of north Wales: Liverpool Geol. Soc., Proc., v. 9, p. 49-67.

Primarily a compilation and listing of all previously described fossils reported from the Lower Carboniferous of northern Wales, United Kingdom. The smaller foraminifer *Archaediscus karreri* is reported from the Upper White Limestone, whereas the Upper Grey Limestone contains *A. karreri*, *Endothyra ammonoides* [now *Loeblichia*], *E. bowmani*, *Saccammina carteri* [now *Saccaminopsis*], *Trochammina incerta* [now *Cyclogyra*], *Valonlina* (sic) *palaeotrochus*, *V. decurrens* [now *Tetrataxis*], and *Nodosaria* [now probably *Earlandinita*].

99. MURAVYEV, I. S., 1961, Stratigraphy and facies structure of the Upper Permian in the Middle Pechora River Basin: Akad. Nauk S.S.S.R., Doklady, v. 136, no. 2, p. 421-423, [in Russian].

Variiegated sandy-argillaceous marine sediments of Upper Permian age (Kungurian Stage) from the Middle Pechora River Basin, U.S.S.R., have yielded *Nodosaria* sp. cf. *N. postcarbonica*, *N. megacephala*, and *Glomospira* sp. aff. *G. bipartita*.

100. MUSIN, M. K., CHERNOMORSKII, V. N., and

NADEZKIN, A. D., 1962, Composite geological section of the Lower Carboniferous terrigenous deposits of northwest Bashkiria. Akad. Nauk S.S.S.R., Doklady, v. 143, no. 3, p. 674-677 [in Russian].

The writers report that the Lower Carboniferous (Viséan) Yelkovo Horizon of northwestern Bashkiria, U.S.S.R., contains *Endothyra antiqua*, *Tournayella* sp. aff. *T. moelleri*, *Endothyra* ex. gr. *glomiformis*, and *E. ex. gr. inflata*.

101. MYERS, D. A., 1965, Geology of the Wayland Quadrangle, Stephens and Eastland Counties, Texas: U. S. Geol. Survey Bull. 1201-C, 63 p., 3 pl., 11 text-fig., 3 tables.

The writer reports the occurrence of Late Paleozoic smaller foraminifers from the following two stratigraphic intervals in north-central Texas: (1) Pennsylvanian (Virgilian) Graham Formation, Gonzales Limestone Member, contains *Bradyina*, *Tetrataxis*, and *Tuberitina*, (2) Permian (Wolfcampian) Pueblo Formation, Waldrip Shale Member, contains *Bradyina* and forms that resemble *Climacammina*.

102. OKIMURA, Y., 1965, Endothyroid Foraminifera, *Endothyranopsis* from Japan: Geol. Rept. Hiroshima Univ., No. 14, Prof. Imamura Mem. Vol., p. 253-264, pl. 21, 2 text-fig.

Four species of *Endothyranopsis* are described and illustrated by thin-section photomicrographs from the *Pseudoendothyra spiroides* Zone of the Akiyoshi Limestone Group, Akiyoshi Plateau, southwestern Japan, and the number 17 horizon of the Onimaru Formation, Kitakami Massif, northeastern Japan. They are *Endothyranopsis hirosei* n. sp., *E. compressa* (Rauser-Chernousova and Reitlinger) *E.?* sp. A., and *E.?* sp. B. The associated foraminiferal assemblage strongly suggests that the *Pseudoendothyra spiroides* Zone of the Akiyoshi Limestone Group is equivalent in age to the Onimaru Formation (Lower Carboniferous-upper Viséan).

103. OMARA, S., 1965, A micropaleontological approach to the stratigraphy of the Carboniferous exposures of the Gulf of Suez region: Neues Jahrb. f. Geol. u. Paläont. Mh., no. 7, p. 409-419, 2 text-fig.

Current micropaleontological studies of the marine Carboniferous exposures of Abu Darag and Wadi Araba, Eastern Desert of Egypt, have demonstrated the existence of Westphalian and Stephanian sediments. This presumably implies that the Westphalian-Stephanian boundary occurs in beds, mainly of Nubian facies, in which the Carboniferous-Permian boundary has previously been delin-

eated. The further establishment of the Tournaisian-Viséan boundary in southwestern Sinai seems to indicate that the complete Carboniferous succession is represented in the Gulf of Suez region. [See Omara and Conil, 1965 and Omara and Vangerow, 1965, for a taxonomic treatment of this microfauna.]

104. OMARA, S. and CONIL, R., 1965, Lower Carboniferous Foraminifera from southwestern Sinai, Egypt: *Géol. Soc. Belgique, Ann.*, v. 88, Bull. 5, p. 221-242, 3 pl., 2 text-fig.

Smaller Foraminifera identified in thin-sections taken from the Middle Member of the Dolomitic Formation of southwestern Sinai (Egypt) correlate well with the Lower Viséan microfauna (VI) of Belgium. The Sinai assemblage consists of 10 species, of which 3 are proposed as new. The new forms are: *Permodiscus umbogmaensis*, *Propermodiscus contiguus*, and *Planoarchaediscus aegyptiacus*. All species are illustrated with thin-section photomicrographs.

105. OMARA, S. and KENAWY, A., 1966, Upper Carboniferous microfossils from Wadi Araba Eastern Desert, Egypt: *Neues Jahrb. f. Geol. u. Paläont. Abh.*, v. 124, no. 1, p. 56-83, pl. 8-11, 3 text-fig. [in English with German abstract].

The writers describe a microfauna of 35 species of smaller foraminifers, of which 8 are regarded as new, from the Upper Carboniferous exposures (shales separated by a crinoidal limestone) of Wadi Araba, Eastern Desert, Egypt. The microfauna is illustrated by camera-lucida whole-specimen drawings and is thought to be a correlative of the upper Missourian-lower Virgilian sequence (lower Stephanian of western Europe). This microfauna is neither homotaxial or coeval with the Lower Carboniferous dolomitic succession of southwestern Sinai.

According to the writers this microfauna contains the oldest record of the genera *?Choffatella*, *?Ammobaculoides*, *?Gaudryina*, and *?Verneuilioides*, none of which is recognized in pre-Jurassic strata. Agglutinated foraminifers represent by far the most abundant microfaunal element.

The new forms are: *Hyperammina hiltermanni*, *Glyphostomella casteri*, *Cribospirina knetschi*, *Spiroplectammina juxi*, *Palaeotextularia rod-el-hamalensis*, *Bigenerina anglifera*, *Climacammina schwarzbachi*, and *Trochammina huzayyini*. The microfauna is also noteworthy in containing rare fusulinids, ostracodes, brachiopods, and conodonts.

106. PAKHTUSOVA, N. A., 1963, On the boundary of the Kazanian and Tartarian and on the stratigraphy of the Lower Ustyia deposits in

the northern part of the Russian Platform: *Akad. Nauk S.S.S.R., Doklady*, v. 152, no. 6, p. 1432-1435 [in Russian].

From the Permian Maryegorskii Beds of the Mezen Basin, U.S.S.R., *Geinitzina spandeli*, *G. ex. gr. pseudoovoides*, and *Padangia* sp. are reported.

107. PAREYN, C., 1961, Les massifs Carbonifères du Sahara sud-oranais: *Publ. du Centre Nation. Rech. Scientif., Ser. Géol. No. 1*, v. 1, Strat. & Tecton., 325 p., 180 text-fig., v. 2, Strat. & Descript. Paléo., 244 p., 27 text-fig., 16 tables, Paris [in French].

Volume 2 contains a number of lists of smaller foraminiferal occurrences (genera only) from the Lower Carboniferous (upper Tournaisian to lower Namurian) carbonate rock units present in Morocco and Algeria, north Africa. No illustrations or systematic descriptions are included, although a brief discussion on the microfaunal makeup of each reported occurrence is given.

108. PATRULIUS, D. and NEAGU, T., 1963, Über die Anwesenheit des Dinants im Untergrund des rumänischen Ebene (Moesisches Massiv): *Rev. de Géol. et de Géogr.*, v. 7, no. 2, p. 203-207, 2 pl., 1 text-fig. [in German].

A microfauna of previously described smaller foraminifers is reported from the subsurface of the Rumanian Plain. The reported microfauna is from the Cetate Well and is thought to be of Lower Carboniferous age. Representative specimens are illustrated by rather poor thin-section photomicrographs.

109. PELHATE, A., 1965, La découverte d'associations de Foraminifères dans le Carbonifère du bassin de Laval permet l'établissement d'une échelle chronostratigraphique: *C. R. Acad. Sci. Paris*, v. 260, p. 5316-5319 [in French].

Study of the smaller Foraminifera of the Lower Carboniferous (upper Tournaisian to middle Viséan) of the Laval Basin of France has shown that this microfaunal sequence is chronologically related to that previously reported from Belgium. In the sediments from the Laval Basin four microfaunal zones have been recognized, these are: Zone 1 (Tn 3bc) characterized by calcispheres and Earlandiidae, *Plectogyra*, *Tetrataxis*, and *Spiroplectammina brevicula* Conil and Lys; Zone 2 (V1a) carries Ammodiscidae and *Pachysphaera dervillei* Conil and Lys; Zone 3 (V1b) characterized by representative Archaediscidae (*Permodiscus*, *Propermodiscus*, and *Archaediscus*); and Zone 4 (V2-V2b to V3a?) characterized by the presence of *Archaediscus convexus* var. *convexa* Grozdilova and Lebedva, *Plectogyra spira* Conil and Lys, *Archaediscus* sp. of the type *globosus* Conil and Lys, and *Plectogyra omphalota* (Rausser and Reitlinger).

110. PFENDER, J., 1937, Sur la présence de Fusulinelles dans le Dinantien du Sahara: Soc. Géol. de France, C. R. Sommaires, pt. 10, p. 119-121 [in French].

A Lower Carboniferous (Viséan) oolitic limestone at the border of the Tanezrouft, North Africa, carries primitive fusulinids and smaller foraminifers commonly referred to the archaediscids.

111. PIRLET, H., 1963, Sedimentologie des formations du Viséen Supérieur, V3b, dans la vallée du Samson (Belgique): Ann. Soc. Géol. Belgique, v. 86, p. 113-142 [in French].

From the Lower Carboniferous upper Viséan (V3b Zone) in central Belgium the writer reports the following smaller foraminifers: *Cribrostomum* sp., *Tetrataxis conica*, *Monotaxis gibba*, *Palaeotextularia consobrina*, and *Archaediscus* sp.

112. PLOTNIKOV, M. A., 1964, Stratigraphy and lithology of the Upper Permian (Tartar) deposits of the lower course of the Mezen and Vashka Rivers: Akad. Nauk S.S.S.R., Komi Filial, Nauka Press, 72 p., 7 pl., 8 text-fig., 5 tables [in Russian].

From the Upper Permian deposits in the vicinity of the Mezen and Vashka Rivers, U.S.S.R., a number of previously described typical Upper Permian smaller foraminifers are noted (p. 13) and illustrated by rather poor thin-section photomicrographs (Plate 1).

113. PLUMLEY, W. J. and GRAVES, R. W., JR., 1953, Virgilian reefs of the Sacramento Mountains, New Mexico: Jour. Geology, v. 61, no. 1, p. 1-16, pl. 1-4, 5 text-fig.

