GEOLOGIE EN MIJNBOUW VOLUME 55 (3-4), p. 163-174 1976

A contribution
to Project
ECOSTRATIGRAPHY

# ON THE SOLENID GROWTH HABIT OF PALEOFAVOSITES

JAN H. STEL[1] and KLEMENS OEKENTORP[2]

## ABSTRACT

Serial sections of *Paleofavosites* specimen presents proof to the contention that *Desmidopora* = *Multisolenia* is only a growth habit of *Paleofavosites*. The so-called solenia are funnel-shaped parts of the paleofavosited wall around quite ordinary corner pores. The former are arranged in dumb-bell pairs among any tour adjoining corallites. Such dumb-bells are arranged crosslike, when seen in the direction of growth of the corallites. This growth habit is found in the type species of *Paleofavosites* as well as in other undisputed members of that genus. The present authors accordingly consider *Priscosolenia* as a junior synonym of *Paleofavosites. Desmidopora* (= *Multisolenia* + *Mesosolenia*) could serve as a subgeneric heading for paleofavositids with this peculiar growth habit.

## INTRODUCTION

Fritz (1937) described *Multisolenia* on account of a single specimen from the Silurian of Canada. *Multisolenia* was defined as a Paleozoic coral, characterised by small polygonal or somewhat rounded corallites with large pore – like solenia or connecting tubes and this walls with septal spines. Because of the general morphology Fritz indicated a possible relationship with Schizocoralla, but as the corallites are connected by solenia a systematic position close to the Alcyonaria was also considered. In 1938 and 1939 Fritz discussed morphological similarities between *Multisolenia tortuosa* and *Desmidopora alveolaris*, described by Nicholson (1886).

Weissermel (1939) described *Favosites asper* from the Silurian of Antirovitha (Turkey) in which both pores near the corners of the corallites and solenia ("Zwischenrohren") occurred. The latter are arranged in the corner of adjoining walls and enfolded by funnel-shaped recesses of the wall.

Chernychev (1941, 1951) considered solenia as corner pores and rejected *Multisolenia*. He observed that corner pores are arranged upon undulations of the walls.

Sokolov (1951[b]) critised the views of Fritz and denied the occurrence of pores in *Multisolenia*. Sokolov stressed genetical and functional differences between pores and solenia. He also noticed that solenia in *Multisolenia* are arranged in a similar way as pores in *Paleofavosites*. The only difference between *Paleofavosites* and *Multisolenia* would be the occurrence of large pores, which should pass into short solenia. Although Sokolov notices solenia in such paleofavositids as *Paleofavosites alveolaris*, he considered *Multisolenia* as a transition between favositids and syringoporids. *Multisolenia* would be more closely related to the former than to the latter. Because of his phylogenetical views and his ideas about the structure of solenia Solokov did not redefine *Multisolenia* as a subgenus of *Paleofavosites*, although he considered this as a possibility.

Mironova (1960) described *Mesosolenia*, a genus in which pores near the corners of corallites, mural pores and solenia were observed. So in this genus pores simila to those of *Mesofavosites* and solenia are seen.

Solokov (1962) erected *Priscosolenia* which was characterised by pores close to the corners of corallites and solenia. According to Stasinska (1967) the genus would occupy a transitional position between *Paleofavosites* and *Mesofavosites*.

Stasinska (1967) erected *Sparsisolenia* for similar tabulates with polygonal (sometimes meandroid) transverse sections and few solenia. She supposed that *Sparsicolenia* might occupy a transitional position between *Priscosolenia* and *Multisolenia*.

When studying the holotype of *Paleofavosites asper* (the type species of *Paleofavosites*) Oekentorp (in press) noticed corner pores and solenia-like pores in this species. The above mentioned poretypes are also occasionally found in *Paleofavosites alveolaris* (= *Paleofavosites rugosus* Sokolov, 1951[b]) described by Lonsdale (1839).

In Oekentorp's longitudinal sections of the type specimen of *Paleofavosites asper* the solenia-like pores are seen both as circular openings which might be linked up by parts of the

1) Geologisch Instituut, Melkweg 1, Groningen.

2) Geologisch-paläontologisches Institut der Universität Münster, D-44 Münster/Westfalen, Pferdegasse 3. West Duitsland.

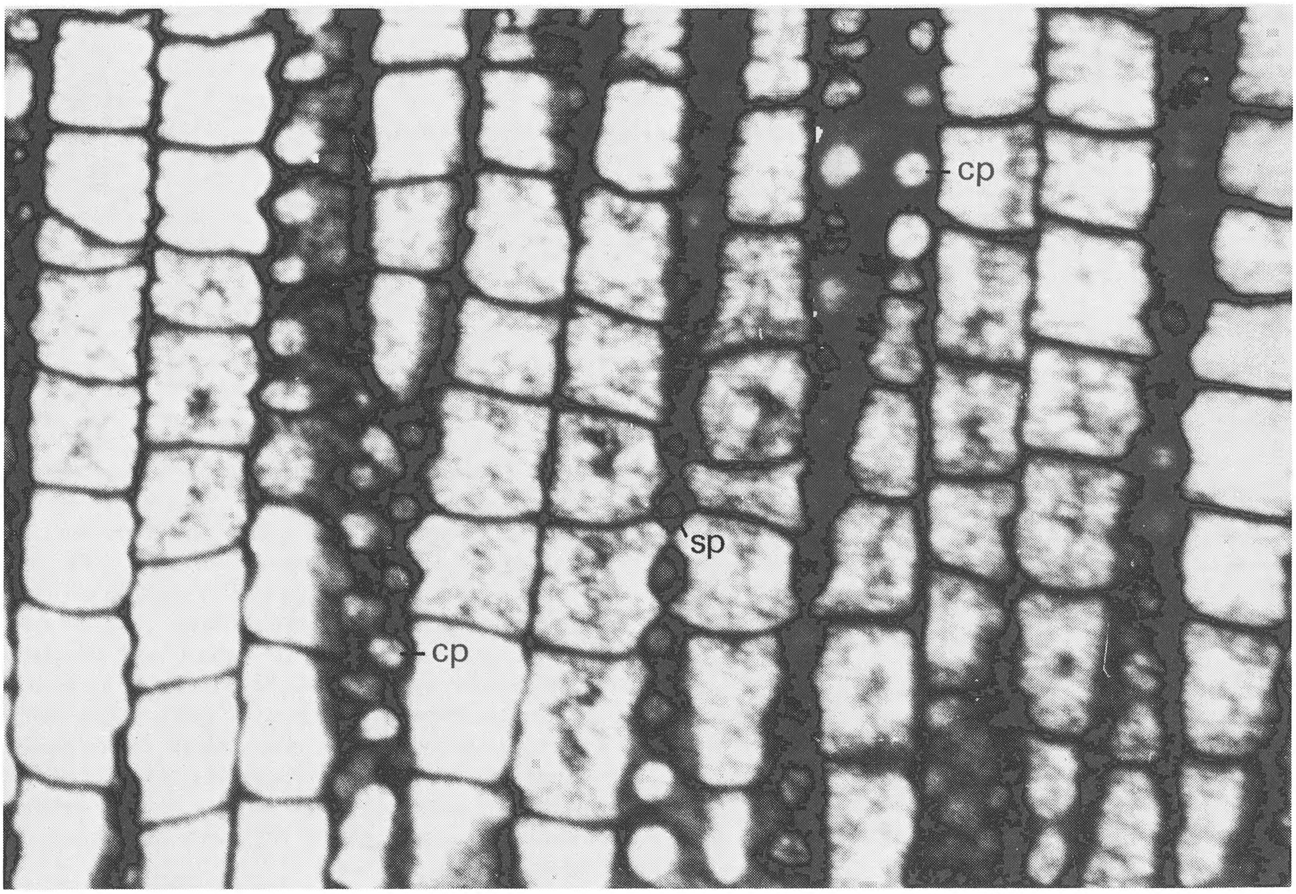



Fig. 1
Longitudinal section of the holotype of *Paleofavosites asper* (D'ORBIGNY, 1850), the type species of *Paleofavosites*. In this section both corner pores (cp) and "solenia"-like pores (sp) are seen. The specimen is stored in the geological collections of the Geological Survey and Museum London, Coll. Murchison 65b, 3726-8.

corallite walls and as isolated circles, when the solenia are sectioned in their central parts (Fig. 1). As there is no difference between the diameters of the corner pores and the solenia-like pores, Oekentorp considers the latter as corner pores.

