

A NEW EXCYSTMENT MECHANISM IN THE SILURIAN ACRITARCH *DIEXALLOPHASIS* OF VIRGINIA

by A. B. REAUGH

ABSTRACT. *Diexallophasis denticulata* (Stockmans and Williere) Loeblich, 1970 excysted through an ornamented circumferential break in the central body wall. This is the first report of a patterned opening among acritarchs which have previously been reported to open by simple rupture or cryptosuture.

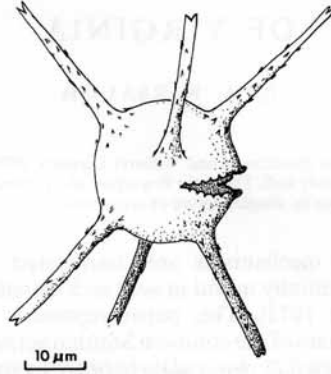
ACRITARCH excystment mechanisms are characteristic features (Loeblich and Tappan 1969) and are potentially useful in acritarch classification based on morphologic similarities (Downie 1973). This paper reports a new style of excystment mechanism for the type species of the common Silurian acritarch genus *Diexallophasis*.

Other workers have reported *D. denticulata* to open 'by simple rupture of the central body' (Loeblich 1970) or 'by cryptosuture, apical or near-equatorial' (Lister 1970, referring to *Evittia granulatispinosa* in whose synonymy he placed *Baltisphaeridium denticulatum* = *D. denticulata*). Stockmans and Williere (1963) did not mention any opening in their original description of *D. denticulata*, but their holotype (1963, pl. 1, fig. 4) clearly shows an unornamented opening. The opening appears to be a straight slit which follows a chord of a hypothetical great circle around the spherical central body; it is probably not an epityche, which, in contrast, can be defined geometrically as following the outline of a small circle on the central body surface. Downie (1973) mentioned the *Diexallophasis* type among acritarchs constituting the *Visbysphaera* group whose 'members . . . open by a cryptosuture (small scale epityche)'.

Another kind of median split excystment structure is found in the acritarch genus *Orthosphaeridium* (Eisenack) Kjellström. The central body is rectangular, and the generic description requires 'a median split, dividing the vesicle into two almost equal halves' (Kjellström 1971, pl. 49). The degree of development of the split varies from species to species; *O. insculptum* Loeblich, 1970 is characterized by complete splitting, yielding specimens commonly found as halves.

Specimens of *Diexallophasis denticulata* from the Rose Hill Formation of Highland County, Virginia, U.S.A., show openings by a rupture which follows a chord of a hypothetical great circle around the central body (text-fig. 1; Pl. 100, figs. 2, 5). Both sides of the opening are ornamented by small, closely spaced bumps (0.5 μm –2 μm in diameter) which form a scalloped pattern along the opening. These bumps are laterally restricted to the sides of the opening and are distinctly different from the spines which ornament the processes and the areas immediately around the process bases (Pl. 100, figs. 5, 7). The bumps are thickenings of the body wall and may represent secondary developments; they do not extend past the split, and the split is

limited by the bumps. All *D. denticulatum* specimens which demonstrate excystment features show this ornamented pattern (11% of specimens examined). This method of excystment may be a local variation within a very variable taxon. It is a distinct form and definitely not a rupture due to compression of the body wall (Pl. 100, figs. 1, 3 show broken walls adjacent to the ornamented openings).



TEXT-FIG. 1. *Diexallophasis denticulata*; reconstruction showing typical ornament, processes, and opening.