From Pennsylvanian (Virgilian) "reefs" exposed in the Sacramento Mountains of southcentral New Mexico, the writers report the occurrence of a typical diverse assemblage of Pennsylvanian smaller foraminifers and fusulinids. None of the forms are illustrated or described. The reported assemblage contains: *Ammobaculites* sp., *Ammovertella* sp., *Calcitornella* sp. [probably would now be referred under the genus *Hedraites*; see Henbest, 1963], *Climacammina cylindrica* Cushman and Waters, C. sp., *Endothyra* sp., *Globivalvulina biserialis* Cushman and Waters, G. sp., *Hyperammina* sp., *Nodosinella* sp., *Nubicularia* sp. [sic], *Orthovertella* sp., *Tetrataxis conica* Ehrenberg, T. sp., *Trochammina* sp., and *Tuberitina* sp.

The writers also note that a shale from a zone below their fifth limestone, and above the "reef" horizon, yielded, in addition to fusulinids, *Climacammina cylindrica* Cushman and Waters, *Globivalvulina biserialis* Cushman and Waters, and *Tetrataxis conica* Ehrenberg.

114. POGREBNIYAK, V. A., and M. YE. DOLUDA,

1964, Carboniferous deposits of Shebelino Gas Field: Akad. Nauk S.S.S.R., Doklady, v. 154, no. 2, p. 348-351, 2 text-fig., [in Russian].

Borehole data from the Shebelino Gas Field, in the region of the Soviet Union between the Donbas and the Dneiper-Donets Trough, indicates the presence of a complete Carboniferous section overlying Precambrian crystalline rocks in an area of the Shebelino Uplift. Previously described species of smaller foraminifers are used in delineating the stratigraphic limits of the Middle Carboniferous stages (Bashkirian and Muscovian).

115. POZNER, V. M. and SCHLYKOVA, I. I., 1961, Paleontological characteristics of the Lower Carboniferous Raskov Beds of the central Volga Basin: Microfauna U.S.S.R., Sbornik 13, All-Union Petroleum Scientific-Research Geol. Exploration Inst., Trans., Publ. 179, p. 5-21, 2 pl. [in Russian].

From the Lower Carboniferous Rakov Beds of the central Volga Basin, U.S.S.R., a microfauna of 15 species, of which 13 are new, is described and illustrated by thin-section photomicrographs. The new forms are: *Tournayella accepta*, *Lituotubella? prima*, *L. certa*, *Haplophragmella antica*, *Quasiendothyra procera*, *Q. compta*, *Plectogyra inopinata*, *P. gentilis*, *P. vicina*, *P. honesta*, *P. formosa*, *P. distincta*, and *P. speciosa*.

116. PURKIN, M. M., POYARKOV, B. V., and ROZANEC, V. M., 1961, The stratigraphy and new species of Foraminifera from the Tournaisian of the Borkoldoi Ridge (Tianchan): Akad. Nauk S.S.R. Kirgiz, Izvest., ser. Nat. Sci., v. 3, pt. 4, p. 15-36, 2 pl., 1 text-fig., 2 tables [in Russian].

From the Lower Carboniferous (Tournaisian) rocks of the Borkoldoi Ridge (Tianchan), U.S.S.R., a microfauna of 57 species is recorded. Of the total microfauna 1 genus, 1 subgenus, 9 species, and 2 names are new. The new forms are illustrated by thin-section photomicrographs; they are: *Quasituberitina magna* n. gen., *Bisphaera elongata*, *Cribrosphaera ovalis*, *Eotuberitina crassa*, *E. tallassica*, *T. magna*, *Salpingothurammina* n. subgen. of *Thurammina*, *Septatournayella lebedevae*, *Septaglomospiranella grozdilovae*, and *Tournayella minima*. *Tuberitina maljawkini* Malakhova, 1956, is renamed *T. malachovae*, and *Parathurammina magna* Bykova, 1955, is renamed *T. (Salpingothurammina) bykovaevae*.

117. RAILEANU, G., PATRULIUS, D., BLEAHU, M., and MIRAUTA, O., 1964, Le Carbonifère des Carpathes Roumaines et de L'avant-pays carpathique: 5th. Internat. Congr. on the Strat.

and Geol. of the Carboniferous, Paris, 1964, C. R., p. 723-729 [in French].

Lower Carboniferous (Viséan) sediments of the Carpathic Foreland, Roumania, have yielded *Endothyra*, *Plectogyra*, *Archaediscus karreri*, *A. krestovnikovi*, *Planoarchaediscus spirillinooides*, and *Hyperammina*. It is noted that the archaediscids are particularly abundant at the top of the section, usually where the fusulinid *Millerella* first appears.

118. RAMOVŠ, A., and KOCHANSKY-DEVIDÉ, V., 1965, Die Entwicklung des Jungpaläozoikums in der Umgebung von Ortnek in Unterkrain: Slovene Acad. Sci., Ljubljana, Cl. 4, Hist., Nat., & Math., No. 8, p. 323-416, 18 pl., 7 text-fig., 18 tables [in Serbian and German].

Primarily a paper reporting and illustrating the Lower Permian (Wolfcampian) biota (algae, fusulinids, brachiopods) from the limestones in the vicinity of Ortnek, in the Lower Ukraine. Lists of commonly occurring smaller foraminifers are given and thin-section photomicrographs of *Spiroplectammina* (plate 6) and *Globivalvulina* (plate 7) are included.

119. RAUSER-CHERNOUSOVA, D. M. (Editor), 1963, Resolutions on the systematics of the endothyroid Foraminifera of the 2nd colloquium organized by the Micropaleontological Commission (Moscow, April, 1962): Akad. Nauk S.S.S.R., Voprosy Mikropaleontologii, No. 7, p. 223-227, 1 pl., [in Russian].

As an important step towards the reclassification of the families Endothyridae and Tournayellidae the Micropaleontological Commission put forth many suggestions and resolutions; among the more pertinent proposals the following merit consideration: (1) that the family Quasiendothyridae should include the genera *Quasiendothyra*, *Planoendothyra*, *Loeblichia*, and *Dainella*; representatives of Cummings' family Loeblichinidae are to be included within this family, (2) that the genus *Criboendothyra* is synonymous with *Quasiendothyra*, (3) creation of the new subgenus *Eoquasiendothyra* Durkina on *Endothyra bella* Chernysheva, 1952, (4) that the genus *Planoendothyra* Reitlinger, 1956, include 18 previously described species, (5) the creation of the new subgenus *Urbanella* Malakhova on *Endothyra urbana* Malakhova, 1954, (6) to support Rosovskaia's proposal to the Commission of Zoological Nomenclature concerning the type of *Endothyra* [see China, 1965, for I.C.Z.N. opinion regarding *Endothyra*], (7) the creation of the new subgenus *Latiendothyra* Lipina on *Endothyra latipiralis* Lipina, 1955, and that 25 previously described species be included in the new subgenus, (8) the creation of the new subgenus *Spinoendothyra* Lipina on *Endothyra costifera* Lipina, 1955,

and that 23 previously described species be included in the new subgenus, (9) the creation of the new subgenus *Eoseptatournayella* on *Septatournayella rauserae* Lipina, 1955, and that 5 previously described species be included in the new subgenus, (10) the description and illustration, by thin-section photomicrographs, of the new subgenus *Rectoseptatournayella* Brazhnikova and Rostovceva on *Rectoseptatournayella stylaensis* n. sp. Brazhnikova and Rostovceva, 1963, and (11) the creation of the new subgenus *Neoseptaglomospiranella* Lipina on *Septaglomospiranella dainae* Lipina, 1955.

120. RAUSER-CHERNOUSOVA, D. M., 1965, Foraminifers in the stratotypical section of the Sakmarian Stage (Sakmara River, southern Urals): Akad. Nauk S.S.S.R. Trudy, Geol. Inst., Trans., v. 135, 80 p., 6 pl., 3 text-fig., 5 tables [in Russian].

Primarily a paper describing the fusulinid sequence of the Permian (Sakmarian) Stage, in the southern Urals, U.S.S.R., however, a number of previously described smaller foraminifers are mentioned in the text as also occurring within this sequence.

121. REITLINGER, E. A., 1960, Limits of Lower Carboniferous in stratigraphic diagram of the U.S.S.R. based on foraminiferal fauna: 4th Congr. for the advancement of the stratigraphy of the Carboniferous (Heerlen), v. 3, p. 591-598, 1 text-fig. [in English].

The development of the foraminifers in the Carboniferous System differs from all preceding deposits in the relative variety of systematic units (orders, families). With the inception of the Carboniferous the first great abundance of foraminifers also occurs; there is also a wide dispersion of forms in regions of different facies. However, rare first representatives of most of these forms had already appeared in Middle Devonian time.

The foraminiferal faunas of the Middle Carboniferous differ considerably from that of the Lower Carboniferous but still retain a succession in the development of the majority of orders and families that are common for the entire Carboniferous.

Natural stages in the development of foraminifers during the Lower Carboniferous provide a basis for a further precision of its boundaries. In the correlation chart of the Carboniferous deposits of the Soviet Union the boundary between the Devonian and Carboniferous is drawn at the base of the Likhvin Substage, with a conditional inclusion of Etroeungt Beds in the Carboniferous. In the area east of the Russian Platform and in the Urals, a peculiar pre-Carboniferous fauna of foraminifers (*Endothyra communis* group) attains its greatest development during upper Levigian

and Etroeungt time and appears to commence with the middle of the Famennian Stage, which suggests the possibility of a Devonian age. Commencing with the Likhvian Substage of the Lower Tournaisian, a distinct new stage in the development of foraminifers occurs.

The Foraminifera of the lower Namurian are very closely linked with the faunas of the upper Viséan. However, higher in the section, a considerable change takes place in the faunal complex; this is marked by the predominance of early fusulinids and representatives of the Endothyridae.

122. REITLINGER, E. A., 1960, Importance of Foraminifera for the stratigraphy of Lower Carboniferous sediments: International Geol. Congress, 21st Session, Repts. of Soviet Geologists, Doklady sovetskikh geologov problema, p. 56-64, 1 chart [in Russian with English abstract].

In the Soviet Union 14 foraminiferal zones subdivide the Lower Carboniferous rocks into widespread stratigraphic units. Comparison of Lower Carboniferous foraminiferal microfaunas of different continents indicates two distinctive zoogeographical provinces — the European and the North American. The boundary between them is marked at the Kuznetsk Basin, asiatic Soviet Union, where the foraminiferal assemblage is impoverished in comparison with the microfauna of the European Province, and is characterized by some forms that are identical, or very nearly so, to the Foraminifera of North America.

The closest relationship of the microfauna of the Soviet Union with that of North America is noted in rocks of upper Tournaisian age. Some identical or similar species are also present in the Etroeungt beds, the lower and upper parts of the Viséan (Kinderhookian), the lower part of the Meramecian, and the upper part of the Chesterian. The appearance of planispiral forms like *Eostaffella* (= ?*Endothyra* of American writers) will probably delineate the boundary between the Tournaisian and the Viséan on a continental scale. At the present time it is possible to distinguish the following zones which appear to have wide stratigraphic distribution: (1) *Quasiendothyra communis* and *Septaglomospiranella primaeva* Zone is probably Etroeungt and Kinderhookian in age, (2) *Chernyshinella* Zone is considered to be Tournaisian and Osagian in age for the most part, and (3) the *Endothyranopsis* and *Eostaffella* Zones correspond approximately to the Viséan, Meramecian, and Chesterian.

