

TYPE SPECIES OF PSEUDOFUSULINA DUNBAR & SKINNER

JOHN W. SKINNER and GARNER L. WILDE

Humble Oil & Refining Company, Midland, Texas

ABSTRACT

A restudy of the type specimens of *Pseudofusulina huecoensis* DUNBAR & SKINNER, the type species of the genus *Pseudofusulina* DUNBAR & SKINNER, shows that all of these specimens display the characters considered diagnostic of *Rugosofusulina* RAUSER-CHERNOUSOVA. Because *Pseudofusulina* has a priority of some six years over *Rugosofusulina*, the latter must be regarded as a junior synonym.

The history of fusulinid nomenclature is a tangled one, indeed, replete with errors most of which were based on misunderstandings or unjustifiable assumptions. In this paper we propose to review this sequence of errors and the efforts that have been made to correct them.

FISCHER DE WALDHEIM (1829, 6) proposed the generic name *Fusulina* for some Foraminifera which he had found in the "Mountain limestone" of Moscovian (Middle Pennsylvanian) age in a quarry at Myachkova, Russia. In 1837 (7), he briefly described, without illustrations, two species of *Fusulina*, *F. cylindrica* and *F. depressa*, in that order. For the next forty years nearly all fusulinids were indiscriminately assigned to *Fusulina*, regardless of age or morphological characters.

In 1842 EHRENBERG (4) published a brief description, without illustrations, of a highly inflated fusulinid which he had found in a piece of chert collected by HELMERSON from Pinega Valley, near Archangel, Russia. Apparently EHRENBERG did not associate his specimens with FISCHER's genus, but assigned them to the Tertiary genus *Borelis* under the name *B. princeps*. In 1854 (5) he published, without text, illustrations of *B. princeps* and an associated more fusiform fusu-

linid which he named *Alveolina montipara*. The illustrations consisted of a drawing of one end of a piece of chert, and several drawings, at a magnification of four diameters, of individual specimens exposed on the weathered or broken surfaces. A third species from the same area was described briefly in 1842 (4) and illustrated in 1854 (5) as *Alveolina prisca*.

VALERIAN VON MÖLLER (1877, 10) published a study of Russian fusulinids in which he redefined *Fusulina* and proposed three new genera, *Schwagerina*, *Fusulinella*, and *Hemifusulina*. In his diagnosis of *Fusulina* he stated that it has more or less strongly fluted septa and a porous spirotheca. The wall structure which VON MÖLLER described as "porous" is the type which is now commonly called alveolar or schwagerinid. In *Fusulina* VON MÖLLER placed all slender or sub-cylindrical fusulinid species with strongly fluted septa, while the new genus *Schwagerina* was proposed for the globular and thickly fusiform types. Although no species of *Schwagerina* was described in his 1877 paper (10), he designated *Borelis princeps* EHRENBERG as the typical species. According to VON MÖLLER, *Schwagerina* displayed the same type of wall structure as that which he

scribed to *Fusulina*. *Fusulinella* was erected for species having a different kind of wall structure and nearly plane septa. In this genus the wall included a clear, translucent layer which VON MÖLLER thought to be a void space and which he called the "ZWISCHENRAUM." This is the diaphanotheca of modern terminology.

The following year VON MÖLLER (11) published a second paper in which he described and illustrated specimens from the Timan Plateau as *Schwagerina princeps* (EHRENBERG). These illustrations showed a nearly globular fusulinid with tightly coiled inner whorls and abruptly inflated, loosely coiled outer whorls. In the same paper he published drawings of topotypes of *Fusulina cylindrica* which showed many fine lines crossing the spirotheca in a direction normal to its surface.

Following VON MÖLLER's work, *Fusulina* was generally assumed to have an alveolar wall, and when subcylindrical species possessing fluted septa and such a wall were found in the Permian they were assigned to that genus. Similarly, the accepted concept of *Schwagerina princeps*, and of the genus *Schwagerina*, was based on VON MÖLLER's illustrations. Thus, all forms with a tightly coiled juvenarium followed by an abruptly inflated adult stage were assigned to *Schwagerina*. Some of these species, like VON MÖLLER's illustrated specimens, had nearly plane septa, whereas others possessed strongly fluted septa.