## MATERIAL

The following colonies were studied in the present paper.

- a colony of *Priscosolenia kozlowskii* sensu Stasinska, 1967 = *Paleofavosites asper* (d'Orbigny, 1850) present authors (RGM. 243667), found as an erratic boulder in Groningen, The Netherlands. From this colony serial sections were prepared. The distance between them is 0.06 mm. Of both a longitudinal and a transverse section fifty acetate peelings were prepared in order to understand the three dimensional shape of the skelet.
- a fragment of a silicified colony of *Priscosolenia* sp. aud. = *Paleofavosites* sp. present authors (RGM. 243668), found by Mr. A. Meijer in Emmerschans, The Netherlands. The photograph depicted in Fig. 6 is taken from this fragment.
- a silicified colony of *Paleofavosites* sp (RGM 243669), found by Mr. H. Huisman in Groningen, The Netherlands. After etching the colony with hydrochloric acid during several days, scanning electron photographs were prepared at the Geological Institute at Leiden.

The material is stored in the museum of the Geological Institute of the University, Groningen. It is labeled in the retrieval system of the National Museum of Geology and Mineralogy at Leiden, The Netherlands.

## PORES

An important characteristic of favositids is the occurrence of pores which are defined by Moore, Hill and Wells (1956, p. F249) as circular or oval small holes in walls between adjoining corallites.

Ozaki (1934), Weissermel (1939) and Oekentorp and Schouppé (1969) demonstrated that a more or less alternating arrangement of pores in *Paleofavosites* caused an undulation of corallite walls near the corners. This undulation is considered as a feature of pores which are situated in the corner points of corallites as is found in *Paleofavosites*. We consider this type of pore-arrangement as corner-pores in order to distinguish them from similar arrangements of mural pores in *Mesofavosites*.

Sokolov (1951) established the genus *Mesofavosites* for material with mural pores as well as pores near the corners of the corallites. If the latter were corner pores, as found in *Paleofavosites*, an undulation of the wall should also been seen. In erratic specimens of *Mesofavosites*, described by Stel (1975) no undulation of the wall is seen. Nor is this undulation found in *Mesofavosites* material collected in Gotland (Sweden). Thanks to a grant of the Netherlands Organization for the Advancement of Pure Research, the first author studied the important collections of Klaamann in Tallinn and of Sokolov (VNIGRI-Museum) in Leningrad during the summer of 1975. In the Sokolov collections no definite proof was found to justify the separation of *Mesofavosites* from *Favosites*. A majority of the specimens of *Mesofavosites* either could be ascribed to *Paleofavosites* or to *Favosites*. Some species, e.g. *Mesofavosites obliquus major* (Sokolov, 1952[a], Tab. 7) show stray mural pores but corner pores are predominant. Such a situation is also found in some paleofavositids, such as the specimen of "*Priscosolenia kozlowskii*" described in this paper. Although more detailed investigation is needed we think that it is doubtful that in any tabulates mural pores and corner pores as defined above for *Mesofavosites* occur at all.

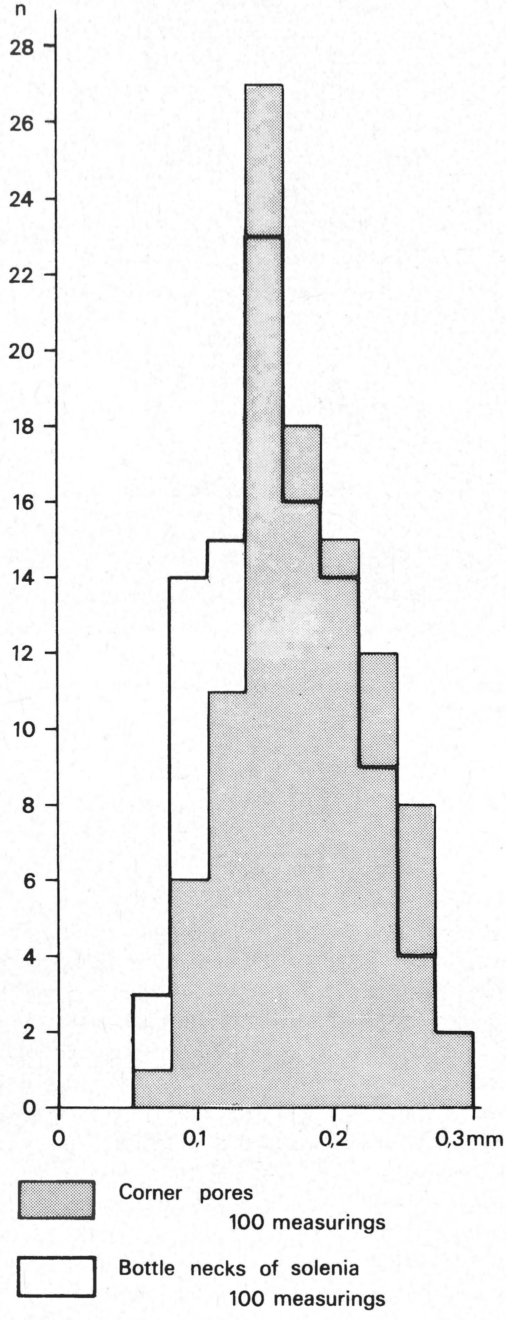
In five successive peelings of transverse sections of "*Priscosolenia kozlowskii*" the diameter of corner pores and of the narrowest part of solenia are measured. As seen in Fig. 2 no difference exists between the latter and the former.

## TRANSVERSE SECTIONS

In transverse serial sections of "*Priscosolenia kozlowskii*" it is seen that solenia are only found in places where four corallites join. When two or three corallites join solenia never occur but normal corner pores are found.

When we consider the arrangement of a solenium between corallites A and B (fig. 3[a]) we see that the solenium between these corallites is roofed during growth (fig. 3[c-d]). In the next picture a narrow solenium between corallites C and D is seen, which widens (fig. 3[f]) and narrows till it is closed (fig. 3[h]) again. Now the corallites A, B, C and D are polygonal but in the following picture (fig. 3[l]) a solenium between corallites A and B is formed again. This solenium parallels the former solenium between corallites A and B but is almost perpendicular to the one between corallites C and D. So

Fig. 2
Frequency histogram of the diameters of corner pores and the bottle necks of "solenia" in five successive peelings of transverse sections of *Paleofavosites asper ("Priscosolenia kozlowskii")*.



