

NEW MICROFOSSILS FROM THE SILURIAN
(LLANDOVERY, STAGE 6) OF THE
OSLO REGION, NORWAY

by ØRNULF LAURITZEN

ABSTRACT. Two new microfossils of problematic affinities are described from the Llandovery of the Oslo Region, viz. *Sandvikina brachiata* gen. et sp. nov. and *Regnellia camera* gen. et sp. nov. Both occur in biomicritic limestones in the Oslo region, while the latter is also found in a biosparite from Dalarna, Sweden.

DURING a current study of the sediments and fauna of stage 6 in the Lower Silurian of the Oslo region (Lauritzen and Worsley in prep.), two undescribed types of microfossils have been found in biomicritic limestones. Both types were found in samples collected in Sandvika (Oslo-Asker district, see Størmer 1953, p. 53), which is located 12 km WSW. of Oslo centre. The fossils can only be detected in thin section. Samples collected from the same beds at other localities in the central part of the Oslo region (at Spirodden 16 km SW. of Oslo centre and on the island of Malmøya 5 km S. of Oslo centre) contained neither of these microfossils. At Sandvika both types occur together with the blue-green alga *Girvanella* sp., suggesting a shallow-water depositional environment for these beds in the area (Lauritzen and Worsley 1974); this alga is also found at Spirodden, but not on Malmøya. Neither of these microfossils have been previously described or recorded from the Oslo region, but *Regnellia camera* has been found in Dalarna, Sweden (Regnéll 1947). Regnéll did not suggest any possible affinities for these structures, and this question remains open. As these microfossils seem to be of stratigraphic value, a new description is given in the hope that it may stimulate information on their geographical distribution, stratigraphical range, and possible affinities.

DESCRIPTIONS

PROBLEMATICA

Genus SANDVIKINA gen. nov.

Type species. *Sandvikina brachiata* sp. nov.

Derivation of name. After the village of Sandvika 12 km WSW. of Oslo centre.

Diagnosis. In section a 4.75 mm almost trapezoidal-shaped microfossil; hollow, with complex wall-structure.

Sandvikina brachiata sp. nov.

Plate 101 and Plate 102, fig. 1; text-figs. 1 and 2

Holotype. The specimen in thin section figured on Plate 101, PMO 93905.

[Palaeontology, Vol. 17, Part 3, 1974, pp. 707-714, pls. 101-102.]

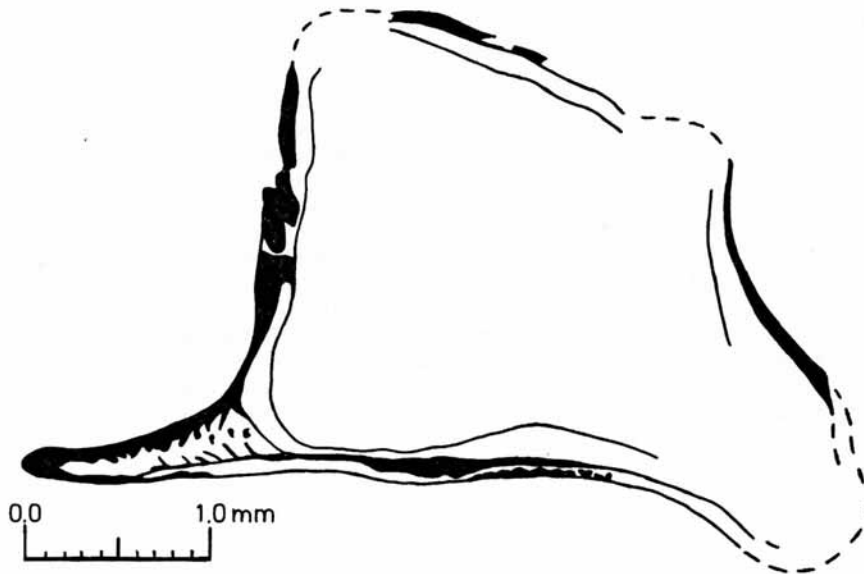
Type horizon and type locality. Llandoverly, stage 6c in a roadsection by Ringeriksveien, Sandvika, Oslo-Asker district, Norway.