GIRTY (1904, 8) proposed the genus *Triticites*, with *Miliolites secalicus* SAY as the type species, for a group of forms which differed from the common concept of *Fusulina* in having nearly plane septa. It possessed an alveolar spirotheca as *Fusulina* was believed to do.

HANS VON STAFF (1909, 14), working with material from North America, proposed the genus *Girtyina* for species having fluted septa, as in *Fusulina*, but a fusulinellid-type wall. However, he designated *Fusulina ventricosa* MEEK & HAY-

DEN as the type species, a species that belongs in *Triticites*. It is now evident that VON STAFF's specimens had been mislabelled and did not actually belong in *F. ventricosa*. In any event, *Girtyina* is a junior synonym of *Triticites*.

J. S. LEE (1927, 9) reported that he had studied topotype specimens of *Fusulina cylindrica* and had found them to have a fusulinellid wall. He pointed out that this was exactly the sort of thing for which VON STAFF had proposed the name *Girtyina*. Accordingly, he suggested resurrecting *Girtyina* as a subgenus of *Fusulina* to include *F. cylindrica* and similar species. This, of course, is contrary to the International Rules of Zoological Nomenclature which require that if a genus be divided into subgenera, the name of the typical subgenus must be the same as the name of the genus. Thus, so long as the genus *Fusulina* is in good standing, no other name can be used in either a generic or subgeneric sense for *F. cylindrica*.

In 1930 DUNBAR & HENBEST (1), working with topotypes of *Fusulina cylindrica* in the collections of Yale Peabody Museum, were able to confirm LEE's observations. VON MÖLLER's misconception as to the spirothecal structure of that species probably stemmed from two sources. First, because of the peculiar preservation the very fine tubes of the mural pores, which ordinarily are not evident, can be seen crossing the wall. VON MÖLLER apparently confused these with the much coarser alveoli of the schwagerinid wall. Furthermore, because the secondary deposit of the inner tectorium is very weakly developed in *F. cylindrica*, the diaphanotheca is not so obvious as it is in many species having a fusulinellid wall. Second, the upper part of the quarry wall at Myachkova is composed of younger limestones containing fusulinids which do have a schwagerinid spirotheca. VON MÖLLER probably thought the differences were merely a matter of relative coarseness of texture.

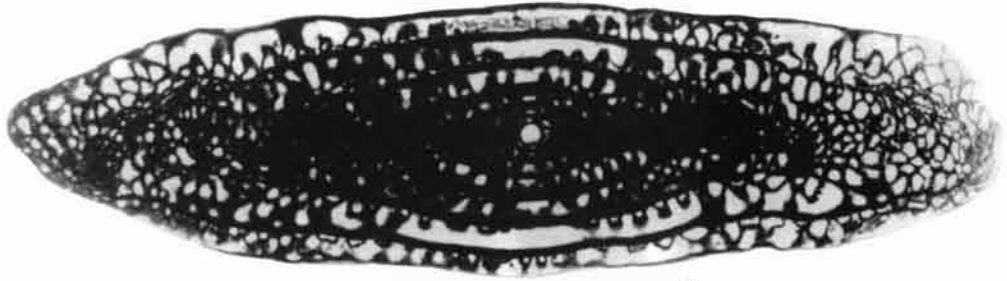
EXPLANATION OF PLATE I

All figures are unretouched photographs.