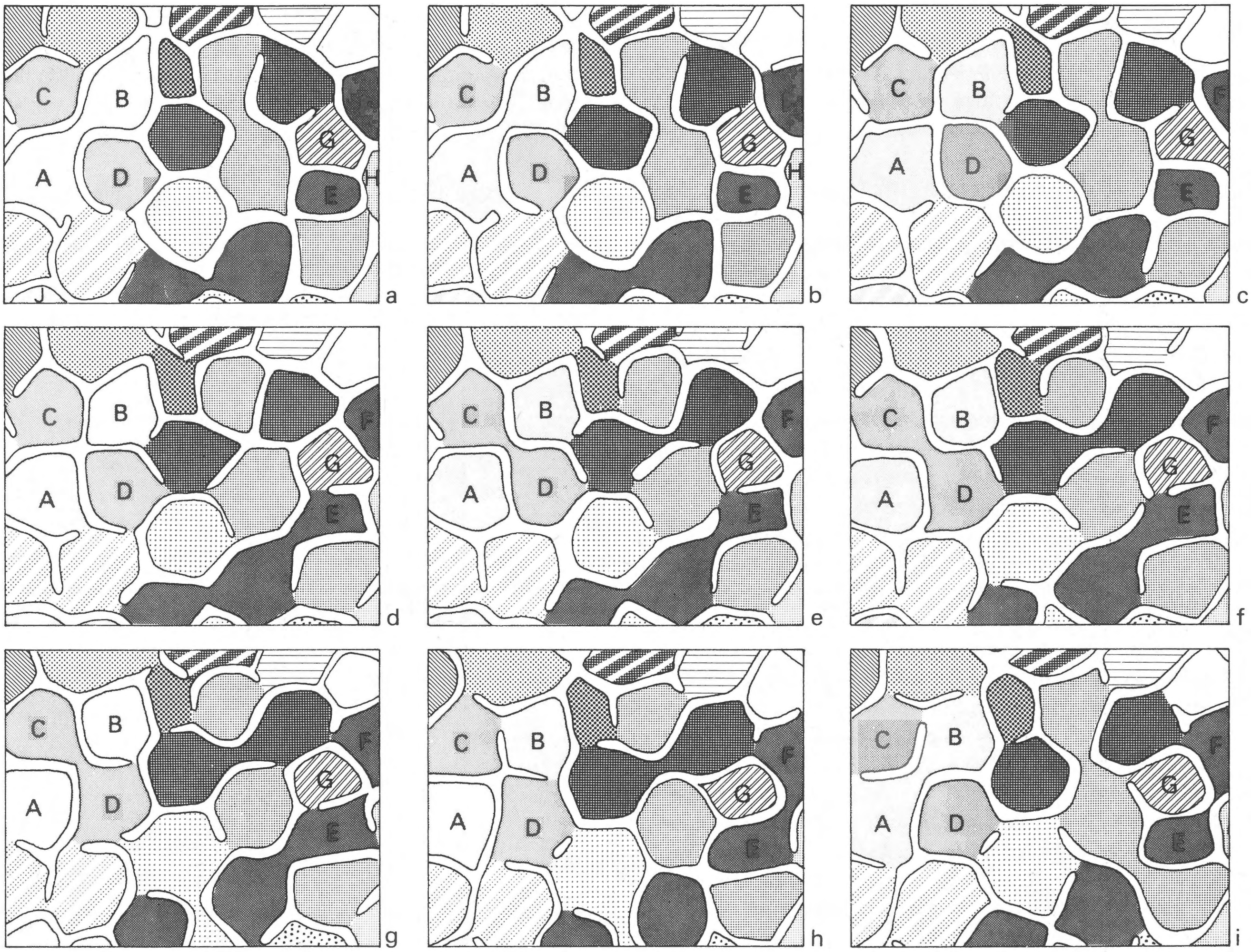



Fig. 3
Drawings of nine successive transverse sections of *Paleofavosites asper ("Priscosolenia kozlowskii")*. The distance between these sections is 0,06 mm. Explanation in the text.

corallites which are connected by solenia, are arranged as two mutually perpendicular dumb-bells or hour-glasses in a transverse section.

The development of a dumb-bell is limited by the distance of the corallites. In fig. $3^{a}$ corallite E and F are not connected by a solenium and a normal wall is secreted between corallites G and H. In figs. $3^{f\text{-}g}$ it is seen that a solenium develops between corallite E and F and consequently a dumb-bell is found (fig. $3^{h}$). Here the solenium is rather narrow possibly so because of the increased distance beteen the corallites. During development of corallite E, corallite F got so close that a dumb-bell arrangement of E and F and consequently of G and H became feasible.

The counterpart situation is also found. In this case, the distance between corallites increases during growth and the dumb-bell arrangement is replaced by a wall between one of the pairs of facing corallites. In this way the dumb-bell of A and J changed into an arrangement shown in fig. $3^{a}$.

As seen in fig. $3^{i}$ one corallite may form several dumb-bell systems with neighbouring corallites. The system always concerns four corallites which form mutually perpendicular dumb-bells. In the bottle necks of solenia, which have the same diameter as corner pores, pore plates are regularly, found. This strongly suggests that the narrowest parts of solenia are pores situated on funnel-shaped outgrowths of the corallites.

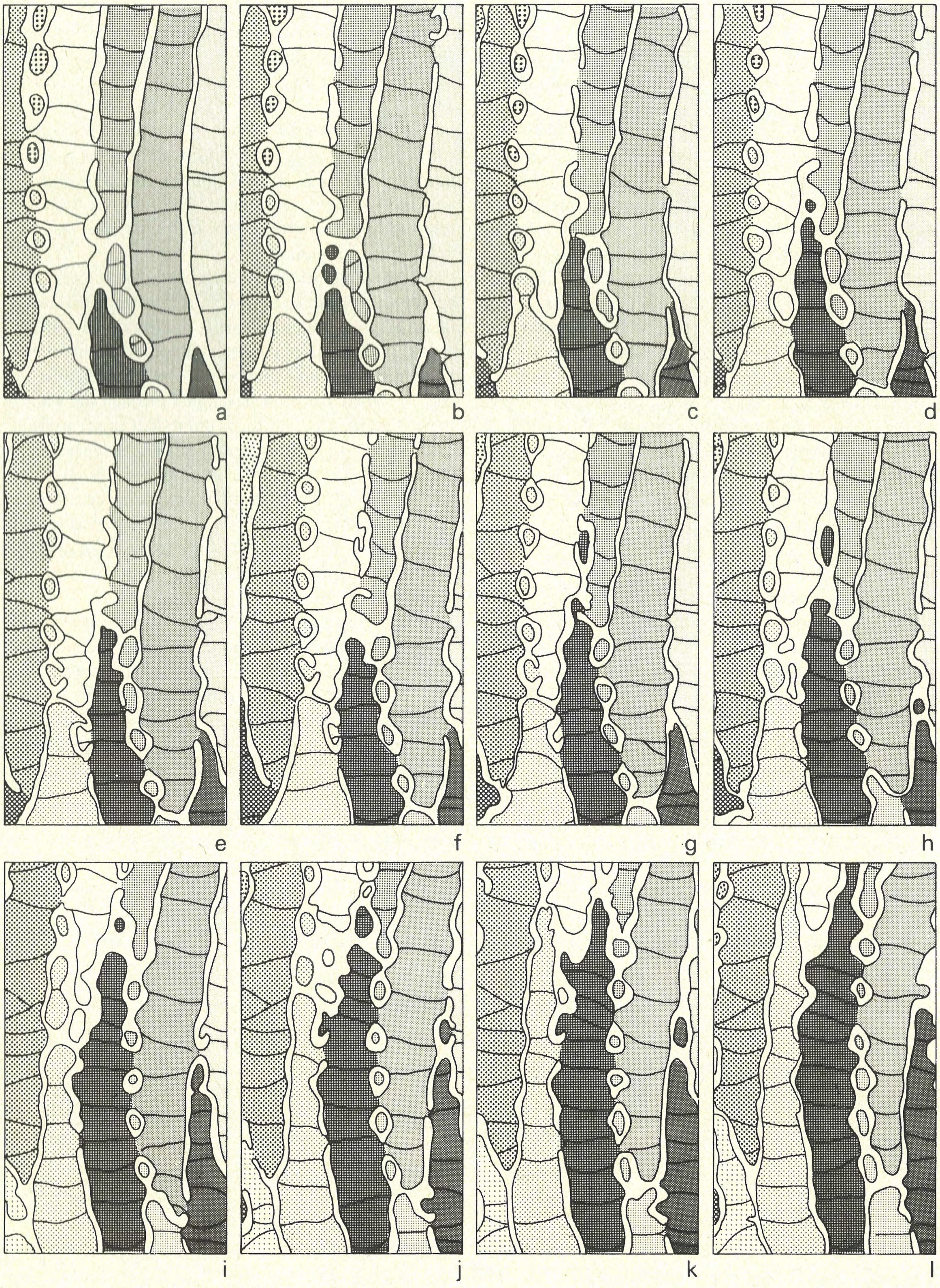



Fig. 4
Drawings of twelve successive longitudinal sections of *Paleofavosites asper* (*"Priscosolenia kozlowskii"*). The distance between the sections is 0,06 mm. Explanation in the text.