123. REITLINGER, E. A., 1963, On the micropaleontological criteria for determination of the limits of the Lower Carboniferous according

to the Foraminifera: Akad. Nauk S.S.S.R., Voprosy Mikropaleontologii, No. 7, p. 22-56, 3 pl., 4 text-fig., 4 tables, [in Russian].

Primarily a fusulinid paper, but the writer discusses certain boundary problems, *i.e.*, the Famennian-Tournaisian and Viséan-Namurian, and the task of accurately delineating these boundaries in the light of distribution patterns of certain groups of smaller foraminifers.

Pertinent phylogenetic dendrograms of related groups of Devonian through Lower Carboniferous foraminifers are shown on text-fig. 2-4.

124. ROCH, E., 1937, Sur le Viséan du Haut-Atlas a l'Est de Marrakech: Acad. Sci. Paris, C.R., v. 205, p. 332-333, [in French].

The writer reports that the Lower Carboniferous Teassaout Shales of Morocco, North Africa, contain the smaller Foraminifer *Endothyra* and are thought to be Viséan in age.

125. ROCH, E., 1950, Histoire Stratigraphique du Maroc: Notes et Mémoires Service Géol. du Maroc, v. 80, 435 p., [in French].

The smaller foraminifers *Endothyra* and *Valvulina* are reported as occurring in the Lower Carboniferous (Viséan) Jebel Begaa Limestone of Morocco, North Africa. In the High Atlas Mountains, the Viséan Ait Akim beds contain *Endothyra*.

126. ROSOVSKAIA, C. E., 1961, On the systematics of the Endothyridae and Ozawainellidae: Paleont. Zhur., No. 3, p. 19-21 [in Russian].

The writer designates *Endothyra parva* as the type species of the new genus *Endostaffella*. Now grouped under this new genus are the following previously described species of *Endothyra*: *E. parva*, *E. barzassiensis*, *E. inflata*, *E. vera?*, *E. fucosa*, *E. shamordini*, *E. tantilla* and *E. mira*.

127. ROSOVSKAIA, C. E., 1963, The earliest fusulinids and their ancestors: Akad. Nauk S.S.S.R., Trudy, Inst. Paleontol., v. 97, 127 p., 22 pl., 2 tables [in Russian].

A fundamental review of the evolution of the Lower Carboniferous Endothyridae and their relationships to the earliest Fusulinidae; one phylogenetic diagram is also included. All forms are fully described and illustrated by thin-section photomicrographs. Of the described microfauna 7 species and 3 subspecies are new. The new forms are: *Endothyra granularis*, *E. parapriscia* Schlykova *triplex* n. subsp., *E. fominiae*, *Plectogyrina affecta*, *Mikhailovella continua*, *Planoendothyra aljutovica* (Reitlinger) *minor* n. subsp., *Endostaffella fucoides*, *E. asymmetrica*, *E. delicata delicata* n. sp. and subsp., and *E. delicata minima* n. subsp. [preoccupied by *Endothyra minima* Lange, 1925].

128. SAGE, N. M., JR., 1954, The stratigraphy of the Windsor Group in the Antigonish Quadrangles and the Mahone Bay-St. Margaret Bay area, Nova Scotia: Dept. Mines, Mem. 3, 168 p., 21 pl., 14 text-fig., 2 maps.

A study of some smaller foraminifers from the Lower Carboniferous Windsor Group of Nova Scotia demonstrates that the upper Windsor Subzone E, including the *Gigantoproductus* and reef-coral faunas, may be correlated with the mid-Chesterian beds of the type Chester area of the United States. Foraminifers from this subzone most closely resemble Chester forms from the Paint Creek Formation and the Glen Dean Limestone. The foraminifers are systematically described and illustrated (Pl. 1-4) by line drawings of thin-section specimens. [All forms (10) are only identified to the generic level; some are obviously misidentified.]

129. SAURIN, E., 1960, Foraminifères et position stratigraphique de quelques calcaires anthracolithiques Indo-Chinois: Soc. Géol. France, C.R., no. 7, p. 171-173, [in French].

The Lower Carboniferous (Viséan) Ban Phit Limestone of Laos, southeast Asia, contains an abundant microfauna characterized by species of the Archaeodiscidae and Endothyridae. A faunal list of 25 genera and 47 species (all previously described) is included.

130. SAURIN, E., 1960, Foraminifères Viséens de Ban Phit (Laos): Ann. Fac. des Sci. Saigon, p. 345-376, pl. 1-4 [in French with English abstract].

The Lower Carboniferous (upper Viséan) limestone of Ban Phit, Laos, southeast Asia, contains an abundance of smaller foraminifers, of which representatives of the Archaeodiscidae and Endothyridae are dominant. The microfauna consists of 69 species of which 31 species and 5 varieties are new. The microfauna is illustrated by thin-section photomicrographs and drawings. The new forms are: *Hyperammina hastata* [= *Earlandia*], *Tolypammina spinosa*, *T. cammonensis*, *T. nodusfocalis*, *Cornuspira bispinata*, *C. zeili*, *C. umbilicata*, *Forschia michaudeli*, *F. auvrayi*, *Forschiella phaseolus*, *Haplophragmella dussaulti*, *Brunsia indosinensis*, *Archaeodiscus pseudovischerensis*, *A. elongatus*, *Permodiscus laotianus*, *Nodosinella virgulina*, *N. vacillans*, *Spiroplectammina modesta*, *Cribrostomum larva*, *C. bradyi* Moeller var. *parva*, *C. acutum*, *C. breve*, *Cribrogenerina humilis*, *C. ampliata*, *Quasiendothyra fucosa* Ganelina var. *concosa*, *Plectogyra cistula*, *P. paraukrainica* Lipina var. *supera*, *Plectogyra pusilla*, *P. tremata*, *P. triangularis*, *P. frequentata* Ganelina var. *pithensis*, *P. excelsa* Ganelina var. *laotiana*, *P. delicata*, *P. banphitensis*,

P. punctum, and *Samarina lusca*. Descriptions of fusulinids are also included.

131. SAURIN, E., 1961, Foraminifères dinantiens du Laos: Ann. Fac. Sci. Saigon, p. 199-230, pl. 1-7 [in French with English abstract].

From some Lower Carboniferous limestones in Laos, southeast Asia, 74 species of smaller foraminifers are described and illustrated by thin-section photomicrographs and drawings. Of the total microfauna 26 species and 2 varieties are new. The new forms are: *Archaelagena namngeunensis*, *Saccammina? rostrata*, *Tuberitina laosensis*, *T. vasiiformis*, *T. irregularis*, *Ammodiscus vermiculus*, *Glomospira elongata*, *G. minutissima*, *G. papaverum*, *Glomospirella orthogonia*, *G. discobola*, *G. bipennis*, *G. endothyroidea*, *Spirillina bocheti*, *S. ovata*, *Brunsiina xiengtongensis*, *Carbonella pahiensis*, *Lituotubella herrmanni*, *Mstinia tranninhensis*, *Archaeodiscus acutus*, *A. praecursor*, *A. aeri-fodinae*, *A. quadratus*, *A. foliaceus*, *A. erectus* and *Cribrostomum macellum*, *Textularia bradyi* (Möeller), Liebus, 1932, is renamed *Cribrostomum liebusi* nov. nom., and *Cribrostomum* sp. no. 2 Lipina, 1948, is renamed *C. lipinae*. Some fusulinids are also described and illustrated.

The Ban Phit and Tham Neup Limestones are dated as upper Viséan; the Ban Nam Thong Limestone as lower Viséan, and the Pah Xien Thong Limestone as uppermost Tournaisian or lowermost Viséan.

132. SCHELLWIEN, H. E., 1894, Über eine angebliche Kohlenkalk-Fauna aus der ägyptisch-arabischen Wüste: Zeit. Deutsch. Geol. Ges., No. 46, p. 68-78, [in German].

During a re-study of Walther's fossil collections of supposed Lower Carboniferous age from Wadi Araba, Eastern Desert, Egypt, the present writer found specimens of *Endothyra* sp. cf. *E. bowmani*, *Tetrataxis*, and *Climacammina* in a thin-section of crinoidal limestone and on this basis assigned the unit to the Upper Carboniferous. [See Omara, 1965, for the most recent discussion of the microfauna of this region].

133. SHCHERBAKOV, O. A., ET AL., 1964, Stratigraphy of the Tournaisian-Viséan boundary beds in the central Urals: Akad. Nauk S.S.S.R., v. 158, no. 1, p. 112-115, 1 text-fig., [in Russian; English translation IN: Doklady ESS, v. 158, Sept.-Oct. 1964, p. 26-28, 1 text-fig.].

The stratigraphy and paleontology (spores, pollen, previously described smaller Foraminifera, corals and brachiopods) of the Tournaisian-Viséan boundary beds of the central Ural Mountains, U.S.S.R., have been studied in detail. Results indi-

cate that the upper Tournaisian deposits of the Gubakha Section in the central Urals include the Kos'va Formation of calcareous to terrigenous rocks which grade downward into the Kizelovo Limestone; the Kos'va Limestone is lithologically similar to the coal measures in many parts of the area.

134. SKVORZOV, V. P., 1965, New Viséan Foraminifera from northern Fergana: Akad. Nauk S.S.S.R., Paleont. Zhur., No. 3, p. 23-32, pl. 3, [in Russian].

From the Lower Carboniferous (Viséan) rocks of northern Fergana, U.S.S.R., eight new species of smaller foraminifers and two new species of fusulinids are described and illustrated by thin-section photomicrographs. The new smaller foraminifers are: *Ammodiscus? irregularis*, *Glomospirella sairamica*, *Plectogyra koksarekensis*, *Archaeodiscus elongatus*, *Propermodiscus elegans*, *P. tenuissimus*, *Planoarchaeodiscus longus*, and *Permodiscus sum-sarensis*.

135. SOSNINA, M. I., 1960, On the methods of studying Lagenidae: International Geol. Congress, 21st. Session, Repts. of Soviet Geologists, Doklady sovetskikh geologov problema, p. 32-47, 2 pl., 15 text-fig., [in Russian with English abstract].

The study of smaller Foraminifera enclosed in hard rocks, resistant to disintegration, is usually done on non-oriented thin-sections. This method affords valuable data in elucidating details of the internal structure. Yet, investigations have shown that it is difficult, if not impossible, to reconstruct the external shape of the shell on the basis of non-oriented thin-sections.

While studying the Permian Lagenidae of Sikhote-Alin, U.S.S.R., the writer developed a method of utilizing consecutive polished sections in order to reconstruct the external shape of the shell. Samples containing Lagenidae were cut into thin laminae, 2-3 mm. thick, then polished surface sections were selected whose outlines closely resembled one another. These forms were polished in three mutually perpendicular directions under a binocular microscope. Each successive stage being copied by means of a drawing apparatus. The work carried out in this manner led to unexpected results. It was evident that Lange (1925), who established the genus *Pachyphloia*, on the basis of non-oriented thin-sections, obtained erroneous results; he referred random oblique lateral cuts to the genus *Pachyphloia*, whereas an approximate longitudinal-axial section was defined as *Geinitzina ovata* Lange. One additional lateral section was described by Lange as *Nodosaria* sp.