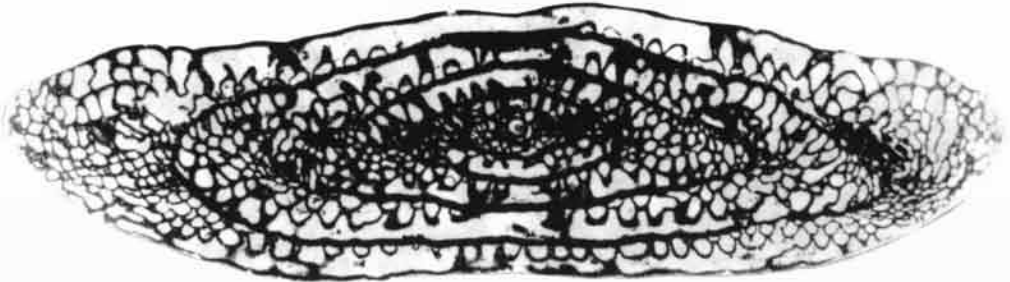
FIGURES

1-6. *Pseudofusulina hucoensis* DUNBAR & SKINNER.—
1. Axial section of holotype, X10 (Y.P.M. 9919F).—2-4. Axial sections of paratypes, X10 (Y.P.M. 15086A, 24855, 15085).—5, 6. Sagittal sections of paratypes, X10 (Y.P.M. 9919E,

15086). All from R. E. King's coll. 395 (Dunbar & Skinner loc. 74), Hueco Limestone, Lower Permian, about 2 miles southeast of Hueco Tanks on the west slope of hill 5345, Hueco Mountains, El Paso County, Texas.