## LONGITUDINAL SECTIONS

In longitudinal serial sections of *"Priscosolenia kozlowskii"* (fig. 4) it is seen that solenia chains fade into corallites. First the diameter of the solenia decreases towards the corner pore diameter. This is seen in the four uppermost solenia in figs. $4^{a-e}$. Subsequently the diameter increases and the solenia fuse into an ordinary favositoid longitudinal section figs. $4^{e-l}$. The minimum diameter of solenia in this section generally agrees with the narrowest parts of solenia in transverse sections. But, as the development of solenia depends on the distance of the facing corallites, the diameter of solenia is smaller if the corallites are at a maximum distance. Near the pores the wall is (figs. $4^{e-h}$) undulated in a way typically seen in *Paleofavosites*. The occurrence of solenia in longitudinal sections depends upon the position of these sections. Only if a corallite is sectioned close to the corner of the prism, a chain of solenia appears.

In our opinion solenia are not functionally and genetically different with pores as S o k o l o v ($1951^{b}$) maintains. Solenia are corner pores in rhythmically flattened tabulate corallites.

## DISCUSSION

In 1917 d'Arcy Wentworth Thompson published his views about growth and form in physico-mathematical terms. In this way he illustrated biological forms by soap-bubbles, spheres and cylinders.

When three equal spheres or cylinders are in contact the three are separated by three partition surfaces which will meet one another at angles of $120^{e}$. The transverse section of this arrangement is depicted in fig. $5^{a}$.

When four spheres are in contact in a plane they could arrange in two symmetrical ways: either (a) with four partition surfaces intersecting at right angles (fig. $5^{b}$), or (b) with five partition surfaces meeting, three and three, at angles of $120^{e}$ (fig. $5^{c}$). The latter arrangement is analogous to the above mentioned configuration of three spheres and turns out to be a stable arrangement as the former is unstable. If four spheres are arranged in form (a) the partition surfaces glide upon one another and the system assumes the form (b) with its two triple instead of one quadrupple conjuction.

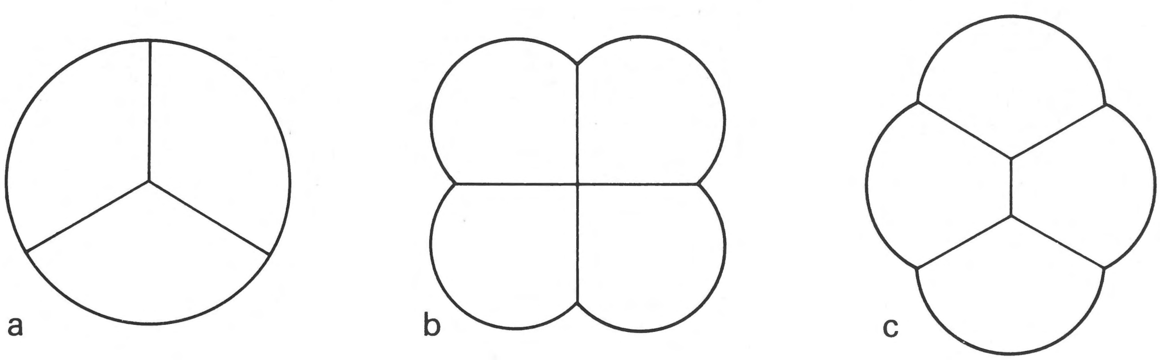
The configuration of dumb-bell shaped pairs of corallites in *"Priscosolenia kozlowskii"* resembles the stable arrangement of four spheres. This is illustrated in fig. $3^{d,\ h}$. The stable configuration is obtained by flattening of two facing corallites; transverse sections are oval rather than polygonal (fig. 3). When a pore is developed through the walls between these flattened corallites, a dumb-bell configuration of the corallites is the result and so-called solenia are observed (figs. 6 and 7). In point of fact such a solenium consists of (a) extensions of the lumen of two facing corallites and (b) a pore in the connecting wall. As soon as a dumb-bell arrangement has developed, a system of perpendicular dumb-bell shaped pairs of corallites grows up by geometric necessity (fig. 3).

The presence of pores between two facing corallites in a dumb-bell is readily explained, as this is the most favourable position. If the corallites, joined in dumb-bell pairs, are growing too far apart, this configuration is lost and a polygonal arrangement is seen. On the other hand a polygonal configuration of corallites is seen to change into pairs of mutually perpendicular arranged dumb-bells when four corallites join (figs. $3^{f-i}$). When studying literature about favositids dealing with solenia we noticed that several new

Fig. 5a
The stable arrangement of three cells or bubbles.

Fig. 5b
The unstable configuration of four cells or bubbles. After d'Arcy Wentworth Thompson.

Fig. 5c
The normal and stable arrangement of four cells or bubbles. After d'Arcy Wentworth Thompson.



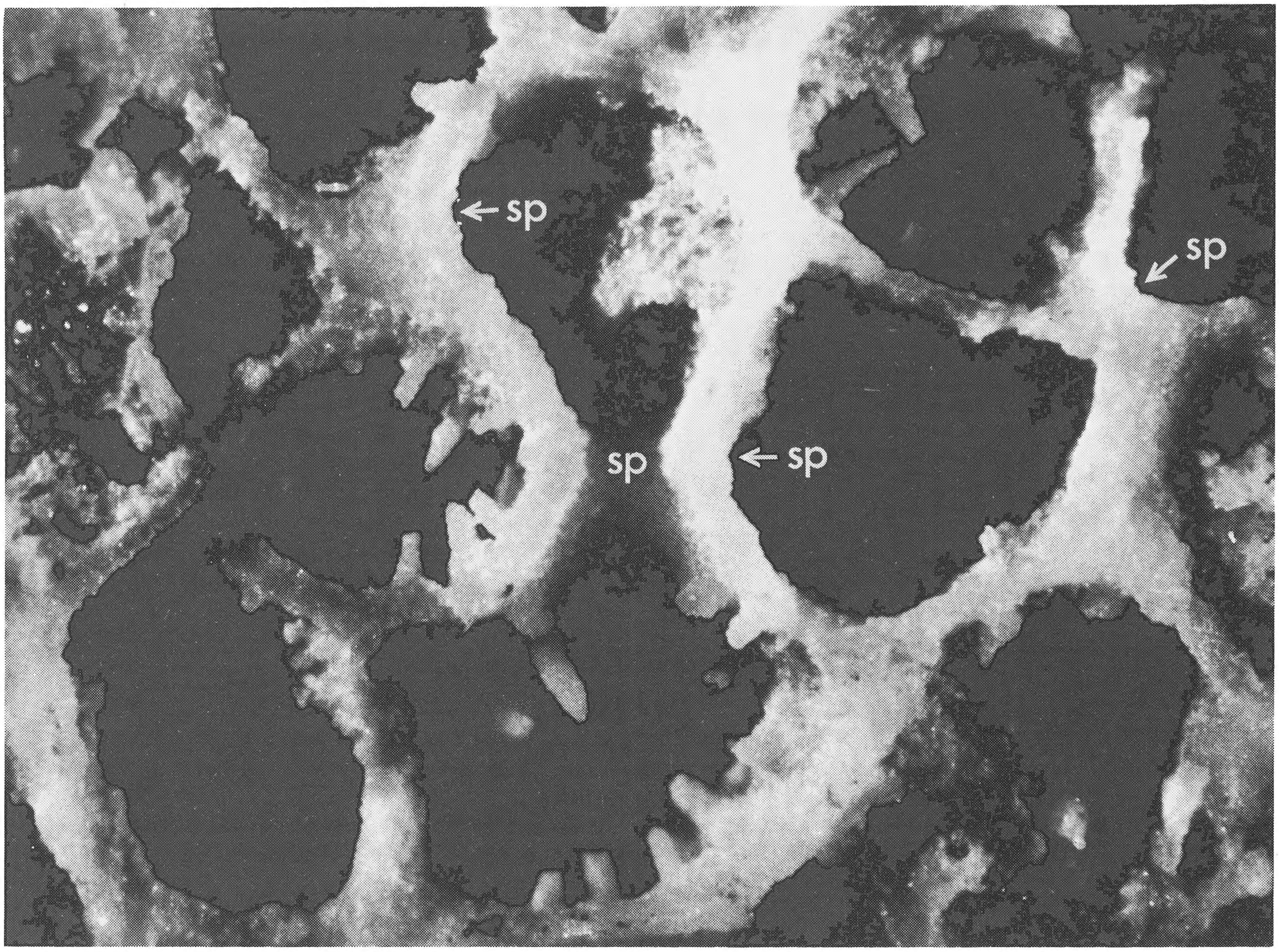
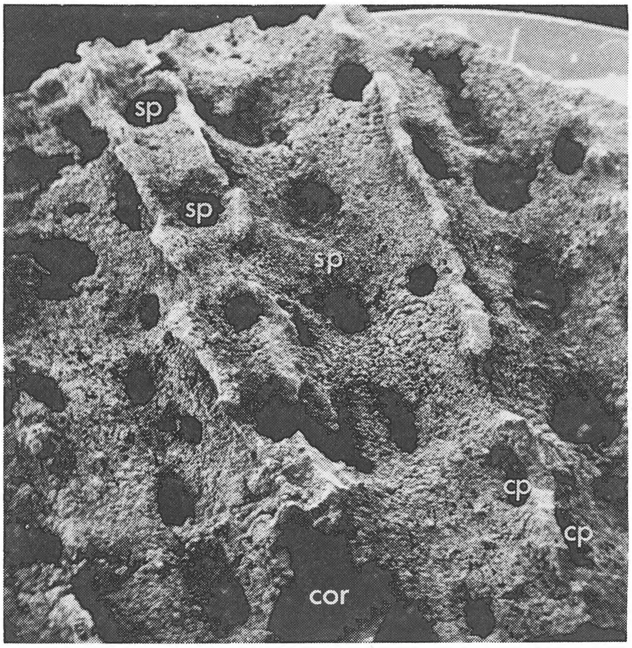