Derivation of name. The species occurs with arm-like structures in some sections (Pl. 101, fig. 2).

Material. In addition to the holotype, four other specimens have been found. One has all the elements shown on text-fig. 1 and Plate 101, fig. 1. In two others the outgrowth and two sides of the main part are preserved (text-fig. 2 and Pl. 101, fig. 2), while in the last the outgrowth only is preserved (Pl. 102, fig. 1).

Description. The holotype (text-figs. 1 and 2 and Pl. 101) has a total length of approximately 4.75 mm (in section). It has an almost trapezoidal shape, and an outgrowth is seen in one corner. The terms 'outgrowth' and 'main part' are purely descriptive, and are not intended to have any genetic meaning.

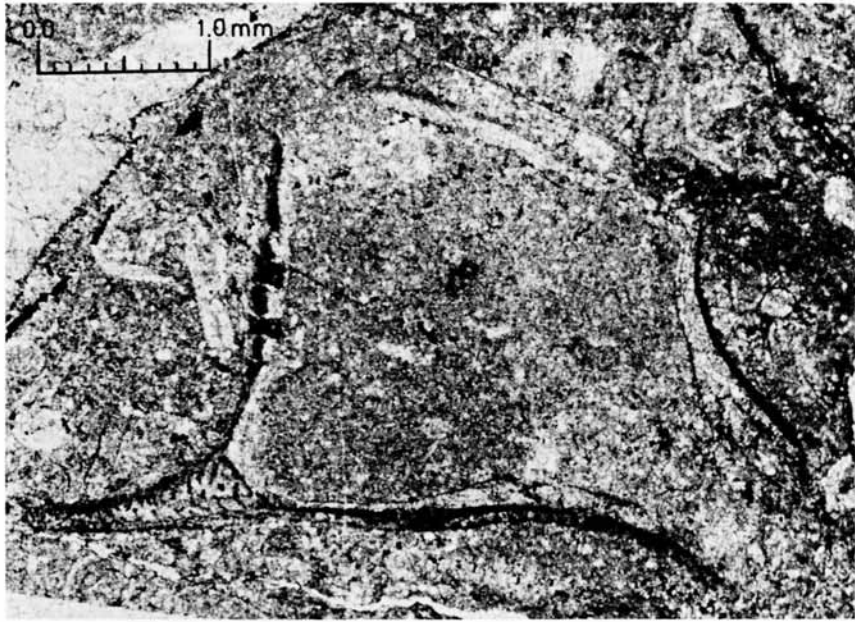
The outgrowth (text-fig. 2, Pl. 101 and Pl. 102, fig. 1) is about 1.75 mm long, and consists of an outer wall surrounding a central chamber. Septa point into the chamber from the inside of the wall. The septa are somewhat irregularly orientated, but tend



TEXT-FIG. 1. An interpretation of the holotype of *Sandvikina brachiata* (see Pl. 101, fig. 1). The outgrowth and the two sides of the main part attached to it have good contact with each other. The three other corners of the trapezoidal structure are not preserved, but the position of the remaining sides and structures in the sediment points to the configuration shown above.