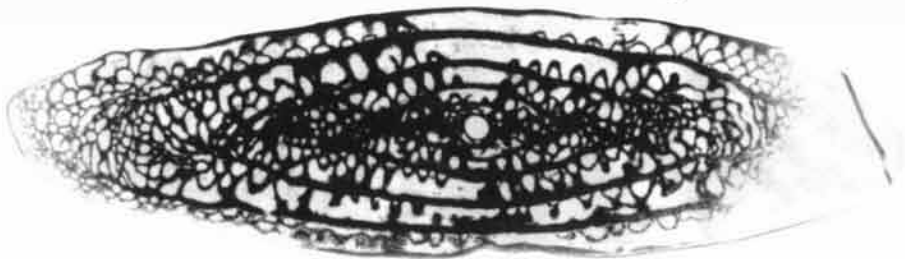
1



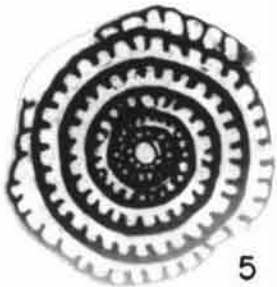
2



3



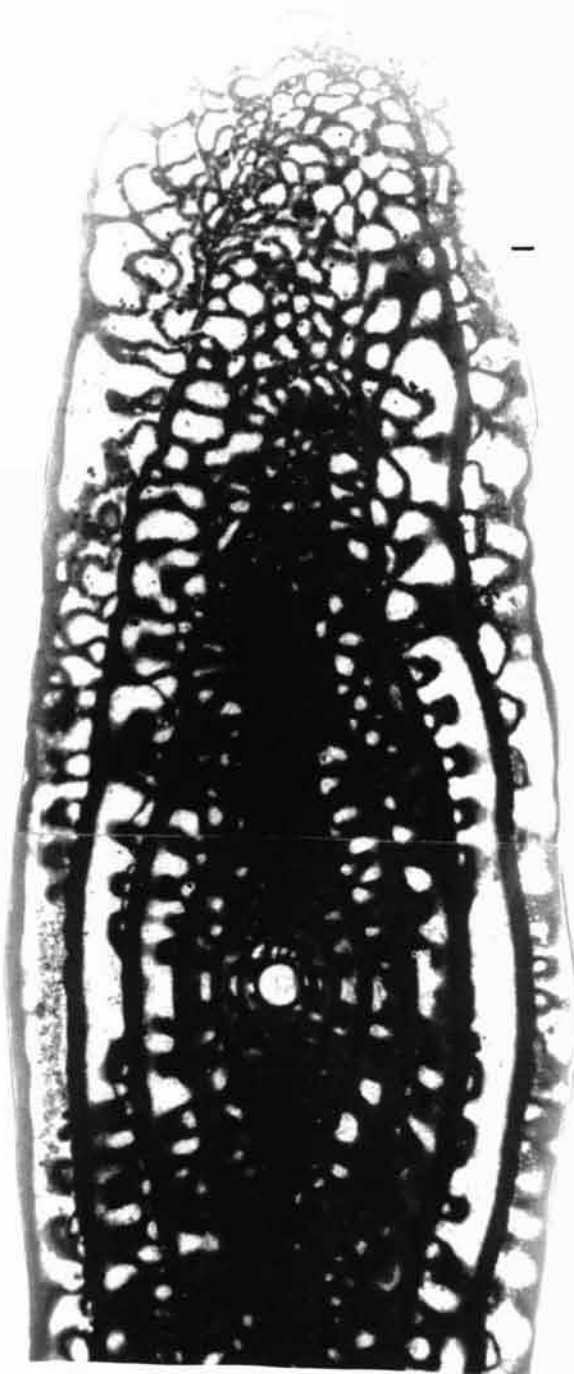
4



5



6



3

2



This discovery left the elongate Permian fusulinids, which have strongly fluted septa and an alveolar wall, without a valid name. In 1931 DUNBAR & SKINNER (2), who had been studying the Permian fusulinids of West Texas, proposed three new generic names for this group. For the oldest and comparatively simple forms they erected the genus *Pseudofusulina*, with *P. huecoensis* as the type species. They proposed the generic name *Parafusulina*, with *P. wordensis* as the type species, for a more advanced type in which the fluting of the septa was carried to the point at which the toes of the folds of adjacent septa were fused together. A small opening was then resorbed at each of these junctions, resulting in a series of low passages, called cuniculi, running around the shell in an equatorial direction. The most advanced type possessed auxiliary tunnels, in addition to cuniculi, and for this group they proposed the name *Polydiexodina*.

In 1936 DUNBAR & SKINNER (3), through the good offices of Dr. O. H. SCHINDEWOLF and the kindness of Dr. W. O. DIETRICH, were entrusted with the piece of chert containing the type specimens of *Borelis princeps* EHRENBURG and *Alveolina montipara* EHRENBURG. They discovered that these species are quite different from the specimens described and illustrated by VON MÖLLER under the names *Schwagerina princeps* (EHRENBURG) and *Fusulina montipara* (EHRENBURG), respectively. In fact, both species appeared to possess essentially the same characters as the group for which they had proposed the name *Pseudofusulina*. Therefore, they redefined *Schwagerina* in accordance with its type species and suppressed *Pseudofusulina* as a synonym. This procedure left the forms which had previously been called *Schwagerina* without a valid name. Accordingly, they proposed the name *Pseudoschwagerina* for those members of the group having nearly plane septa and a tightly coiled juvenarium followed by an abruptly inflated adult stage. For species having a similar

mode of coiling but strongly fluted septa they erected the new genus *Paraschwagerina*. This action was questioned by several fusulinid specialists, and the matter was submitted to the International Commission on Zoological Nomenclature for settlement. In 1954 the Commission, in Opinion 213, fixed the type species of *Schwagerina* as *Borelis princeps* EHRENBURG, 1842, (not *Schwagerina princeps* VON MÖLLER, 1878, = *S. moelleri* RAUSER-CHERNOUSSOVA, 1936).

RAUSER-CHERNOUSSOVA (1937, 12) proposed the new generic name *Rugosofusulina* to embrace species which differ from *Schwagerina* principally in possessing a "rugose" spirotheca. Other characters include strong but irregular septal fluting and the common presence of phrenothecae and abundant conspicuous septal pores. She recognized two general types of "rugosity." The first, which she regarded as more primitive, consists of "sharply expressed undulations of the whole wall," while the second consists of "rugosity of its surface due to the rugose structure of the tectum—the outside layer of the theca." A third type is observed in some species where the first two are combined. DUNBAR (1948) pointed out that the wall is not actually rugose, saying, "Since the wall appears to undulate, regardless of the orientation of the section, it is evident that the inequalities are of the nature of dimples and mounds rather than rugae." It would be more accurate to state that the outer surface is scored by numerous sharp furrows which are directed both axially and sagittally, resulting in a surface which resembles a miniature cobblestone pavement.