Fig. 6
Weathered surface of a silicified colony of *Paleofavosites* sp. (*"Priscosolenia"* sp.), showing the mutually perpendicular arrangement of dumb-bell pairs of corallites and "solenia"-like corner pores (sp) in between them. Erratic boulder Emmen (RGM 293668).

species of *Mulsisolenia* are described which hardly show difference with the type species, *Multisolenia tortuosa*. Although S o k o l o v (1951[b]) considered *Paleofavosites mirabilis* synonymous with *Multisolenia tortuosa* B o l t o n (1965) described the former as *Multisolenia mirabilis* because of differences in the number of tabulae along the distance of 1 mm. Presently, time and material are lacking for a revision of *Multisolenia*. But it is clear that too many species were described on the strength of very subordinate details.

As seen in Table 1 the corallite diameter in species of *Multisolenia* is considerably smaller than in species of *Priscosolenia.* In *Multisolenia* the corallites normally have diameters less than 1 mm whereas in *Priscosolenia* this usually is more than 1 mm. In the latter also solenia are less frequent than in the former. This indicates a relationship between the corallite diameter and the number of solenia seen in longitudinal sections. When the corallite diameter is small ($<$ 1 mm) a large number of solenia is found and consequently junctions of four corallites regularly occur. As the pore diameter in *Multisolenia* frequently is of about the same as the corallite diameter (Table 1) meandroid coralla develop. When the corallite diameter is larger ($>$ 1 mm), as in *Priscosolenia*, the number of solenia decreases. Instead of more or less meandroid coralla, cerioid coralla are found. In this cerioid colonies locally a dumb-bell arrangement of mutually perpendicular pairs of corallites occurs. *Sparsisolenia kiaeri* forms the exception to the rule as it has only few solenia but its corallite diameter is small.

Fig. 7
Scanning electron photographs of a silicified colony of *Paleofavosites* sp. (RGM 243669) etched with hydrochlorid.

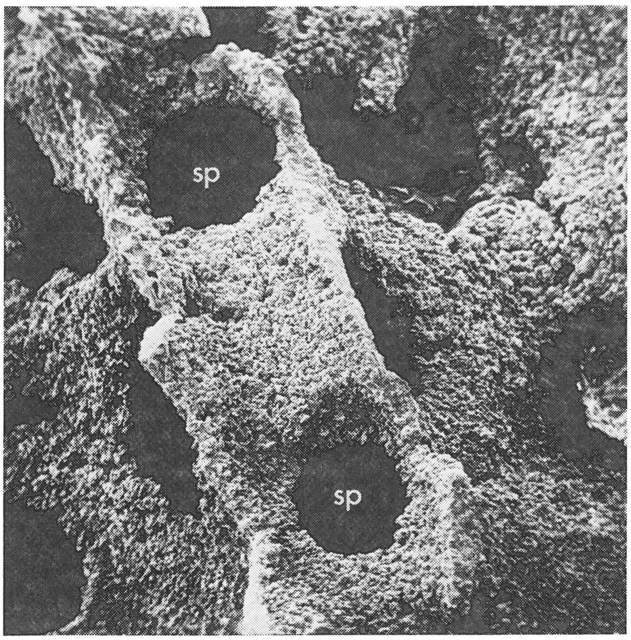


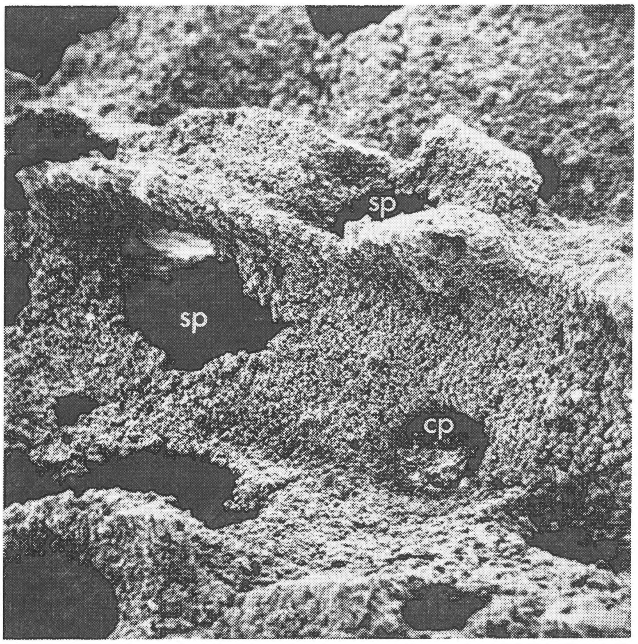

S o k o l o v (1951[b]) mentioned the occurrence of solenia in *Paleofavosites alveolaris* (Goldfuss) and in *Paleofavosites mirus* Sokolov from the Estonian SSR. S o k o l o v (1952[a]) pictures of *Paleofavosites luhai* Sokolov (Pl. 1 and 2) and *Paleofavosites jaaniensis* Sokolov (Pl. 3, fig. 1) resemble transverse and longitudinal sections of *Priscosolenia* species very much.

S o k o l o v (1951[b]) considers these paleofavositids as transitions between *Paleofavosites* and *Multisolenia*. K l a a m a n n (1962) described *Paleofavosites finitimus* Klaamann in which solenia are also found. L e l e s h u s (1972) gives several pictures of paleofavositids in which solenia are also seen. S t e l (1975) described *Paleofavosites finitimus* Klaamann with a transverse section as normally found in *Priscosolenia* This arrangement is after Stel the consequence of the presence of large pores, with a diameter of 0.24-0.35 mm.