This study has shown that diverse oblique

random sections of the genus *Pachyphloia* have been assigned to at least eight different genera by various authors: *Nodosaria*, *Geinitzina*, *Parageinitzina*, *Pachyphloia*, *Pseudogeinitzina*, *Pararobuloides*, *Parapermodiscus*, and *Parapachyphloia*. Of these *Parageinitzina*, *Parapachyphloia*, *Pseudogeinitzina*, and *Parapermodiscus* have proved to be synonyms of the genus *Pachyphloia*.

Studying non-oriented smaller foraminifers has led some authors to erect spurious genera and species and to go astray as to their systematic position and phylogenetic relationships.

136. SULTANAYEV, A. A., 1965, Reefs of Moscow age in the Urals: Akad. Nauk S.S.S.R., Doklady, v. 165, no. 4, p. 904-906, [in Russian].

Reefs which are believed to be of Moscow age (Middle Pennsylvanian) were identified on the eastern slope of the southern Urals at the shore of the Ui River, U.S.S.R. The same limestones were formerly assigned to a Silurian age on the basis of a coral whose actual range is Silurian to Carboniferous. The present study revealed the possibility of a more accurate age determination on the basis of previously described Foraminifera found in 3 of the 4 units present. The foraminiferal assemblages contain *Plectogyra bradyi* (Mikhailov) and a number of previously described fusulinids that are similar to those in the upper Moscow beds (the upper part of the Middle Carboniferous System).

137. SUN, Y. C., 1964, On the lower boundary of the Carboniferous System of south China: 5th. Internat. Congress on the Geol. and Strat. of the Carboniferous, Paris, C.R., 1964, p. 807-812.

From the Lower Carboniferous Mengkungao Formation in central Hunan, south China, the following previously described smaller foraminifers are recorded: *Glomospirella irregularis*, *Tournayella primaria*, *Septatournayella pseudocamerata*, *Plectogyra recta*, and *P. inflata maxima*.

138. THEODOROVITCH, G. I., 1945, The Bashkirian Stage of the Middle Carboniferous and its subdivisions: Akad. Nauk S.S.S.R., Doklady, v. 49, no. 2, p. 133-135, [in Russian].

On the basis of fusulinids the Middle Carboniferous Bashkirian Stage has been subdivided into three substages. All three of these substages contain *Archaeodiscus bashkircus* Krestovnikov and Theodorovitch and *Bradyina* sp. cf. *B. cribratomata* Rauser-Chernousova and Reitlinger.

139. THEODOROVITCH, G. I., GROZDILOVA, L. P., and LEBEDEV, N. S., 1959, Some data on the subdivision of the Bashkir Stage of mountainous Bashkiria in accordance with the Foraminifera

inifera fauna: Soc. Nat. Hist. Moscow, Bull., ser. geol., v. 34, no. 6, p. 103-115, 1 table, [in Russian with English summary].

This paper deals primarily with new data on the stratigraphy of the Bashkir Stage from the western slope of the South Urals, U.S.S.R. The subdivision of the Bashkir Stage into five faunal zones (mainly on the basis of previously described smaller foraminifers) that had been previously proposed has been confirmed and undergone further substantiation, thus acquiring a more regional stratigraphic significance.

140. TOOMEY, D. F., 1966, Application of factor analysis to a facies study of the Leavenworth Limestone (Pennsylvanian-Virgilian) of Kansas and environs: Kansas Geol. Survey, Spec. Distribution Publ. 27, 28 p., 13 text-fig., 6 tables.

Samples from 32 Leavenworth Limestone (Pennsylvanian-Virgilian) localities from southwestern Iowa to northern Oklahoma were subjected to a factor analysis in order to differentiate meaningful facies and biofacies. Total counts of calcareous smaller foraminifers were studied with the aid of a computer; three biofacies were defined: (1) mobile foram biofacies — which contain the highest percentage of mobile smaller foraminifers, (2) fusulinid biofacies — dominated by an abundance of triticitid fusulinids, and (3) an encrusting foram biofacies — in which three encrusting foraminiferal genera represent the bulk biofacies characteristics. The mobile foram biofacies comprises 20 outcrop localities, whereas the fusulinid biofacies is represented at nine localities. Both foraminiferal biofacies are closely related. The encrusting foram biofacies is only represented at three localities in southwestern Iowa. Results of the foraminiferal analysis suggest that the biological mechanism responsible for the Leavenworth calcareous foraminiferal distribution and abundance are relatively interrelated factors of a highly organized ecosystem.

Formic acid residues yielded a relatively abundant microfauna of agglutinated and silicified Foraminifera. Nine genera of agglutinated foraminifers and two silicified, though originally calcareous, genera are present.

Consideration of all the data suggests that the Leavenworth Limestone was deposited in relatively shallow water on a broad, slowly subsiding carbonate platform and that this thin carbonate is a very persistent and laterally homogenous unit.

141. VALIULLINA, R. T. and CHERNOMORSKY, V. N., 1961, The subdivision of the Lower Carboniferous terrigenous strata of northwest Bashkiria according to spore-pollen data and

mineralogical analyses of the shales: Akad. Nauk S.S.S.R., Doklady, v. 139, no. 5, p. 1181-1184, [in Russian].

The smaller foraminifers *Endothyra antiqua*, *E. latispiralis*, and *Tournayella* sp. are listed as occurring in the Lower Carboniferous Kizel strata of the Kama-Kinel Depression, U.S.S.R.

142. VDOVENKO, M. V., 1962, Some new upper Viséan and lower Namurian species of Foraminifera from the southwestern part of central Kazakhstan: Paleont. Zhur., No. 1, p. 41-46, pl. 3-4 [in Russian].

Eight new species of Lower Carboniferous smaller foraminifers are described from the upper Viséan and lower Namurian rocks of the southwestern part of central Kazakhstan, U.S.S.R. All forms are illustrated by thin-section photomicrographs. The new species are: *Ammobaculites? anomalis*, *Spiroplectammina minima*, *S. exotica*, *Moravammina koktjubensis*, *Howchinia beleutensis*, *Tetrataxis dzhezkazganicus*, *T. kingiricus*, and *T. ovalis*.

143. VOICHEKOVSKAIA, A. A., 1961, On some species of the family Endothyridae in the Lower Carboniferous of the uppermost northern region: Leningrad Inst. Geol., Symposium on Paleontol. and Stratigr., Bull. 24, p. 16-45, 7 pl., [in Russian].

From the Lower Carboniferous Tournaisian and Viséan limestones of northern Siberia a microfauna of 28 foraminiferal species, of which 17 are new species and 2 are new varieties, is described and illustrated by rather poor thin-section photomicrographs. The new forms are: *Endothyra? zlobini*, *E. transita* Lipina var. *magna* n. var., *E.? transita* Lipina var. *minima* n. var., *E.? originis*, *E. juliusi*, *E. lipinae* [specific name preoccupied; see Morozova, 1949], *E. finitima*, *Quasiendothyra pseudochromatica*, *Plectogyra grata*, *P. juncta*, *P. schlykovae*, *P. poljarica*, *P. corallovaajaensis*, *P. coarta*, *P. munita*, *P. ovoidea*, *Plectogyrina reitlingeriae*, *Globoendothyra arctica*, and *G. tumida*. Taxonomic changes include the following: *Nanicella fragilis* Lipina, 1951 = *Plectogyra fragilis* (Lipina), and *Endothyra? gracilis* Rauser-Chernousova, 1948 = *Mikhailovella gracilis* (Rauser-Chernousova).

144. WAGNER, H. C., 1966, Pennsylvanian megacyclothems of Wilson County, Kansas, and speculations concerning their depositional environments: Kansas Geol. Survey Bull. 169, Symposium on cyclic sedimentation, p. 565-591, 10 text-fig.

The writer notes that sedimentation during Pennsylvanian time in Wilson County, Kansas, was

cyclic, and that characteristic environments prevailed during each part of the megacycle, resulting in the formation of sedimentary rocks with clearly different lithological and faunal attributes. Ten depositional stages composing each megacycle are recognized, their characteristics are noted and speculations concerning their depositional environments are given. It is reported that Stage C, the argillaceous transgressive-regressive marine stage, contains *Ammodiscus*, *Ammovertella*, *Tolypammina* [probably *Minammodytes*], *Glomospira*, and *Hyperammina*; Stage F, the stagnant-water marine stage, contains *Ammodiscus*, *Cornuspira*, and *Tetrataxis*.

145. WALTHER, J. K., 1890, Über eine Kohlenkalk-Fauna aus der ägyptisch-arabischen Wüste: Zeit. Deutsch. Geol. Ges., No. 42, p. 419-449, [in German].

The writer mentions the occurrence of *Cornuspira* sp. [now referred to *Cyclogyra*], and *Trochammina incerta?* in the fauna of Wadi Araba, Eastern Desert, Egypt, and assigned the unit to the Lower Carboniferous. [See Omara, 1965, for the most recent discussion of the microfauna from this region.]

146. WILLIAMS, J. S. and YOLTON, J. S., 1945, Brazer (Mississippian) and lower Wells (Pennsylvanian) section at Dry Lake-Logan Quadrangle, Utah: Am. Assoc. Petroleum Geologists, Bull., v. 29, no. 8, p. 1143-1155, 2 text-fig., 1 table

Endothyra sp. is listed as occurring in unit 2 of the Brazer Limestone (Meramecian) at Dry Lake, Utah.

From the lower part of the Early Pennsylvanian Wells Formation at Dry Lake, Utah, *Endothyra* sp. cf. *E. ovata* Waters is listed as occurring within this interval.

147. WOLFENDEN, E. B., 1958, Palaeoecology of the Carboniferous reef complex and shelf limestones in northwest Derbyshire, England: Geol. Soc. America, Bull., v. 69, p. 871-898, 12 text-fig., 3 tables.

In a detailed study of the Lower Carboniferous (middle Viséan) reef complexes of northwest Derbyshire, England, the writer notes that there is a conspicuous increase in the numbers of calcareous foraminifers from the fore-reef and reef proper, towards the back-reef and lagoonal facies.

It is mentioned (p. 887) that the form *Aphralysia carbonaria* Garwood is thought to be an encrusting foraminifer comparable to species of the genus *Nubecularia*, although no evidence is given to support this contention.

148. ZAVJALOVA, E. A., 1959, Tournaisian Foraminifera of the Lvov Depression: Ukrainskii Nauchno-issledovatel'skii Geologorazvedochnyi Inst., Kiev, Trudy, v. 1, p. 174-179, 3 pl., [in Russian].

Four previously described species of smaller foraminifers are discussed and systematically described from the Lower Carboniferous (Tournaisian) rocks of the Lvov Depression (Ukraine) of the Soviet Union. All forms are illustrated by rather poor thin-section photomicrographs. The microfauna consists of: *Chernyshinella glomiformis* Lipina, *Tournayella discoidea* Dain, *Septabrunsiina krainica* Lipina, and *Parathurammina suleimanovi* Lipina.

149. ZELLER, D. E. N., 1955, Endothyroid foraminiferal faunas from the Lower Carboniferous of England and Algeria (Abstract): Jour. Paleontology, v. 29, no. 4, p. 738.

An abundant and diverse microfauna of endothyroid Foraminifera is reported from Lower Carboniferous limestones collected from England and Algeria.