It should be pointed out that there has always been some uncertainty as to the validity of *Rugosofusulina*. In erecting the genus, RAUSER-CHERNOUSSOVA designated "*Fusulina prisca* EHRENBURG em. MÖLLER" as the "genoholotype" of *Rugosofusulina*. Since there is no evidence that VON MÖLLER ever saw EHRENBURG's specimens, and since EHRENBURG published only very crude small-scale drawings of the exterior of his

EXPLANATION OF PLATE 2

All figures are unretouched photographs.

FIGURES

1-3. *Pseudofusulina huecoensis* DUNBAR & SKINNER.—
1. Axial section of holotype, X20 (Y.P.M. 9919F).—2, 3. Parts of same specimen, X40, showing "rugosity" of spirotheca. From R. E.

King's coll. 395 (Dunbar & Skinner loc. 74), Hueco Limestone, Lower Permian, about 2 miles southeast of Hueco Tanks on the west slope of hill 5345, Hueco Mountains, El Paso County, Texas.

species, it seems quite possible that VON MÖLLER'S "emendation" may actually have been a misidentification. This possibility is strengthened by the fact that VON MÖLLER is known to have misidentified his own specimens with the other two of EHRENBURG'S three species. RAUSER-CHERNOUSOVA'S concept of *Alveolina prisca* EHRENBURG is obviously based on the published drawings of a form, showing "rugosity," which VON MÖLLER identified, correctly or not, with EHRENBURG'S species. EHRENBURG'S specimens are apparently now lost, and it seems improbable that their true nature will ever be learned.

In subsequent years a number of fusulinid specialists have concluded that the type species of *Pseudofusulina*, *P. huecoensis*, is not congeneric with *Schwagerina princeps* (EHRENBURG). Therefore, they resurrected *Pseudofusulina* for some of the species which other students now include in *Schwagerina*.

About ten years ago, while studying numerous topotypes of *Pseudofusulina huecoensis*, we observed that, without exception, they exhibited a certain amount of "rugosity" of the spirotheca as well as the other features which characterize *Rugosofusulina*. The degree of "rugosity" is highly variable from one specimen to another, but it is always present to some extent and both types cited by RAUSER-CHERNOUSOVA are represented. We wrote to Dr. CARL O. DUNBAR asking him to check the type specimens for the presence of this character. He replied that it appeared to be present and sent us the specimens for study. When DUNBAR & SKINNER described the species in 1931, no holotype was designated. However, THOMPSON (1948, 15) later designated the specimen shown in figure 5 of plate 1 of the 1931 paper as the holotype. This specimen, an axial section, is abnormally thick, and although a slight degree of "rugosity" is visible under the microscope it is very difficult to obtain adequate photographs. Consequently, when we published our findings in 1965 (13), reviving *Pseudofusulina* and suppressing *Rugosofusulina* as a synonym, we chose one of the paratypes to illustrate the characters of *P. huecoensis*.

Several months later, Dr. FRANZ KAHLER, of Klagenfurt, Austria, pointed out (personal com-

munication) that in order to establish this relationship firmly it is absolutely necessary to demonstrate that these characters are present in the holotype of *Pseudofusulina huecoensis*. Through the good offices of Dr. DUNBAR and the kindness of Dr. KARL M. WAAGE, presently Curator of Invertebrate Paleontology at Yale Peabody Museum, we have been entrusted with the type specimens of *P. huecoensis* for further study.

Although, as mentioned above, the holotype is an abnormally thick axial section, we have succeeded in obtaining photographs which demonstrate the presence of sporadic "rugosity" in this specimen (Pl. 2, figs. 2, 3). In addition, it displays the other characters ascribed to *Rugosofusulina* such as strong but irregular septal fluting, phrenothecae, and abundant conspicuous septal pores (Pl. 2, fig. 1). Admittedly, this specimen (Y.P.M. 9919F) does not exhibit these features so well as some of the other specimens in the collection, but they are definitely present.