SYSTEMATIC PALAEOLOGY

Genus *DIEXALLOPHASIS* Loeblich, 1970

Diexallophasis denticulata (Stockmans and Williere) Loeblich, 1970

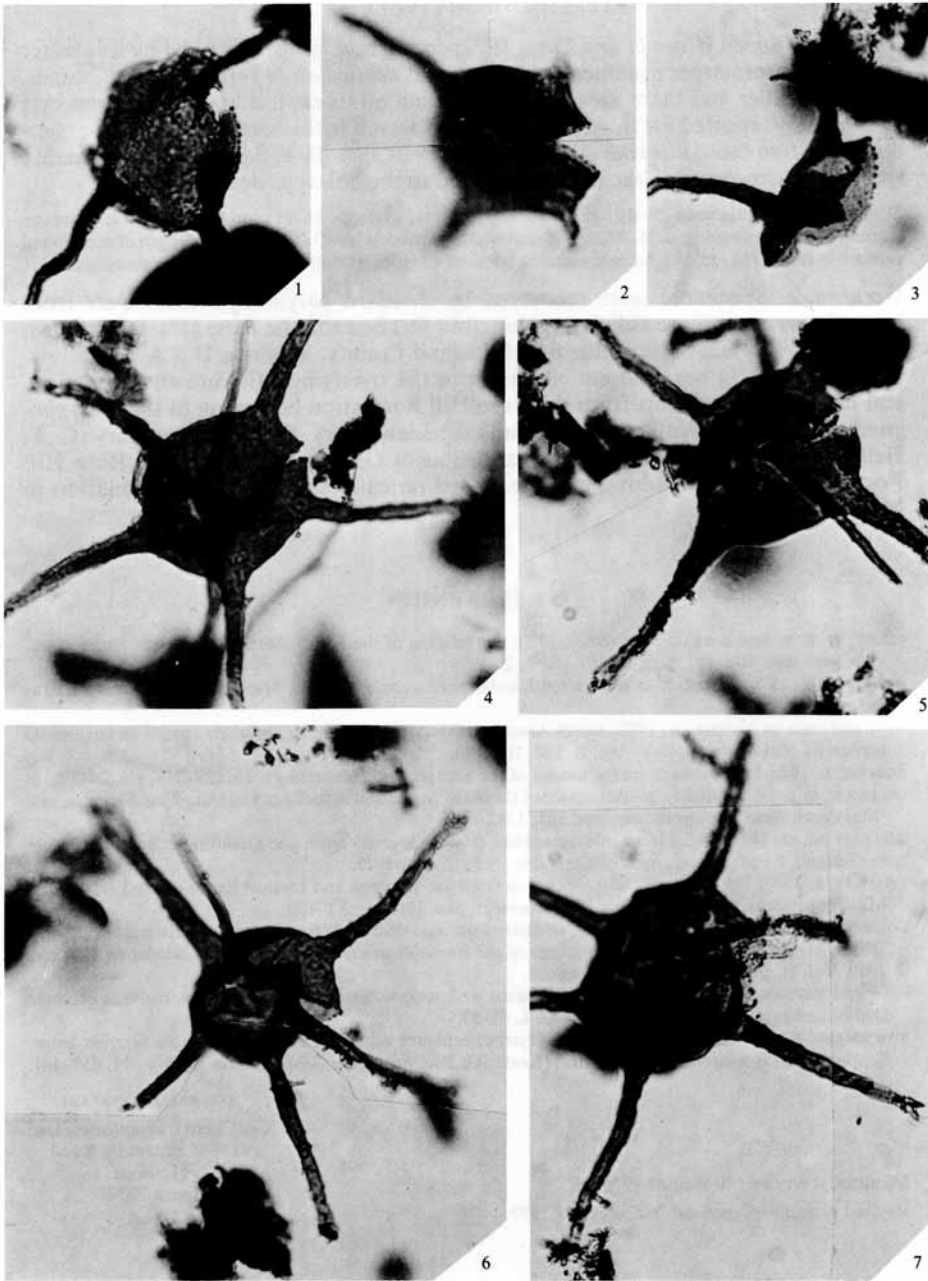
Plate 100, figs. 1-7; text-fig. 1

Remarks. Specimens recorded here conform to the limits of variability previously reported for this taxon (for summary see Lister 1970, p. 69). Two morphologically similar taxa occur in the same sample. One, *D. denticulatissima* = *Multiplicisphaeridium*

EXPLANATION OF PLATE 100

Diexallophasis denticulata (Stockmans and Williere) Loeblich, 1970. All specimens are from the author's slide 64-1 from the Rose Hill Formation of Highland County, Virginia, U.S.A. All figs. $\times 940$ and are from unretouched negatives. Coordinates are given to the left of (L) and towards the bottom of (+) the slide relative to the upper right-hand corner of the cover slip.