The European endothyroid faunas show greater similarity to the Mississippian faunas of the Cordilleran Geosyncline than they do to the faunas of the Midcontinent region.

Specimens from the upper Viséan at Taghit, Algeria, seem to be conspecific with *Plectogyra phrissa* Zeller from the Kinkaid Limestone (upper Chesteran) of Illinois.

Associated with the endothyroid foraminifers are two other interesting genera of smaller foraminiferas. *Howchinia bradyana* (Howchin), previously known only from England, has been found in samples from the upper Viséan at Taghit, Algeria. *Archaediscus karreri* Brady, known to occur in the upper Viséan of Europe, has also been discovered in beds of the same age at Igli, Algeria, North Africa.

150. ZELLER, E. J., 1955, Endothyroid zonation in the Mississippian of the Rocky Mountains (Abstract): Jour. Paleontology, v. 29, no. 4, p. 737-738.

Through the use of endothyroid Foraminifera it is possible to recognize four widespread microfaunal zones in the Mississippian rocks of the western United States. The faunal succession of the endothyroids and the lateral extent of the four microfaunal zones was determined by thin-section studies of carbonates from twelve measured sections along the Cordilleran Trough, from Arizona to Montana.

DISTRIBUTION OF ARTICLES
ACCORDING TO
GEOLOGIC AGE AND CATEGORY

<p>PRECAMBRIAN 21</p> <p>CAMBRIAN 12, 21</p> <p>ORDOVICIAN 7</p> <p>SILURIAN 3, 11, 14, 15, 58</p> <p>DEVONIAN 1, 2, 4, 5, 6, 8, 9, 10, 13, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 34, 66, 121, 122, 123</p> <p>MISSISSIPPIAN 1, 9, 29, 30, 31, 33, 34, 35, 37, 38, 39, 41,</p>	<p>42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 53, 55, 56, 57, 60, 61, 62, 64, 66, 67, 69, 77, 78, 79, 80, 81, 82, 83, 86, 87, 88, 89, 90, 91, 92, 93, 95, 96, 98, 100, 102, 104, 107, 108, 109, 110, 111, 115, 116, 117, 119, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 133, 134, 137, 141, 142, 143, 145, 146, 147, 148, 149, 150</p> <p>PENNSYLVANIAN 32, 36, 52, 54, 58, 59, 66, 72, 75, 82, 84, 97, 101, 103, 105, 113, 114, 132, 136, 138, 139, 140, 144</p> <p>PERMIAN 36, 40, 54, 63, 65, 68, 70, 71, 73, 74, 75, 76, 85, 94, 97, 99, 101, 106, 112, 118, 120, 135</p> <p>GENERAL 39, 79, 81, 119, 121, 122, 135</p>
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330. VARIATION IN TEST MORPHOLOGY OF
TRILOCULINA LINNEIANA D'ORBIGNY IN LABORATORY CULTURES

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ABSTRACT

At reproductive maturity the offspring of a single specimen of *Triloculina linneiana* d'Orbigny produced asexually in laboratory culture attain a size only about one eighth that of the original parent. The offspring show spiroloculine, irregular, and, very rarely, quinqueloculine characteristics, but none of the specific characters of *T. linneiana*.

INTRODUCTION

The occurrence of variability of test morphology, especially as associated with sexual and asexual modes of reproduction, is well known among foraminifera. The variations affect the size of the proloculus and the general proportions of the adult test. Less widely known is the existence of great variability among foraminiferal specimens which were produced by a single type of reproduction.

The present study is based on cultures of foraminifera maintained in the Department of Geology of the University of Illinois. The parent foraminifera were collected on Dec. 29, 1965 by W. W. Hay and D. S. Marszalek at Largo Sound, Key Largo, Florida. The study has been supported by National Science Foundation Grant GB-4101 (W. W. Hay, Principal Investigator). I thank Dr. Eugene B. Small, Department of Zoology, Univ. of Illinois,

for his aid in establishing the isolation cultures. The culture medium was millipore-filtered Largo Sound water; temperature was maintained at about 25°C.

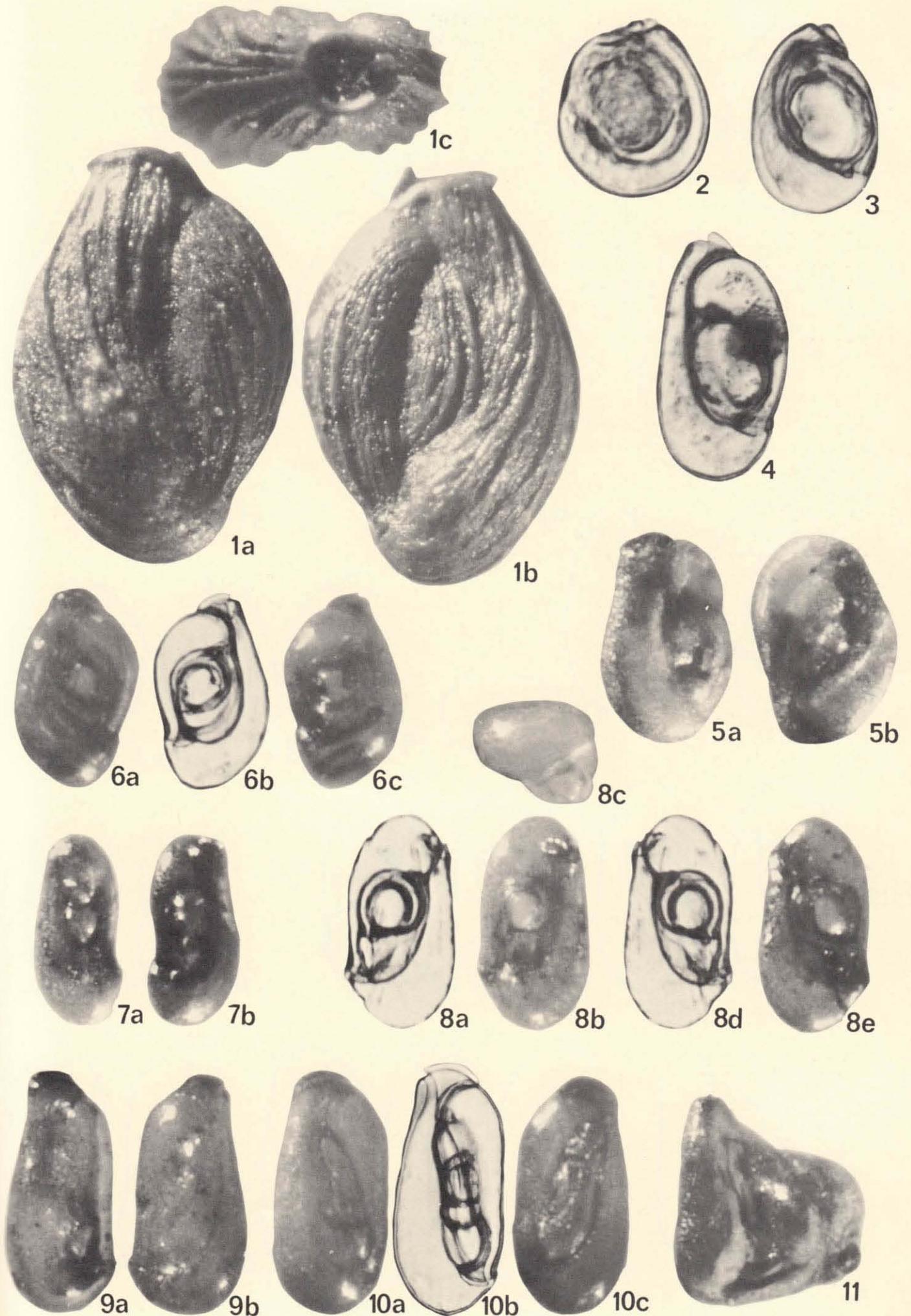
RESULTS

An isolated specimen of *Triloculina linneiana* d'Orbigny began to reproduce asexually in March 1966. Some of the offspring were removed to isolation cultures to establish controlled clonal lineages, the rest were kept in bulk cultures. By late August 1966, six asexually produced generations could be observed in the isolation cultures. The first and most obvious disparity between the original parent and all of its offspring exists in the size relationships. Nearly all of the specimens of *T. linneiana* in the Florida Key material were between 0.65 and 1.0 mm in length, whereas the offspring attained on the average a length of only 125 microns at reproductive maturity. The parent specimen from Florida had 11 chambers, but the offspring reproduced when four or five chambers had been built. The size of the proloculus for both forms was nearly the same, around 30 to 35 microns minimum diameter. From the study of the proloculus, it was not possible to determine whether or not the large Florida specimens represent the

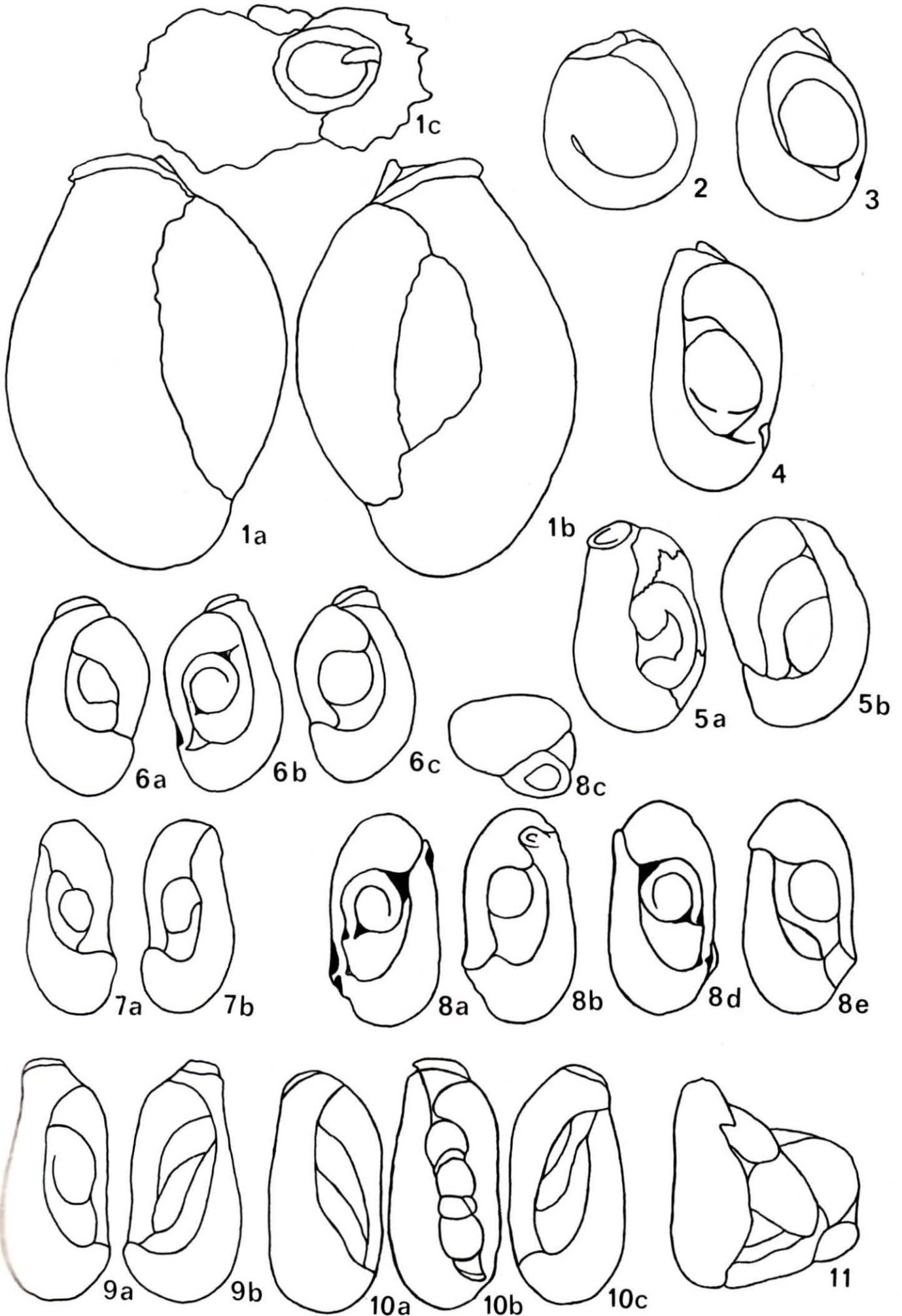
EXPLANATION OF PLATE 7 AND TEXT FIGURES 1 TO 11

Text figures 1 to 11 are tracings of outlines and suture-lines of the specimens illustrated on the plate and are numbered correspondingly.