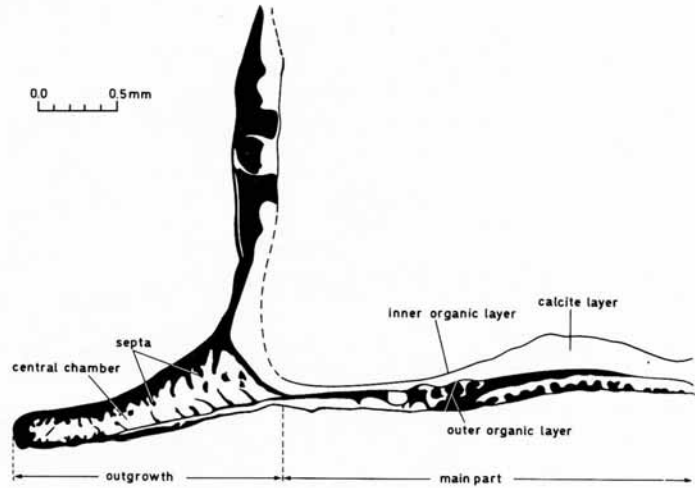
EXPLANATION OF PLATE 101

Figs. 1, 2. *Sandvikina brachiata* gen. et sp. nov., holotype. PMO 93905. 1, having the almost trapezoidal shape, with the outgrowth in the lower left-hand corner. 2, details from the outgrowth and the two sides of the main part attached to it. Both the septa of the outgrowth and the complexity of the walls can be seen.



LAURITZEN, Silurian microfossils

to point towards the apex of the outgrowth. One septum completely separates the outgrowth from the main part of the organism, and no aperture is evident. The wall is imperforate and consists mostly of one layer, but in one part a double wall appears. The main part (text-figs. 1 and 2, and Pl. 101) of the organism is almost trapezoidal in shape in the section seen here, and is about 3 mm in diameter. The two sides adjacent to the outgrowth are the best preserved, their lengths being about 2.7 mm (see text-fig. 2 and Pl. 101, fig. 2).



TEXT-FIG. 2. The diagram shows the best-preserved parts of *Sandvikina brachiata* and the names used here for the different organic structures described.

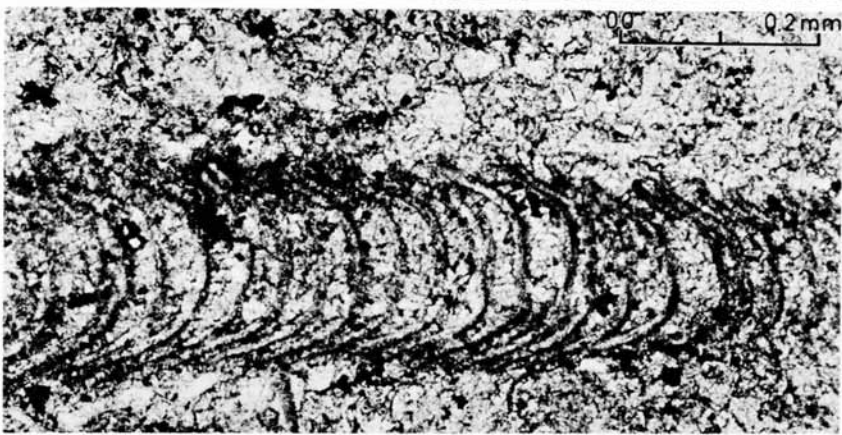
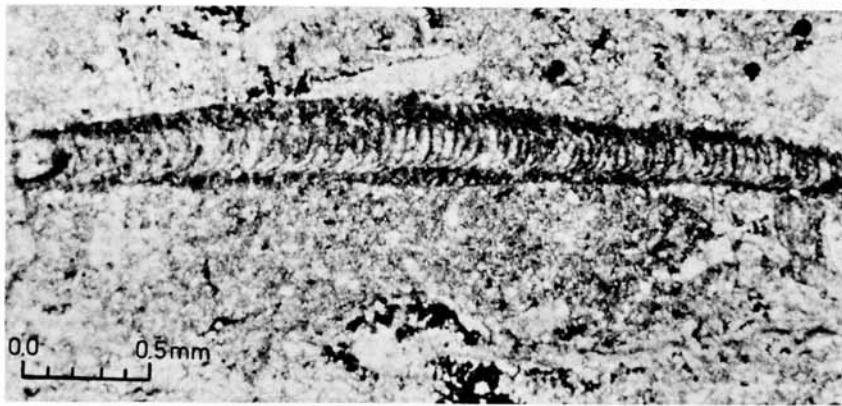
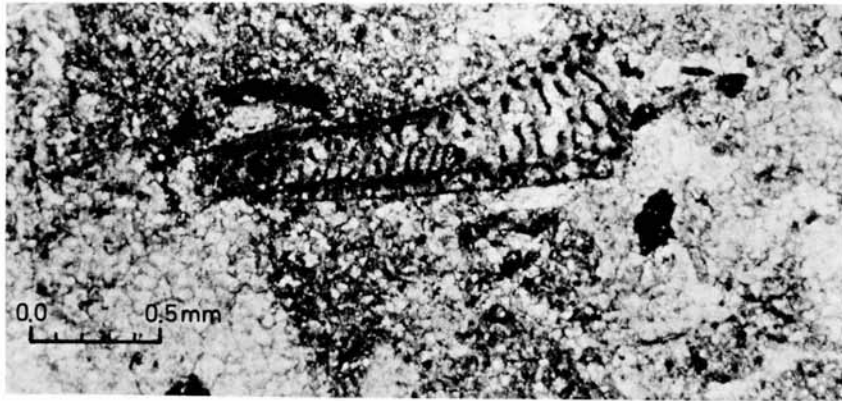
The wall of the main body appears to consist of at least two layers of organic material, a relatively thick (approx. 0.1 mm) outer layer with a composite structure, and a simple membranous inner layer; these are separated by a calcite layer varying in thickness between 0.05 and 0.25 mm.