One of the paratypes (Y.P.M. 15086A) shows all these characters unusually well. We are figuring it here as Plate 1, figure 2, Plate 3, figures 1-3, and Plate 4, figures 1, 2. This is the specimen illustrated in our 1965 (13) paper, which, incidentally, was the first time this section had ever been figured in a publication.

Another paratype (Y.P.M. 24855) also displays spirothecal "rugosity" very well, and we are showing it here as Plate 1, figure 3 and Plate 4, figure 3. This specimen has not previously been figured in any publication.

Although it is true that some specimens of *Schwagerina* may exhibit a varying degree of undulation of the spirotheca, this irregularity is not accompanied by sharp indentations of the tectum as in *Pseudofusulina*. Consequently, there is usually little difficulty in distinguishing between members of the two genera.

In summary, we believe that the accompanying photographs definitely establish that *Pseudofusulina huecoensis* possesses all the generic characters ascribed to *Rugosofusulina* and that the latter, therefore, should be suppressed as a junior synonym of the former.

REFERENCES

- (1) DUNBAR, C. O., & HENBEST, L. G., 1930, *The fusulinid genera Fusulina, Fusulinella, and Wedekindella*: Am. Jour. Sci., ser. 5, v. 20, p. 357-364.
- (2) ———, & SKINNER, J. W., 1931, *New fusulinid genera from the Permian of West Texas*: Am. Jour. Sci., ser. 5, v. 22, p. 252-268, pl. 1-3.
- (3) ———, & ———, 1936, *Schwagerina versus Pseudoschwagerina and Paraschwagerina*: Jour. Paleontology, v. 10, p. 83-91, pl. 10, 11.
- (4) EHRENBERG, C. G., 1842 (Discussion without title): *Berichte Verhandl. Kais. Preuss. Akad. Wiss.*, Berlin, p. 273-275.
- (5) ———, 1854 (Figures): *Mikrogeologie*, pl. 37, X, C, 1-6.
- (6) FISCHER DE WALDHEIM, G., 1829, *Sur les céphalopodes fossiles de Moscou et de ses environs, en montrant des objets en nature*: Soc. Imp. Nat. Moscou, Bull. 1, p. 330, 331 (Introduction of the name *Fusulina*).
- (7) ———, 1837, *Oryctographie du Gouvernement de Moscou*: p. 126, 127, pl. 13.
- (8) GIRTY, G. H., 1904, *Triticites, a new genus of Carboniferous Foraminifera*: Am. Jour. Sci., ser. 4, v. 17, p. 234-240, fig. 1-5.
- (9) LEE, J. S., 1927, *Fusulinidae of North China*: China Geol. Survey, Palaeont. Sinica, ser. B, v. 4, pt. 1, p. 1-173, pl. 1-24.
- (10) MÖLLER, V. VON, 1877, *Ueber Fusulinen und ähnliche Foraminiferen-Formen des russischen Kohlenkalks*: Neues Jahrb. Mineral., Geol., & Palaont., Jahrg. 1877, p. 138-146, 1 fig.
- (11) ———, 1878, *Die spiral-gewundenen Foraminiferen des russischen Kohlenkalks*: Acad. Imp. Sci., St. Pétersburg, Mém., ser. 7, v. 25, no. 9, p. 1-147, pl. 1-15.
- (12) RAUSER-CHERNOUSOVA, D. M., 1937, *Rugosofusulina, a new genus of fusulinids*: Moscow Univ., U.S.S.R., Studies in Micropal., v. 1, fasc. 1, p. 9-26, pl. 1-3.
- (13) SKINNER, J. W., & WILDE, G. L., 1965, *Permian biostratigraphy and fusulinid faunas of the Shasta Lake Area, northern California*: Univ. Kansas Paleont. Contrib., Protozoa, art. 6, p. 1-98, pl. 1-65, fig. 1-3.
- (14) STAFF, H. VON, 1909, *Beiträge zur Kenntnis der Fusuliniden*: Neues Jahrb. Mineral., Geol., & Paläont., Beilage-Band 27, p. 461-508, fig. 1-16.
- (15) THOMPSON, M. L., 1948, *Studies of American fusulinids*: Univ. Kansas Paleont. Contrib., Protozoa, art. 1, p. 1-184, pl. 1-38.