FIGS:	PAGE
1. Test of original parent; length 995 microns.	84
2. Offspring consisting of prolocular apparatus only, immersed in glycerine; maximum diameter 41 microns.	85
3. Offspring consisting of prolocular apparatus plus one chamber, immersed in glycerine; length 56 microns.	85
4. Three-chambered offspring, immersed in glycerine; length 82 microns.	85
Specimens illustrated in figs. 2, 3, and 4 were killed before photography; specimens illustrated in figs. 5-11 are empty tests, after reproduction.	
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6. Spiroloculine offspring, four-chambered; length 119 microns (fig. 6b immersed in glycerine).	85
7. Slightly twisted spiroloculine form; length 91 microns.	85
8. Spiroloculine offspring with apertural end of ultimate chamber twisted approximately 120 degrees from previous plane of coiling; length 125 microns (figs. 8a, 8d immersed in glycerine).	85
9. Offspring with slightly twisted spiroloculine form; length 136 microns.	85
10. Offspring with slightly twisted spiroloculine form, six-chambered; length 136 microns (fig. 10b immersed in glycerine).	85
11. Monstrous offspring; length 114 microns.	85



Schnitker: Variation in *Triloculina linneiana* d'Orbigny



TEXT FIGURES 1 TO 11

microspheric stage and the cultured specimens a megalospheric stage.

In his observations on *Spiroloculina hyalina* Schulze, Arnold (1964) illustrates the great variability of that species, in which he observes tests which can be assigned to *Spiroloculina*, *Quinqueloculina* and *Triloculina* or which are completely irregular. The same range of variability is displayed among the descendants of *T. linneiana*, with the exception of the triloculine form. The prolocular apparatus is identical to the one described and figured by Arnold for *S. hyalina*, but subsequently the tests become relatively higher and narrower. In about 60% of the specimens, the chambers are added in approximately the same plane of coiling, resulting in spiroloculine forms (figs. 3, 4, and 6). In about 30% of the specimens, they are added in planes of coiling which are slightly rotated, but without bringing the chambers to an extensive overlap. Such irregular specimens resemble occasionally a massiline chamber arrangement but lack the quinqueloculine juvenarium of that genus (figs. 7, 9, and 10). A quinqueloculine chamber arrangement is occasionally displayed (fig. 5, the penultimate chamber of this specimen was broken during preparation for photography). Fig. 8 illustrates a specimen which is basically "spiroloculine," but in which the apertural end of the ultimate chamber is rotated by about 120 de-

grees with relation to the penultimate chamber, as is typical for *Triloculina*. Among many hundreds of specimens, no closer similarity to *Triloculina* could be observed. All specimens are highly transparent and smooth in appearance. The heavy surface ornamentation characteristic of *T. linneiana* is never present. A few obviously aberrant or monstrous specimens were found among the offspring in culture, one of these is illustrated in fig. 11.

CONCLUSIONS

The laboratory populations of the offspring of *T. linneiana*, on the basis of morphological study alone, cannot be assigned to the proper species. These forms are regarded as variants produced under favorable living conditions when reproduction occurs before specific characters are developed.

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CORRECTIONS

The following changes should be made in the paper entitled "*Asterorotalia trispinosa* (Thalman), a spinose rotaliid from Digha Beach, Southern Bengal" by B. K. Ghose, which appeared in Vol. XVII, pt. 3, pp. 104-108 of this journal:

p. 105, Table 4, first line below the table: for "-0.41" read "0.41."

p. 105, Table 4, third line below the table: for "P" read "rho."

p. 105, 2nd column, 13th line from top: for "model" read "modal."

p. 106, Table 5: the entries showing values for the confidence limits should be interchanged.

p. 106, Table 5, third line below the table: for "P" read "rho."

p. 106, 2nd column, 16th line from the bottom: for "P" read "rho."

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RECENT LITERATURE ON THE FORAMINIFERA

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

- AKIMETS, V. S. The stratigraphy and Foraminifera of the Lower Cretaceous deposits of Byelorussia (in Russian), in *Palaeontology and Stratigraphy of the Baltic and the Byelorussia*, No. 1 (6).—Ministry of Geol. of U.S.S.R., Vilnius, 1966, p. 293-375, pls. 1-5, text figs. 1-8 (maps, columnar sections).—Sixteen species (13 new) from Valanginian, Hauterivian-Barremian, Aptian, and Albian.
- ALEXANDROWICZ, ZOFIA. Cretaceous deposits in glacial floes on the island Wolin and in the vicinity of Kamien Pomorski (English summary of Polish text).—*Polska Akad. Nauk, Prace Geol.*, No. 35, 1966, p. 1-103, photos 1-33 (outcrops, thin sections, faunal assemblages), text figs. 1-33 (maps, range charts, block diagram, geol. sections, graphs, pie diagrams), tables 1-3.—Foraminifera used in determining Cretaceous age and Baltic origin of glacial xenoliths within Quaternary morainic clays and sands.
- BAGMANOV, M. A. Krupnye Foraminifery i Molljuskovaja Fauna Eothenovykh Otlozhenij Malogo Kavkaza.—*Akad. Nauk Azerbajdzhan SSR, Instit. Geol.*, Baku, 1966, p. 1-302, pls. 1-91, text figs. 1-3 (outcrop photos).—Section on nummulites and other larger Foraminifera (p. 11-68, pls. 1-18).
- BANNER, F. T., and BLOW, W. H. Two new taxa of the Globorotaliinae (Globigerinacea, Foraminifera) assisting determination of the late Miocene/Middle Miocene Boundary.—*Nature*, v. 207, No. 5004, Sept. 25, 1965, p. 1351-1354, text figs. 1-3.—In the evolutionary sequence of *Globorotalia tumida*, *G. mesotumida* of Tortonian age and *G. tumida plesiotumida* of Messinian age.
- Progress in the planktonic foraminiferal biostratigraphy of the Neogene.—*Nature*, v. 208, No. 5016, Dec. 18, 1965, p. 1164-1166.—Definition of 23 zones within the Miocene to Recent.
- BANNER, F. T., and EAMES, F. E. Recent progress in world-wide Tertiary stratigraphical correlation.—*Earth Science Reviews*, v. 2, 1966, p. 157-179.—A summary.
- BARR, F. T. Upper Cretaceous Foraminifera from the Ballydeenlea Chalk, County Kerry, Ireland.—*Palaeontology*, v. 9, pt. 3, Oct. 1966, p. 492-510, pls. 77-79, text figs. 1, 2 (map, range chart).—Eighteen species (none new; 2 indeterminate) from beds correlated with the upper Campanian.
- BELYAEVA, N. V., and SAIDOVA, KH. M. Relations between the benthic and planktonic Foraminifera in the uppermost layers of Pacific sediments (English translation).—*Oceanology, Akad. Nauk SSSR*, v. 5, No. 6, 1965 (English edition, Oct. 1966), p. 56-59, text figs. 1, 2 (map, graphs).—Percentages of benthonic (secreted or agglutinated kinds) and planktonic specimens at various depths and latitudes in the Pacific.
- BIELECKA, WANDA, and STYK, OLGA. The Malm microfauna in the southern part of the Peri-Baltic syncline (English summary of Polish text).—*Poland Instyt. Geol., Kwart. Geol.*, tom 10, no. 2, 1966, p. 350-366, pl. 1, text figs. 1-3 (geol. map, range charts for foraminifera and ostracodes).—Occurrences in bore-hole sections through Oxfordian, Kimmeridgian, and Portlandian beds are indicated for 72 species of Foraminifera. *Quinqueloculina jurassica* is new.
- BIELOKRYK, L. S. Dolomitized Foraminifera (English summary of Ukrainian text).—*Dopovidi Akad. Nauk Ukrain. RSR*, No. 11, 1966, p. 1467-1471, text figs. a, b (thin section photographs).—In Sarmatian dolomites.
- BIGNOT, G., and GUYADER, J. Découverte de Foraminifères planctoniques dans l'Oxfordien du Havre (Seine-Maritime).—*Revue de Micropaléontologie*, v. 9, No. 2, Sept. 1966, p. 104-110, pl. 1, text fig. 1 (graph).—Includes a résumé of other Jurassic records—Lithuania, Daghestan, Poland, Westphalia, Switzerland, Spain.
- BLACKMAN, ABNER, and SOMAYAJULU, B. L. K. Pacific Pleistocene cores: faunal analyses and geochronology.—*Science*, v. 154, No. 3750, Nov. 18, 1966, p. 886-889, text figs. 1-5 (map, graphs), tables 1, 2.—Dating of 2 cores off northern Chile that have been faunally analyzed as to warm and cold intervals, and comparison with 3 Atlantic cores similarly dated and analyzed, suggests that glacial and interglacial stages occurred simultaneously in the Pacific and Atlantic.