In the best-preserved portion of the section, the thicker outer layer appears to consist of two membranes with an intervening space irregularly filled with wall material. In one portion of the section the arrangement of the latter is reminiscent of septa. The calcite layer consists of crystalline calcite with crystals of varied size.

EXPLANATION OF PLATE 102

Fig. 1. *Sandvikina brachiata* gen. et sp. nov., PMO 93903. An incomplete outgrowth without other parts of the organism preserved.

Figs. 2, 3. *Regnellia camera* gen. et sp. nov., holotype. PMO 93904. 2, clearly divided into chambers, and thicker in the middle than at the ends. 3, detail from the holotype. The chamber walls are all double, but no outer wall can be seen.



LAURITZEN, Silurian microfossils

A grained structure is apparent (Horowitz and Potter 1971, p. 63) with irregular optic orientation under crossed nicols.

All walls are imperforate and brownish in colour.

Distribution. The specimens described here are found in biomicritic limestones from stage 6c at Sandvika. Samples with this species have been found with a stratigraphical separation of 50 metres.

Genus REGNELIA gen. nov.

Type species. *Regnellia camera* sp. nov.

Derivation of name. This genus is named in honour of Professor G. Regnéll, who first recorded and illustrated, but did not name, this microfossil from Dalarna, Sweden (Regnéll 1947).

Diagnosis. In section a 3.25 mm long sub-cylindrical and chambered microfossil, with no recognizable wall structure.

Regnellia camera sp. nov.

Plate 102, figs. 2 and 3

Holotype. The specimen in thin section figured on Plate 102, figs. 2 and 3, PMO 93904.

Type horizon and type locality. Llandover, stage 6c in a roadsection by Ringeriksveien, Sandvika, Oslo-Asker district, Norway.

Derivation of name. The species shows chambers in section.

Material. Three thin sections from stage 6c at Sandvika, and one thin section from a crackfilling in the Boda limestone of Kallholn, Dalarna, Sweden (The University of Lund, LO 3434-3437 Slide 4772).

Description. The holotype (Pl. 102, fig. 2) has a total length of 3.25 mm, while other specimens in thin section are all fragments. The fossil is sub-cylindrical with a medial diameter of about 0.35 mm, tapering to 0.2 mm at both ends.

It has well-defined chambers, and the chamber walls are all double (Pl. 102, fig. 3). The walls are imperforate and no wall-structures are visible. There are 24-26 chamber walls per mm length in the Sandvika specimens, while there are 13 per mm in the Swedish specimens.

No outer walls can be seen in the Norwegian material, but some of the Swedish specimens show a poorly defined wall-like structure (Regnéll 1947, p. 4, fig. 3).

Distribution. *Regnellia camera* is found in biomicritic limestones of stage 6c at Sandvika, Oslo region, Norway, and in crackfilling in the Boda limestone of Kallholn, Dalarna, Sweden.