Fig. 7a
Surface of longitudinal section showing both "solenia"-like corner pores (sp), seen as mutually perpendicular dumb-bells, and corner pores (cp). The latter are arranged in a way typical for paleofavositids and the undulation of the wall is clearly visible. Details from the uppermost "solenia"-like corner pore are shown in figures b and c. Cor. = corallite. 26 ×

Fig. 7b en 7c
Three mutually perpendicular "solenia"-like corner pores (sp.). 60 ×



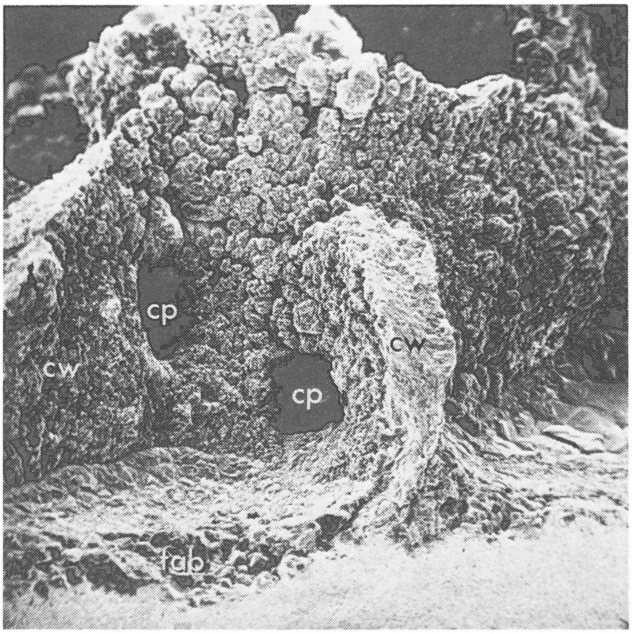



Fig. 7d
The arrangement of corner pores (cp) in a corallite wall (cw) just above a tabulum (tab). 63 ×

Oekentorp (in press) notices solenia in the holotypes of *Paleofavosites asper* (d'Orbigny), the type species of *Paleofavosites*.

Apart from *Paleofavosites alveolaris* the corallite diameter of the above mentioned paleofavositids is comparable to those of *Priscosolenia* (Table 1). The pore diameter of these paleofavositids and priscosolenids are also similar. Moreover we demonstrated that (a) corner pore diameters in a specimen of *"Priscosolenia kozlowskii"* are within the range of diameters of the narrowest parts of solenia (fig. 2) (b) the development of successive solenia is caused by geometry. This brings us to consider *Priscosolenia* as a phenotype and a junior synonym of the genus *Paleofavosites*. In *Multisolenia* the solenia develop in the same way as in *Priscosolenia* and always incorporate corner pores. Because these corner pores occur frequently in extensions of the lumen of corallites and because the pores are of comparitive large size (Table 1), transverse- and longitudinal sections of *Multisolenia* are readily recognizable. Although the different species listed under this heading are probably phenotypes of small species

TABLE 1
Presents data on paleofavositids, part of which with desmidoporid features such as solenia. These favositids are listed according to their corallite diameter in the genera identified as such by various authors. Species with larger corallite diameters are more like *Paleofavosites*, and therefore these are mostly identified as species of either this genus or *Priscosolenia*. The latter genus is synonymous with the former, according to the present authors.

| CORALLITE DIAMETER | PORE DIAMETER | IDENTIFICATION OF PALEOFAVOSITIDS WITH SOLENIA, ACCORDING TO AUTHORS | | |
|---|---|---|---|---|
| 0,25-0,40 | 0,18-0,22 | *Multisolenia misera* SOKOLOV & TESAKOV (holotype) | Sokolov & Tesakov | 1963 |
| 0,25-0,60 | 0,25 | *Multisolenia tortuosa* FRITZ (holotype, genotype) | Fritz | 1937 |
| 0,30-0,40 | 0,25 | *Multisolenia tortuosa* FRITZ | Struz | 1961 |
| 0,30-0,45 | 0,25 | *Multisolenia tenuis* SOKOLOV | Sokolov | 1951[b] |
| 0,30-0,80 | 0,30-0,35 | *Multisolenia tortuosaeformis* KLAAMANN (holotype) | Klaamann | 1962[a] |
| 0,30-0,80 | 0,35 | *Multisolenia tortuosaeformis* KLAAMANN | Klaamann | 1964 |
| 0,32-0,60 | 0,17-0,25 | *Multisolenia abnormalis* CHEKHOVICH (holotype) | Chekhovich | 1954 |
| 0,35-0,45 | 0,30 | *Multisolenia tortuosa* FRITZ (hypotype) | Bolton | 1965 |
| 0,35-0,45 | 0,15-0,22 | *Multisolenia tortuosa* FRITZ | Yu | 1962 |
| 0,35-0,65 | 0,25 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| 0,35-0,70 | 0,25 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| 0,40 | 0,30-0,35 | *Multisolenia tortuosa cylindrica* SOKOLOV (holotype) | Sokolov | 1951[b] |
| 0,40 | 0,15-0,25 | *Multisolenia gansuensis* YU (holotype) | Yu | 1962 |
| 0,40-0,60 | 0,26-0,36 | *Multisolenia tortuosa* FRITZ | Zhizhina & Smirnova | 1959 |
| 0,40-0,60 | 0,30-0,40 | *Multisolenia tortuosa* FRITZ | Sokolov | 1955 |
| 0,40-0,60 | 0,20-0,30 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| | | = *Paleofavosites mirabilis* CHERNYCHEV | Chernychev | 1938[a] |
| 0,40-0,65 | 0,30 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| 0,40-0,65 | 0,30 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| 0,40-0,65 | 0,40-0,65 | *Multisolenia tortuosa* FRITZ | Klaamann | 1964 |
| 0,40-0,65 | 0,30 | *Multisolenia labyrinthica* SOKOLOV & TESAKOV (holotype) | Sokolov & Tesakov | 1963 |
| 0,40-0,70 | 0,15-0,20 | *Mesosolenia festiva* (CHERNYCHEV) | Sokolov & Tesakov | 1963 |
| | | = *Favosites? festivus* (CHERNYCHEV) | Dubatolov | 1959 |
| 0,45-0,65 | 0,28-0,35 | *Multisolenia zhongningensis* YU (holotype) | Yu | 1962 |
| 0,45-0,65 | 0,30 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| 0,45-0,90 | 0,20-0,25 | *Multisolenia temperans* KLAAMANN (holotype) | Klaamann | 1962[a] |