- BOLTOVSKOY, ESTEBAN. Datos nuevos con respecto a la ubicación de la zona de convergencia subtropical/subantártica en base al estudio de los Foraminíferos planctónicos.—*Anais Acad. Brasileira Ciencias*, v. 37, suple., Sept. 1965, p. 146-155.—In the western South Atlantic the zone of convergence of subtropical and subantarctic waters is recognizable by the species of planktonic Foraminifera each kind of water carries. No line of contact between the waters was observed, only a zone of mixture. Subtropical waters are found as far south as 37° 30' S in summer and as far north as 30° S in winter.
- Zonacion en las latitudes altas del Pacifico Sur segun los Foraminiferos planctonicos vivos.—*Rev. Museo Argentino Ciencias Nat. "Bernardino Rivadavia," Instit. Nac. Invest. Ciencias Nat., Hidrobiologia*, v. 2, No. 1, Oct. 1966, p. 1-56, pls. 1-4, maps 1-14, graphs 1-4, table 1.—Study based on 151 vertical tows or surface plankton samples taken between 90° and 160° W and 50° and 65° S. Ten species are found and their percentage distribution plotted on maps, defining 4 zones within the area: antarctic, mixed subantarctic/antarctic, subantarctic, and mixed subtropical/subantarctic. In typical Antarctic water only 2 species (or possibly only deep-floating and shallow-floating forms of *Globigerina pachyderma*) are found. The positions of 2 upwellings, recognized by deep-floating specimens of *G. pachyderma* together with benthonic specimens in surface waters, are plotted.
- Resultados oceanograficos sobre la base del estudio del plancton recogido durante la campaña "Cosetri 11."—*Bol. Serv. Hidrografia Naval*, v. 3, No. 2, 1966, p. 105-114, map, tables 1-3.—In a study based on 51 surface and vertical tows off Argentina, distinctions between coastal water, Malvin Current (cold from Antarctic), and mixed waters with subtropical predominant or with subantarctic predominant, are made from the planktonic Foraminifera each carries. Position of contact differs from top to bottom of the water column, so the coastal waters appear to overlap the Malvin Current, and the subtropical to overlap the subantarctic.
- BOLTOVSKOY, ESTEBAN, and LENA, HAYDEE. Foraminiferos Recientes de la zona litoral de Pernambuco (Brasil).—*Rev. Museo Argentino Ciencias Nat. "Bernardino Rivadavia," Instit. Nac. Invest. Ciencias Nat., Hidrobiologia*, v. 1, No. 8, May 1966, p. 269-367, pls. 1-10, map, text figs. 1-6 (pie diagrams, drawings).—Illustrated catalog of about 210 species (none new, 15 indeterminate); 47 found living when collected. Included are numerous formae. Described as new are 1 variety and 1 forma. The area belongs to the West Indian zoogeographical province, not to the Argentine epicontinental province.
- Contribucion al conocimiento de las Tecamebas de Ushuaia (Tierra del Fuego, Argentina).—*Neotropica*, v. 12, No. 38, 1966, p. 55-65, 1 pl.—Twelve species and 3 formae, none new.
- BOLTOVSKOY, E., and THEYER, F. Neuere Daten über rezente Foraminiferen Zentralchiles.—*Beiträge zur Neotropischen Fauna*, Stuttgart, Band 4, heft 3, 1965, p. 143-149, 1 pl., table 1.—Illustrations of 18 species from the continental shelf of central Chile.
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- BOSELLINI, A., and BROGLIO LORIGA, C. Gli "Strati a Triasina" nel gruppo di Sella (Dolomiti Occidentali).—*Mem. Geopaleont. Univ. Ferrara*, v. 1, fasc. 2, 1965, p. 159-180, pls. 1-4, text figs. 1-6 (photomicrographs, drawings).—Upper Triassic assemblage of 16 species (9 indeterminate), illustrated in thin section.
- BRÖNNIMANN, PAUL, and PAGE, CLAUDE. Sur quelques Foraminifères du Trias a l'W de Jaun (Canton de Fribourg, Suisse).—*Archives des Sciences*, v. 19, fasc. 1, Jan.-Apr. 1966, p. 83-91, pl. 1, text fig. 1 (map).—Three agglutinated species, one *Trochammina* new.
- BURCKLE, LLOYD H., and SAITO, TSUNEMASA. An Eocene dredge haul from the Tuamotu ridge.—*Deep-Sea Research*, v. 13, No. 6, Dec. 1966, p. 1207-1208.—Paleoecology and age of boulders in a dredge haul are interpreted by Foraminifera as upper Eocene (deep water facies) and lower middle Eocene (shallow water facies).
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- CARTER, A. N. Tertiary Foraminifera from Gippsland, Victoria, and their stratigraphical significance.—*Geol. Survey of Victoria, Mem. No. 23*, 1964, p. 1-154, pls. 1-17, text figs. 1-36 (maps, columnar sections, geol. section, range charts, correl. charts, drawings, graphs, phylogenetic diagram), tables 1-9.—The present study is based on 38 samples making up a composite standard sequence, covering 12 rock units of Oligocene to early Pliocene age. All but the lowest 3 (Eocene) units of 11 previously-defined faunal units are present at Gippsland. Descriptions and distribution of 102 species (18 new and 1 given a new name) from Gippsland are included and many are illustrated. For Victoria, a sequence of 10 foram zones is proposed: 3 in the Eocene, 2 in the Oligocene, and 5 in the Miocene, the sequence ending below the top of the Miocene.
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- CRESPIN, IRENE. Foraminifera in Cabawin No. 1 well.—*Australia Bureau Min. Resources, Geol., and Geophysics, Publ. No. 43*, 1964, p. 39-49.—Lists of lower Albian, Aptian, and Permian species.
- DERIN, B., and REISS, Z. Jurassic microfacies of Israel.—*Israel Instit. of Petrol., Spec. Publ.*, Oct. 1966, 43 p., 27 pls. (photomicrographs), tables 1, 2 (correl. table, columnar sections).—Three hundred and twenty thin-section illustrations with their organic remains identified.
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- photomicrograph, geol. section).—Includes an illustrated systematic catalog of nummulites, alveolines, and discocyclines (29 species, none new) by which the Cuisian section is subdivided.
- EICHER, DON L. Foraminifera from Belle Fourche Shale and equivalents, Wyoming and Montana.—*Jour. Paleontology*, v. 41, No. 1, Jan. 1967, p. 167-188, pls. 17-19, text figs. 1-6 (map, range charts, correl. charts).—Thirty-four species (1 new) and 1 subspecies.
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- GAWOR-BIEDOWA, EUGENIA. The Upper Cretaceous deposits in north east Poland in the light of micropaleontological researches (English summary of Polish text).—*Poland Instyt. Geol., Kwart. Geol., tom 10, No. 3*, 1966, p. 809-819, fig. 1 (occur. and abund. table).—Occurrence of 76 species of Foraminifera in sections of Cenomanian, Turonian, Campanian, Maestrichtian, and Dano-Paleocene age.
- GORBATCIK, T. N. The first discovery of the foraminiferal genus *Siphoninella* in the Valanginian of the Crimea (in Russian): *Paleont. Zhurnal*, No. 3, 1966, p. 133-135, 1 text-fig.—*S. antiqua*, sp. nov.
- GRIGELIS, A., and GARUNKSTIENE, S. New data on two genetic groups of Foraminifera of the Upper Cretaceous deposits of Lithuania (in Russian), in *Palaeontology and Stratigraphy of the Baltic and Byelorussia*, No. 1 (6).—*Ministry of Geol. of U.S.S.R., Vilnius*, 1966, p. 377-411, pls. 1-4, text figs. 1-10 (phylogenetic diagrams, drawings).—Five species (1 new), in the genetic group *Gavelinella ammonoides* extending from Cenomanian to Maestrichtian, and 6 species (1 new) in the genetic group *Reussella kelleri* extending from Turonian to Campanian.
- GRIGORJAN, S. M. Assiliny Paleogenovykh Otlozhenij Armjanskoj SSR i ikh Stratigraficheskoe Znachenie.—*Akad. Nauk Armjanskoj SSR, Izvestija*, tom 19, no. 5, 1966, p. 3-19, pls. 1-3.—Five species of *Assilina*, one having 2 new varieties.
- GROSS, J. TH. Das Problem der Malm Alpha/Beta-Grenze in mikropaläontologischer Sicht.—*Erlanger geol. Abh., Heft 62*, Dec. 5, 1966, p. 92-104, text figs. 17-22 (graphs), tables 4, 5.—Boundary identified by Foraminifera in 17 profiles.
- GROZDILOVA, L. P. Foraminifery Verkhnego Karbona Severnogo Timana, in *Mikrofauna SSSR, Sbornik 14*.—*Russia Vses. neft. nauchno-issl. geol.-razved. instit., Trudy (n. ser.), vyp. 250*, 1966, p. 254-331, pls. 1-15, tables 1, 2.—Descriptions and illustrations of 56 fusulinids, 47 species and 1 forma new, from the Upper Carboniferous.
- GUDINA, V. I. Foraminifery i Stratigrafija Chetvertichnykh Otlozhenij Severo-Zapada Sibiri.—*Akad. Nauk SSSR, Sibirskoe Otdel., Institut Geol. Geofiz.*, 1966, 132 p., 13 pls., 27 text figs. (map, drawings, well correl. diagrams, graphs, paleogeographic maps), 6 tables.—Detailed study of Quaternary in numerous shallow well sections near Obskaya Guba in northwestern Siberia. Systematic section on Foraminifera includes 31 species (9 new) and 2 subspecies (1 new). *Planocassidulina* gen. nov. (type species *Cassidulina norcrossi* Cushman) is erected.