DISCUSSION

The affinities of these microfossils are not clear, and it is also uncertain whether they represent fragments of larger organisms or are complete as seen in the thin sections figured here. The completeness of *Sandvikina brachiata* is highly uncertain as there is no natural ending seen in three of the corners of its trapezoidal structure. The only complete corner is that with an outgrowth (text-fig. 1 and Pl. 101, fig. 1) so that there

could originally have been equivalent structures in the three other corners, although this is unlikely.

Regnellia camera appears to be more complete, with a natural termination at both ends. The Norwegian specimens are thought to belong to the same species as those found in Sweden in spite of the different proportions of the chambers in the two localities. *R. camera* occurs in quite different sediment types in Norway and Sweden. The Swedish specimens are found in a biosparite (suggesting a rather turbulent depositional environment), while the Norwegian material is found in biomicrites indicative of quieter conditions. Since the bottom conditions were probably so different, a pelagic way of life may be indicated. Some specimens of *S. brachiata* are obviously incomplete and lack the main part, and this partial preservation might indicate some post-mortem transport, but says nothing about the mode of life of the organism.

Both the Norwegian and the Swedish material of these microfossils appear together with fragments of other fossils. Regnéll (1947) stated that the only macrofossils present in hand specimens were brachiopods and sparse columnals of pelmatozoans, but in the thin section I have also found whole ostracods and fragments of ostracods, trilobites, and bryozoans. The faunal elements seen in thin sections of the Norwegian material are somewhat similar; fragments of brachiopods, bryozoans, corals, echinoderms, ostracods, trilobites, and colonies of the blue-green alga *Girvanella* sp.

The sediment in which the Swedish specimens of *R. camera* are found occur as crackfillings in the Upper Ordovician (Harjuan) Boda limestone (Regnéll 1947). The fissures are filled with graptolitic shales belonging to the Middle Llandovery (Thorslund 1960). These shales sometimes contain concretionary horizons of dark limestone, and the biosparite from Dalarna with *R. camera* probably comes from such limestone nodules.

In the Oslo region the same microfossils are found in the uppermost part of stage 6. Bassett and Rickards (1971) correlated stage 6c of the Oslo district with the Middle and Upper Llandovery (B₃-C_{2/3}) beds of the Llandovery district. If the Swedish and the Norwegian specimens of *R. camera* are of the same age, then this could support the view of Thorslund (1960) that in Dalarna the Lower Llandovery is missing above the Boda limestone.

Acknowledgements. I am indebted to Professor Gerhard Regnéll, University of Lund, Sweden, for letting me borrow the Swedish specimens from Dalarna. I am grateful to Dr. Svein B. Manum for his help in preparing parts of this manuscript. I would also like to thank Drs. David Bruton and David Worsley for their criticism and help.

REFERENCES

- BASSETT, M. G. and RICKARDS, R. B. 1971. Notes on Silurian stratigraphy and correlation in the Oslo district. *Norsk. Geol. Tidsskr.* **51**, 247-260.
- HOROWITZ, A. S. and POTTER, P. E. 1971. *Introductory Petrography of Fossils*. Springer-Verlag. Berlin-Heidelberg-New York.
- LAURITZEN, Ø. and WORSLEY, D. 1974. Algae as depth indicators in the Silurian of the Oslo region. *Lethaia*, **7**, 157-161.
- REGNÉLL, G. 1947. Some problematic micro-fossils from the Silurian of Dalarna. *Kungl. Fysiografiska Sällsk. i Lunds Förhandl.* bd. 17, nr. 5.

- STØRMER, L. 1953. The Middle Ordovician of the Oslo region, Norway. I. Introduction to Stratigraphy. *Norsk Geol. Tidsskr.* **31**, 37-141.
- THORSLUND, P. 1960. Notes on the Geology and Stratigraphy of Dalarna. *Intern. Geol. Congr. 21st Session, Norden. Swedish geol. guidebooks.*

ØRNULF LAURITZEN
Geological Institute
University of Oslo
Postbox 1047, Blindern
Oslo 3
Norway

Typescript received 2 November 1973