*vervolg TABLE 1*

| CORALITE DIAMETER | PORE DIAMETER | IDENTIFICATION OF PALEOFAVOSITIDS WITH SOLENIA, ACCORDING TO AUTHORS | | |
|---|---|---|---|---|
| 0,45-0,90 | 0,20-0,25 | *Multisolenia temperans* KLAAMANN | Klaamann | 1964 |
| 0,50 | 0,20-0,30 | *Multisolenia tortuosa* FRITZ | Solokov | 1951[b] |
| | | = *Paleofavosites mirabilis* CHERNYCHEV | Chernychev | 1941[a] |
| 0,50 | 0,35 | *Multisolenia tortuosa* FRITZ | Stearn | 1956 |
| 0,50 | 0,25 | *Multisolenia tortuosa sibirica* SOKOLOV (holotype) | Sokolov | 1951[b] |
| 0,50-0,60 | 0,35 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| 0,50-0,65 | 0,40-0,45 | *Multisolenia tortuosa* FRITZ (holotype) | Bolton | 1965 |
| 0,50-0,70 | 0,30-0,35 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| | | = *Paleofavosites mirabilis* CHERNYCHEV (holotype) | Chernychev | 1937 |
| 0,50-0,70 | 0,30-0,40 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| | | = *Paleofavosites mirabilis* CHERNYCHEV | Chernychev | 1938 |
| 0,50-0,70 | 0,50-0,70 | *Multisolenia tortuosa* FRITZ | Sokolov | 1951[b] |
| 0,50-0,70 | 0,30-0,45 | *Multisolenia tortuosa* FRITZ | Sokolov & Tesakov | 1963 |
| 0,50-0,80 | 0,30-0,35 | *Multisolenia tortuosaeformis* KLAAMANN | Stasinska | 1967 |
| 0,50-0,80 | 0,22 | *Multisolenia nikiforovae* SOKOLOV & TESAKOV (holotype) | Sokolov & Tesakov | 1963 |
| 0,50-1,00 | 0,30-0,35 | *Multisolenia ninae* (CHERNYCHEV) | Sokolov | 1951[b] |
| 0,50-1,20 | 0,40-0,50 | *Multisolenia excelsa* KLAAMANN (holotype) | Klaamann | 1961[a] |
| 0,50-1,20 | 0,40-0,50 | *Multisolenia excelsa* KLAAMANN | Klaamann | 1964 |
| 0,50-1,20 | 0,40-0,50 | *Multisolenia excelsa* KLAAMANN | Stasinska | 1967 |
| 0,50-1,20 | 0,48-0,72 | *Multisolenia excelsa* KLAAMANN | Stel | 1975 |
| 0,50-2,00 | 0,20 | *Paleofavosites nodosus* POULSEN | Leleshus | 1972 |
| 0,50-2,40 | 0,20 | *Paleofavosites hirtus* SOKOLOV | Leleshus | 1972 |
| 0,55-0,75 | 0,40-0,55 | *Multisolenia tortuosa* FRITZ (hypotype) | Bolton | 1965 |
| 0,60-1,10 | 0,24-0,35 | *Paleofavosites finitimus* KLAAMANN | Stel | 1975 |
| 0,60-1,15 | 0,40-0,50 | *Priscosolenia prisca occulta* (SOKOLOV) (holotype) | Sokolov | 1962 |
| | | = *Multisolenia prisca occulta* SOKOLOV | Sokolov | 1951[b] |
| 0,60-1,15 | | *Priscosolenia prisca occulta* (SOKOLOV) | Klaamann | 1964 |
| 0,60-1,60 | 0,22-0,40 | *Priscosolenia* sp. a | Stel | 1975 |
| 0,65-0,95 | 0,35-0,40 | *Multisolenia formosa* SOKOLOV (holotype) | Sokolov | 1947[a] |
| 0,65-0,95 | 0,35-0,40 | *Multisolenia formosa* SOKOLOV | Sokolov | 1951[b] |
| 0,65-0,95 | 0,30 | *Multisolenia formosa* SOKOLOV | Sokolov & Tesakov | 1963 |
| 0,70-1,00 | 0,27-0,40 | *Multisolenia sichuaniana* YU (holotype) | Yu | 1962 |
| 0,70-1,00 | 0,30 | *Multisolenia uchkudukia* KIM (holotype) | Kim | 1966 |
| 0,70-1,00 | 0,22 | *Mesosolenia prima* SOKOLOV & TESAKOV (holotype) | Sokolov & Tesakov | 1963 |
| 0,70-1,30 | 0,35-0,56 | *Priscosolenia* sp. b | Stel | 1975 |
| 0,80-0,90 | 0,30-0,50 | *Multisolenia kuldgukica* KIM (holopype, | Kim | 1966 |
| 0,80-1,10 | 0,20-0,25 | *Paleofavosites finitimus* KLAAMANN (holotype) | Klaamann | 1962 |
| 0,80-1,25 | 0,45-0,55 | *Priscosolenia prisca* (SOKOLOV) (holotype, genotype) | Sokolov | 1962 |
| | | = Multisolenia prisca SOKOLOV | Sokolov | 1951[b] |
| 0,80-1,25 | 0,45-0,50 | *Priscosolenia prisca* (SOKOLOV) | Klaamann | 1964 |
| 0,80-1,50 | 0,25 | *Paleofavosites asper* (d'ORBIGNY) (holotype, genotype) | Oekentorp | in press |
| 0,80-1,50 | 0,50 | *Priscosolenia rozkowskae* STASINSKA (holotype) | Stasinska | 1967 |
| 0,80-1,60 | 0,20-0,24 | *Priscosolenia rozkowskae* STASINSKA | Stel | 1975 |
| 0,80-1,70 | 0,24-0,48 | *Multisolenia reliqua* SOKOLOV (holotype) | Stel | 1975 |
| 0,90-1,00 | | *Sparsisolenia kiaeri* STASINSKA (holotype, genotype) | Stasinska | 1967 |
| 0,90-1,20 | 0,25 | *Paleofavosites mirus* SOKOLOV (holotype) | Sokolov | 1951[b] |
| 0,96-1,40 | 0,25-0,37 | *Priscosolenia kozlowskii* STASINSKA | Stel | 1975 |
| 1,00-1,40 | 0,20-0,35 | *Priscosolenia kozlowskii* STASINSKA (holotype) | Stasinska | 1967 |
| 1,00-1,60 | 0,30-0,35 | *Priscosolenia perarmata* (KLAAMANN) (holotype) | Klaamann | 1964 |
| | | = *Paleofavosites perarmatus* KLAAMANN | Klaamann | 1962[a] |
| 1,00-1,60 | 0,30-0,60 | *Multisolenia pseudoreliqua* KIM (holotype) | Kim | 1966 |
| 1,00-1,75 | 0,40-0,45 | *Multisolenia? frivola* KLAAMANN (holotype) | Klaamann | 1961[a] |
| 1,07 | 0,50 | *Multisolenia confluens* STEARN (holotype) | Stearn | 1956 |
| 1,10-1,70 | 0,09-0,13 | *Paleofavosites luhai* SOKOLOV | Stel | 1975 |
| 1,20-1,60 | 0,10-0,15 | *Paleofavosites luhai* SOKOLOV (holotype) | Sokolov | 1952 |
| 1,20-1,60 | 0,17-0,30 | *Paleofavosites luhai* SOKOLOV | Leleshus | 1972 |
| 1,30-1,50 | 0,30-0,40 | *Multisolenia reliqua* SOKOLOV (holotype) | Sokolov | 1952[a] |
| 1,50-2,20 | 0,25-0,30 | *Paleofavosites jaaniensis* SOKOLOV (holotype) | Sokolov | 1952[a] |
| 2,50-3,10 | 0,20-0,30 | *Paleofavosites alveolaris* (GOLDFUSS) | Leleshus | 1972 |
| 2,50-3,50 | 0,22-0,25 | *Paleofavosites alveolaris* (GOLDFUSS) | Sokolov | 1951[b] |

of *Paleofavosites*, we prefer to maintain an artificial heading for paleofavositids with a *Multisolenia*-like habitus. We therefore consider *Multisolenia* as a subgenus of *Paleofavosites*.

Nicholson (1886) described *Desmidopora alveolaris*, which was characterised by a corallite diameter of 0.6 – 1.0 mm, mural pores and the absence of septal spines. After studying the pictures of Nicholson's well preserved specimen of *Desmidopora alveolaris* (1886; Pl. 8, figs. 4-6) we think this monotypic genus has the same characteristics as are seen in Fritz (1937) monotypic genus *Multisolenia*. Although Fritz (1938, 1939) later on considered this resemblance, she maintained her *Multisolenia* as a distinct genus on the strength of misinterpretations of the description of Nicholson and because of subordinate morphological difference between *Desmidopora alveolaris* Nicholson and *Multisolenia tortuosa* Fritz. Fritz (1939) especially stressed the presence of "large mural pores" and the "absence of solenia" in *Desmidopora alveolaris*, but as a matter of course Nicholson could not write about solenia in 1886, when Fritz introduced this characteristic in 1937. In Nicholson's description of *Desmidopora alveolaris* he only mentioned the occurrence of numerous mural pores which were not unusually large.

On account of Nicholson's pictures (Pl. 8, figs. 4-6) we consider his species as a paleofavositid, with a multisolenia-like habitus, because of (a) the characteristic transverse section (Pl. 8, fig. 4) and (b) the undulated walls (Pl. 8, fig. 6). We therefore classify *Desmidopora alveolaris, Multisolenia tortuosa* and all other paleofavositids with a *Desmidopora*-like habitus for the sake of convenience as specimen of the subgenus *Paleofavosites (Desmidopora)*.