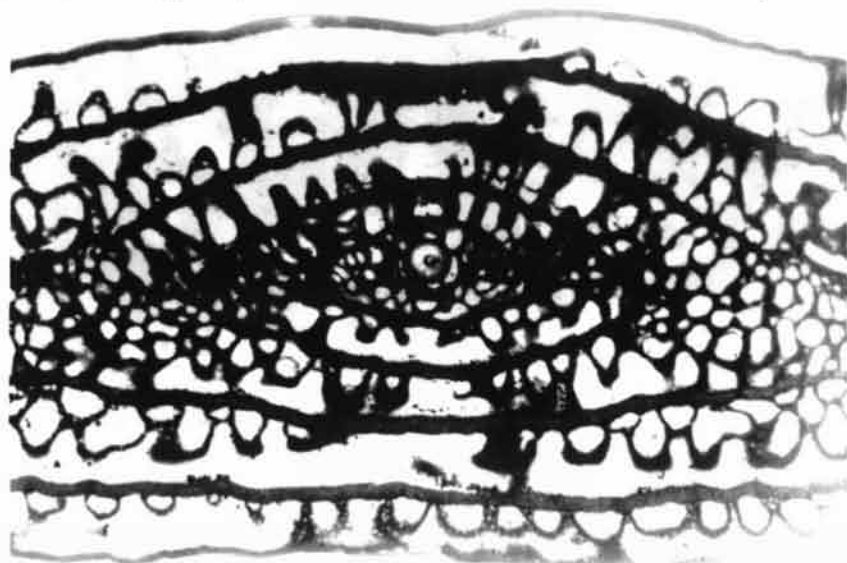
EXPLANATION OF PLATE 3

All figures are unretouched photographs.

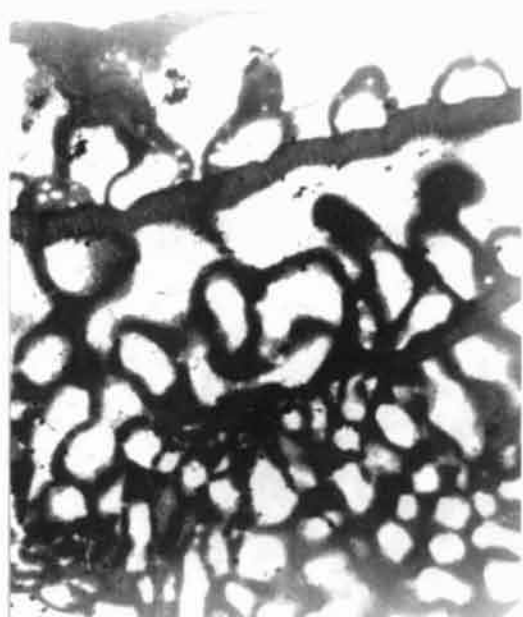
FIGURES

1-3. *Pseudojussulina huacoensis* DUNBAR & SKINNER.—
1. Part of specimen shown in Plate 1, figure 2,