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- Fortschritte der Mikropaläontologie in Deutschland mit einer Bibliographie für das Jahr 1965.—*Paläont. Zeitschr.*, Stuttgart, Band 40, Nr. 3/4, Oct. 1966, p. 277-294.
- VAN HINTE, J. E. Some Foraminifera and correlation of the type Campanian.—*Proc. Second West African Micropaleont. Colloquium*, Ibadan, June 18-July 1, 1965, Leiden, 1966, p. 86-91, text figs. 1, 2 (zone chart, graph).—By planktonics.
- HOFKER, J. Foraminifera of the Cretaceous of South-Limburg, Netherlands. LXXX. Polymorphinidae from the holes in the hard ground covering the Md in the quarry Curfs near Houthem, South-Limburg.—*Natuurhist. Maandblad*, 54° Jrg., No. 9, Sept. 29, 1965, p. 111-117, text figs. 1-32.—Illustrations of 23 species mostly from the Paleocene.
- LXXXI. *Coleites reticulosus* (Plummer).—*Natuurhist. Maandblad*, 54° Jrg., No. 10, Oct. 27, 1965, p. 136-138, text figs. 1-7.
- LXXXII. Once again *Linderina visserae* Hofker.—*Natuurhist. Maandblad*, 55° Jrg., No. 1, Jan. 26, 1966, p. 13-15, text figs. 1, 2.
- LXXXIII. *Tremastegina roestae* (Visser).—*Natuurhist. Maandblad*, 55° Jrg., No. 2, Feb. 25, 1966, p. 24-26, text figs. 1-9.—In the Upper Cretaceous, High Md.
- LXXXIV. The structure of *Karrereria fallax* Rzehak.—*Natuurhist. Maandblad*, 55° Jrg., No. 4, April 27, 1966, p. 58-60, 1 pl.—Specimens from the type locality and from Denmark and Holland are compared as to agglutination and secondary thickening by addition of chalky or clear calcitic material to chamber walls.
- Maestrichtian, Danian and Paleocene Foraminifera. The Foraminifera of the type-Maestrichtian in South Limburg, Netherlands, together with the Foraminifera of the underlying Gulpen Chalk and the overlying calcareous sediments; the Foraminifera of the Danske Kalk and the overlying greensands and clays as found in Denmark.—*Palaeontographica*, Suppl.-Band 10, Sept. 1966, p. 1-376, pls. 1-86, text figs. 1-178 (diagrams, maps, columnar sections, drawings, outcrop sketches, graphs), tables 1-69 (check lists).—A compilation of faunal lists, illustrations, and some brief species descriptions from 17 zones in Holland (5 in the Gulpen Chalk of late Campanian and Maestrichtian age; 7 in the Maestricht Tuff Chalk of Dano-Maestrichtian age; 4 in the Paleocene; and 1 in the Kunrade Chalk probably of Paleocene age) and also from the Danske Kalk and beds at the Danian-Paleocene boundary in Denmark. Species characteristic of each zone are listed and check lists are included for numerous localities. Over 900 species are involved; 21 are described as new and *Vacuovalvulina* nov. gen. (genotype *Marssonella keyzeri* van Bellen) is erected in the Valvulinidae.
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- KENNETT, J. P. Biostratigraphy and paleoecology in upper Miocene-lower Pliocene sections in Wairarapa and southern Hawke's Bay.—Trans. Roy. Soc. New Zealand, Geol., v. 4, No. 3, June 30, 1966, p. 83-102, text figs. 1-12 (maps, columnar sections), tables 1-5 (range chart, correl. charts).—Zonation of the deep-water facies by Foraminifera and the shallow-water facies by Mollusca.
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- Russian text).—Mezhvedom. Respublik. Nauchn. Sbornik, Paleont. Sbornik No. 2, vyp. 2, Izdatel. L'vov. Universit., 1965, p. 16-23, pls. 1, 2.—Three species and 3 subspecies, all new.
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- MCCRONE, ALISTAIR W., and SCHAFER, CHARLES. Geochemical and sedimentary environments of Foraminifera in the Hudson River estuary, New York.—Micropaleontology, v. 12, No. 4, Oct. 1966, p. 505-509, text figs. 1, 2 (loc. map, salinity diagram), tables 1-4.—Only *Miliammina* and *Ammomarginulina* survive at 5‰, but chitinous specimens of *Ammonia* and *Trochammina* occur in low salinities.
- MCGOWRAN, BRIAN. Bilamellar walls and septal flaps in the Robertinacea.—Micropaleontology, v. 12, No. 4, Oct. 1966, p. 477-488, pls. 1-4.—Demonstrated by thin-section photographs.
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- MERIC, ENGIN. A propos de la reproduction des Orbitoididae (Deuxième partie).—Bull. Min. Res. Explor. Instit. Turkey, No. 66, April 1966, Foreign Ed., p. 147-153, pls. 1-3, text fig. 1 (map), 1 table.—Comparisons between 3 species.
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- 1.—Six species and 4 subspecies in the genera *Frondicularia*, *Citharina*, *Neoflabellina*, and *Palmula*, having narrow stratigraphic ranges.
- NORLING, ERIK. On the genus *Ichtyolaria* Wedekind 1937.—Sver. Geol. Unders., ser. C, Nr. 613, Arsbok 60, Nr. 8, 1966, p. 1-20, pls. 1-4, text fig. 1 (map).—Four Liassic species from southern Sweden, none new, and a new diagnosis of this Permian to Jurassic genus (type species *Frondicularia bicostata* d'Orbigny).
- ODRZYWOLSKA-BIENKOWA, EWA. Micropalaeontological stratigraphy of the Miocene in the north-eastern margin of the Carpathian fore-deep (English summary of Polish text).—Poland Instyt. Geol., Kwart. Geol., tom 10, no. 2, 1966, p. 432-441, text figs. 1, 2 (map, correl. diagram), tables 1, 2.—Upper Tortonian and Sarmatian Foraminifera.
- OMARA, SAYED, VANGEROW, ERNST FRIEDRICH, and KENAWY, ABBAS. Neue Fund von Foraminiferen im Oberkarbon von Abu Darag, Ägypten.—Paläont. Zeitschr., Stuttgart, Band 40, Nr. 3/4, Oct. 1966, p. 244-256, pl. 24, text figs. 1, 2 (map, columnar section).—Eighteen species and 1 new subspecies.
- D'ONOFRIO, SARA. I Foraminiferi del neostatotipo del Messiniano.—Ann. Mus. Geol. Bologna, ser. 2, v. 32, fasc. 2, 1964, p. 409-461, pls. 55-59 (assemblages), text fig. 1 (columnar sections), table 1 (occur. table).—Includes a micropaleontologic appendix (100 species) and photomicrographs of assemblages typical of Tortonian, Messinian, and lower Pliocene.
- PHLEGER, FRED B. Patterns of living marsh Foraminifera in south Texas coastal lagoons.—Bol. Soc. Geol. Mexicana, tomo 28, No. 1, 1965, p. 1-44, text figs. 1-22 (maps, range chart, histogram), tables 1-10.—Quantitative analyses of specimens are recorded and distribution patterns studied in 10 areas of marine marsh; 26 species, plus 11 rare ones, are involved. Five zones are recognizable by their distinctive assemblages. Living populations range from 2 to 20 species per sample; fewer in the marsh than in the bay and mud flat areas.
- Living Foraminifera from coastal marsh southwestern Florida.—Bol. Soc. Geol. Mexicana, tomo 28, No. 1, 1965, p. 45-59, pl. 1, text figs. 1-3c (maps), table 1.—In mangrove bay areas calcareous Foraminifera are dominant over arenaceous ones. *Miliammina fusca* is rare and is found in only a few samples. Twenty-nine species are recorded quantitatively from 25 samples.
- PHLEGER, FRED B., and BRADSHAW, JOHN S. Sedimentary environments in a marine marsh.—Science, v. 154, No. 3756, Dec. 23, 1966, p. 1551-1553, text figs. 1-3 (range chart, graphs).—Continuous recordings in Mission Bay, California, show diurnal and seasonal variations related to tidal flushing, air temperature variations, sunlight duration, and marsh plant metabolism.
- PISCHVANOV, L. S. On the correlation of the Miocene of the western districts of USSR and Italy by means of planctonic Foraminifera (English summary of Russian text).—Mezhvedom. Respublik. Nauchn. Sbornik, Paleont. Sbornik No. 2, vyp. 2, Izdatel. L'vov. Universit., 1965, p. 8-15, 2 pls., tables 1, 2.—In addition, 2 new benthonic species are described.
- POAG, C. W. Paynes Hanimock (Lower Miocene?) Foraminifera of Alabama and Mississippi.—Micropaleontology, v. 12, No. 4, Oct. 1966, p. 393-440, pls. 1-9, text-figs. 1-12 (loc. map, columnar sections, tables, check list, graphs, line drawing).—Illustrated systematic catalog includes 138 species, 32 new and 14 indeterminate. *Arcanispira* (type species *A. bacata* n. sp.) is erected in the family Rotaliidae. The formation is correlated with planktonic zones of the Ciperio Formation of Trinidad.
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- POROSHINA, L. A. Novye Predstaviteli *Discorbis* Neokomskikh Otlozhenij Severo-Vostochnogo Azerbajdzhana.—Izvestija Akad. Nauk Azerbajdzhan. SSR, ser. nauk o zemle, no. 3, 1966, p. 8-14, 1 pl.—Five species and a subspecies, all new, from the Neocomian.
- PORTNAJA, V. L. New data in structure and distribution of *Discocyclina* shell and methods of study (in Russian).—Biul. Moskovskogo Obshch. Ispytat. Prirody, nov. ser., tom 71, Otdel. Geol., tom 41, vyp. 4, 1966, p. 129-137, text figs. 1-8.
- PTUKHJAN, A. E. Materialy k Stratigrafii Srednego Eothena Armenii.—Akad. Nauk Armjanskoj. SSR, Izvestija, tom 19, no. 5, 1966, p. 26-37, pls. 1, 2.—Four species of *Nummulites* from middle Eocene of Armenia.

- RAU, WELDON W. Stratigraphy and Foraminifera of the Satsop River area, southern Olympic Peninsula, Washington.—Washington Div. Mines and Geol., Bull. No. 53, 1966, p. 1-66, text figs. 1-9 (map, geol. map, columnar sections, check lists, range chart), tables 1, 2.—In 13,000 feet of section, ranging from Ulatian (middle Eocene) through Narizian, Refugian, and Zemorrian to Saucian (lower Miocene), 170 species of Foraminifera are recorded as to their ranges and occurrences in 4 measured sections.
- REISS, Z., and GVIRTZMAN, G. Subsurface Neogene stratigraphy of Israel.—Internat. Union Geol. Sci., Proc. Third Sess. in Berne 8-13 June 1964, Leiden, 1966, p. 312-346, pls. 88-99, text figs. 83-87 (isopach map, range chart, paleogeographic map, geol. section, diagram).—Includes illustrations of planktonic species used in age determinations between late Eocene and Pliocene in Israel.
- ROCHA, A. TAVARES, and UBALDO, M. LOURDES. Foraminiferos do Terciário Superior e do Quaternário da Província Portuguesa de Timor.—Mem. Portugal Junta Invest. Ultramar, 2nd ser., No. 51, 1964, p. 1-180, pls. 1-19, text figs. 1-3 (geol. map, pie diagrams), tables 1-3 (range chart, check lists).—Illustrated systematic catalog includes 247 species, varieties, and formae, none new—203 from late Tertiary beds of medium-depth facies and 48 from Quaternary beds of shallow, coral-reef facies, from the eastern part of the island of Timor.
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- TOCORJESCU, MARIA. Studiul micropaleontologic al depozitelor succesiunii Cretacic Superior-Paleogen de pe Valea Mitonii-Reg. Laicai.—Assoc. Géol. Carpat-Balkanique, Vème Congrès, 4-19 Sept. 1961, Bucarest, Communications Sci., IIème Sec.: Stratigraphie, 1963, p. 257-293, text figs. 1-5, tables 1-3, range chart.—Ranges between lower Turonian and Lutetian shown for 44 planktonic species; the interval being subdivided into 12 zones.
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- VERVLOET, C. C. Stratigraphical and micropaleontological data on the Tertiary of southern Piedmont (northern Italy).—Schotanus & Jens N.V., Utrecht, March 1966, p. 1-88, pls. 1-12, text figs. 1-6 (map, geol. section, correl. chart, biostratigraphic chart, graphs, measurement table), tables 1-11 (columnar sections, distrib. and abund. tables, correl. diagram), maps 1-5.—In 5 geologic sections studied, a composite sequence of 10 planktonic zones between upper Eocene and upper Miocene (Messinian) are recognized. In the lower part of the sequence, zonation by larger Foraminifera is based on associations and on lineages.
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- WADDELL, DWIGHT E. Pennsylvanian fusulinids in the Ardmore Basin, Love and Carter counties, Oklahoma.—Oklahoma Geol. Survey Bull. 113, 1966, 128 p., 13 pls. (thin section photographs, columnar section), 11 text figs. (map, correl. chart, range chart, columnar section, drawings, diagram), 8 tables.—Seventeen species (4 new) and 7 fusulinid biozones.
- WEBB, PETER NOEL. New Zealand Late Cretaceous Foraminifera and Stratigraphy.—Schotanus & Jens N.V., Utrecht, 1966, p. 1-18, text figs. 1-4 (correl. chart, maps, zonal diagram).—Proposing 2 arenaceous assemblage zones (fa-

cies controlled) and 1 planktonic zone (correlated with Maestrichtian).

WEZEL, FORESE CARLO. Descrizione neotipica di Foraminiferi delle argille subetnee illustrati da Seguenza: introduzione metodologica e studio di *Bolivina (Bolivina) alata*.—Geol. Romana, v. 5, 1966, p. 215-248, pls. 1, 2, text figs. 1-8 (graphs, drawings), tables 1-6.—Because the Seguenza 1862 types are dispersed, neotypes need to be established. *Bolivina alata* illustrates a proposed new method of establishment of neotypes. Using biometric methods a

median type is selected, with lateral types showing differences in all directions.

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