Mironova (1960) described *Mesosolenia*, with a *Mesofavosites*-like arrangement of pores as well as solenia. After studying the pictures of mesosolenids described by Dubatolov (1959; Pl. 84) and Sokolov and Tesakov (1963; Pl. 5, figs. 3-6) we consider these species as paleofavositids because of (a) undulated walls in longitudinal sections (b) emplacement of pores in the corners of the corallites. Mural pores are seldom seen in transverse sections of these *Mesosolenia* species. Whenever these are depicted, the pores are situated not far from the corner lines of corallite prisms. This mural pore arrangement might have been caused by the position of the transverse section through a corner pore. Similar effects are also seen in the serial sections of *Paleofavosites asper* (= "Priscosolenia kozlowskii"). Depending of the position of the longitudinal section, a mural pore-like arrangement of corner pores is also inferred. In fig. 4[j] one of two neighbouring corallites was sectioned just behind a corner pore whereas the other was sectioned in front or in side of a corner pore. When juxtaposed this pattern mimicks mural pores of one corallite. In the longitudinal section of *Mesosolenia prima*, described by Sokolov and Tesakov (1963; Pl. 4, fig. 6) this arrangement is clearly visible. On account of the typical transverse and longitudinal sections of the specimens of Table 1 we refer to these as specimen of *Paleofavosites (Desmidopora)*.

## ACKNOWLEDGEMENTS

The authors wish to thank Dr. G.J. Boekschoten for discussion and comments. The first author is also indebted to the Netherlands Organization for Advancement of Pure Research (Z.W.O.) for granting a trip to Tallinn and Leningrad. He is grateful for help to Dr. E. Klaamann and Dr. J.V. Smirnova.

Messrs H. Huisman and A. Meijer put material at our disposal. The drawings were prepared by Mr. M.L. Brittijn and the photographs by Messrs M.H. Huizinga and W.C. Laurijssen.

## REFERENCES

Bolton, T.E. (1965) – Ordovician and Silurian tabulate corals *Labyrinthites, Arcturia, Troedssonites, Multisolenia* and *Boreaster*. Bull. geol. Surv. Canada 134: 15-22.

Caramanica, F.P. (1975) – Stabilization of the spelling of the generic name *Paleofavosites* Twenhofel. J. Paleont. 49: 1126-1129.

Chekhovich, V.D. (1954) – Novyj vid *Multisolenia* iz ludlovskikh otlozhenij Hurantinskogo khrebta. Dokl. AN Uzb. SSR 3: 45-49.

Chernychev, B.B. (1937) – Silurijskie i Devonskie Tabulata Mongolii i Tuvy. Trudy Mongolskoj komissi AN SSSR 30: 5-34.

——, (1938) – Tabulata ostrova Vajgacha. Trudy Arkt. 101: 109-145.

——, (1938[a]) – O nekotorykh silurijskikh Tabulata s reki Letnej. Trudy Arkt. 101: 147-153.

——, (1941[a]) – Silurijskie i Nizhnedevonskie korally bassejna r. Tarei (jugo-zapadnyj Tajmyr). Trudy Arkt. 158: 9-64.

Dubatolov, V.N. (1959) – Tabuljaty, Geliolitidy i Khetetidy Siluria i Devona Kuzneckogo bassejna. Trudy VNIGRI 139: 1-292.

Fritz, M.A. (1937) – *Multisolenia* a new genus of paleozoic corals. J. Paleont. 11: 231-234.

——, (1938) – Resemblance of the coral *Multisolenia* to *Desmidopora*. J. Paleont. 12: 299.

——, (1939) – Two unique Silurian corals. J. Paleont. 13: 512-513.

Kim, A.J. (1966) – Tubaljatomorfnye korally paleozoja Zarafshano-Gissarskoj gornoj oblasti. Ministerstovo Geol. Uzbekskoj SSR: 25-27.

Klaamann, E.R. (1961[a]) – Tabuljaty i Geliolitidy Venloka Estonii. Trudy inst. Geol. AN Est. SSR 6: 69-112.

——, (1962) – Tabuljaty Verkhnego Silura Estonii. Trudy inst. Geol. AN Est. SSR 9: 25-74.

——, (1962[a]) – Rasprostranenie Ordovikskikh i Silurijskikh tabuljat Estonii (s opisaniem nekotorych novych vidov). Trudy inst. Geol. AN Est. SSR 10: 149-172.

——, (1964) – Pozdneordovikskie i Rannesilurijskie Favositida Estonii. Inst. Geol. AN Est. SSR: 1-118.

Leleshus, V.L. (1972) – Silurijskie Tabuljaty Tadzhikistana. Inst. Geol. An Tadzh. SSR: 1-85.

Mironova, N.V. (1960) – Dva novykh roda tabuljat. Trudy SNIIGGIMS 8: 95-98.

Moore, R.C., D. Hill & J.W. Wells (1956) – Glossary of the morphological terms applied to corals. In: R.C. Moore: Treatise on Inverteabrate Paleontology F: 245:251.

Nicholson, H.A. (1886) – On *Desmidopora alveolaris* Nich., a new genus and species of Silurian corals. Geol. Mag. 3: 289-292.

Oekentorp, Kl. & A. von Schouppé (1969) – Kritische Betrachtungen über die Anordnung der Poren bei *Palaeofavosites* Twenhofel, 1914, N. Jb. Geol. Paläont. Abh. 133: 89-100.

Oekentorp, Kl. (in press) – Revision und Typisierung der Genus *Paleofavosites*.

Ozaki, K. (1934) – Description of fossils, A. Corals. In: S. Shimizu, K. Ozaki & T. Obata: Gotlandian deposits of Northwest Korea II. J. Shanghai Sci. Inst. 1: 62-78.

Sokolov, B.S. (1947[a]) – Geograficheskoe rasprostranenie stratigraficheskoe znachenie i sistematicheskoe polozhenie roda *Multisolenia* Fritz, 1937. Dokl. AN SSSR 58: 287-289.

——, (1950[a]) – Silurijskie korally zapada Sibirskoj platformy. Vopr. Paleont. 1: 211-242.

——, (1951[b]) – Tabuljaty paleozoja evropejskoj chasti SSR. II. Silur Pribaltiki (Favozitidy Llandoverskogo jarusa). Trudy VNIGRI, N.S. 52: 1-124.

——, (1952[a]) – Tabuljaty paleozoja evropejskoj chasti SSSR. III. Silur Pribaltiki (Favozitidy venlokskogo i ludlovskogo jarusov). Trudy VNIGRI, N.S. 58: 1-85.

——, (1955) – Tabuljaty paleozoja evropejskoj chasti SSSR. Vvedenie. Obshchie voprosy sistematiki i istorii razvitija tabuljat (s kharacteristikoj morfologicheski blizkikh grupp). Trudy VNIGRI, N.S. 85: 1-528.

——, (1962) – Osnovy paleontologii. Tabulata. 2: 192-254.

Sokolov, B.S. & Yu. I. Tesakov (1963) – Tabuljaty paleozoja Sibiri. Tabuljaty Ordovika i Silura vostochnoj chasti Sibiri. AN SSSR: 1-188.

Stasinska, A. (1967) – Tabulata from Norway, Sweden and from the erractic boulders of Poland. Paleont. Polonica 18: 9-112.

Stearn, C.W. (1956) – Stratigraphy and paleontology of the Interlake group and Stonewall formations of southern Manitoba. Canada geol. Surv. Mem. 281: 1-162.

Stel, J.H. (1975) – Erratische Favositidae der nördlichen Niederlande. Der Geschiebesammler, Sonderheft 2: 1-100.

Strusz, D.L. (1961) – Lower paleozoic corals from South Wales. Paleont. 4: 334-361.

Thompson, d'Arcy W. (1917) – On growth and form. Cambridge University Press, Cambridge.

Yü, C.M. (1962) – Note on the Multisolenid corals from Xingjlang, Gansu & Sichuan. AP Sin. 10: 351-360.

Zhizhina, M.S. & M.A. Smirnova (1959) – Favozitidy i Tamnoporidy iz Silurijskikh otlozhenij Vostochnogo Tajmyra. NIIGA. Cb. statej po paleont. i biostratigr. 16: 62-93.