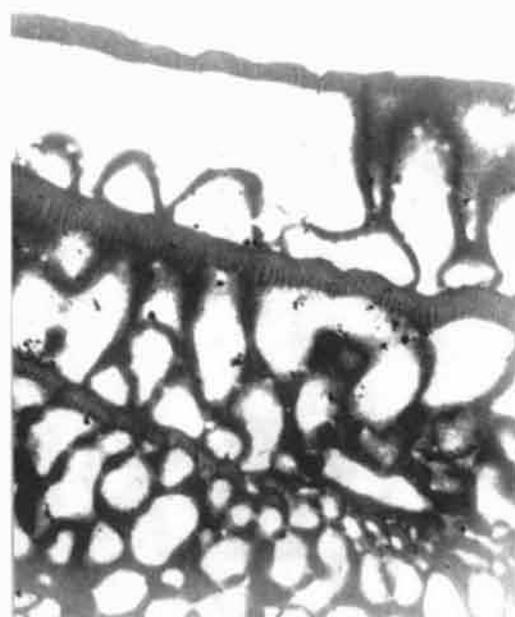
X20.—2, 3. Parts of same specimen, X40,
showing "rugosity" of spirotheca.



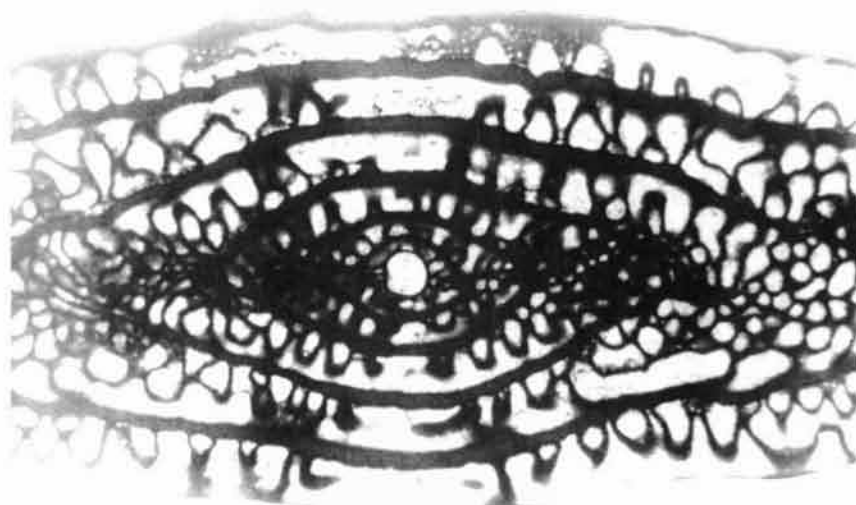
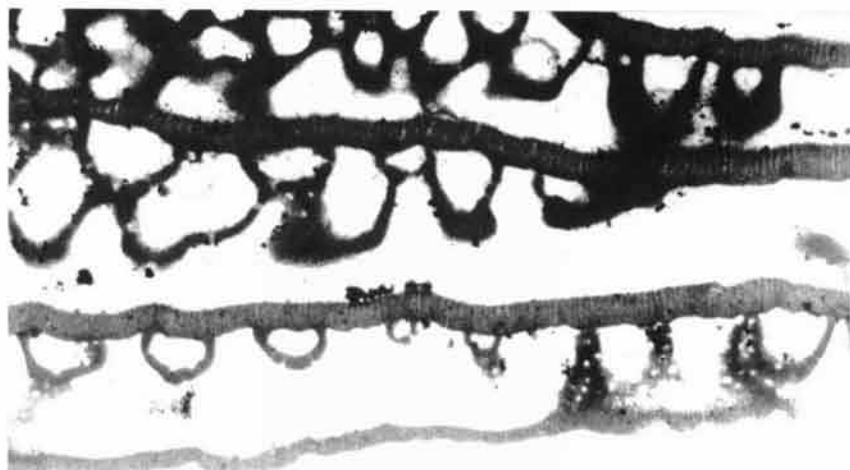
1



2



3



EXPLANATION OF PLATE 4

All figures are unretouched photographs.

FIGURES

1-3. *Pseudofusulina huacoensis* DUNBAR & SKINNER.—
1, 2. Parts of specimen shown in plate 1, figure

2, X40, showing "rugosity" of spirotheca (Y.P.M. 15086A).—3. Part of specimen shown in plate 1, figure 3, X20 (Y.P.M. 24855).