- Fig. 1. Broken specimen showing difference between the ornament of the rupture and the rupture developed at random near a process base. (L46·9, +17·7).
 Fig. 2. Specimen with gaping opening ornamented on both sides of the rupture. (L48·5, +20·6).
 Fig. 3. Broken specimen showing difference between patterned opening and broken wall. (L2·6, +19·1).
 Figs. 4, 5. Typical specimens with openings. (L38·7, +13·0), (L37·4, +20·6).
 Fig. 6. Specimen with very large bumps along rupture. (L48·7, +16·1).
 Fig. 7. Specimen showing difference in ornament of the rupture and the spines at the base of the process. (L13·4, +17·5).



REAUGH, *Diexallophasis* from Virginia

denticulatissimum (Cramer and Diez, 1972) comb. nov. is distinguished by its greater size and denser, larger ornament; the other, *M. denticulatum gothlandicum* (Cramer, 1970) is smaller and there are no obvious grana on its central body. The inner cyst occasionally reported for these taxa was not observed in this sample. These specimens do differ from those illustrated by Loeblich (1970, figs. 8A-E, 9A-C) in having smaller spines on the processes, like those illustrated in the holotype description.

Dimensions. Body diameter 28–41 μm (mean 33 μm); total diameter 95–111 μm (102 μm); 6–8 processes (commonly 6); process length 31–42 μm (38 μm); width of process base 3–5 μm (4 μm); length of excystment rupture 9–20 μm (15 μm). Eighteen specimens with ornamented excystment features were measured.

Occurrence. Specimens were recovered by standard palynologic techniques from green shales of the Rose Hill Formation, four feet beneath the Rose Hill–Mifflintown contact on Virginia State Route 642, Highland County, Virginia, U.S.A.

Helfrich (1975) reported conodonts from the overlying Mifflintown Formation, and has found conodonts from the Rose Hill Formation belonging to the *amorphognathoides* zone of Walliser which spans the Llandovery–Wenlock boundary (C. T. Helfrich 1977, pers. comm.). Berry and Boucot (1970, p. 215) date the Rose Hill Formation as late Llandovery in age, based on ostracodes from the Formation in Maryland.

REFERENCES

- BERRY, W. B. N. and BOUCOT, A. J. (eds.). 1970. Correlation of the North American Silurian rocks. *Spec. Pap. geol. Soc. Am.* **102**, i–xii, 1–289, pls. 1, 2.
- CRAMER, F. H. 1970. Distribution of selected Silurian acritarchs. *Revta esp. Micropaleont.*, Numero Extraordinario, 1–203.
- and DIEZ DE CRAMER, M. 1972. North American Silurian palynofacies and their spatial arrangement: acritarchs. *Palaeontographica*, Abt. B, **138**, 107–180.
- DOWNIE, C. 1973. Observations on the nature of the acritarchs. *Palaeontology*, **16**, 239–259, pls. 24–27.
- HELFRICH, C. T. 1975. Silurian conodonts from the Wills Mountain Anticline, Virginia, West Virginia, and Maryland. *Spec. Pap. geol. Soc. Am.* **161**, 1–82.
- KJELLSTRÖM, G. 1971. Ordovician microplankton (Baltisphaerids) from the Gröttingba Borehole No. 1 in Gotland, Sweden. *Sver. geol. Unders. Afh., Ser. C.* **655**, 1–75.
- LISTER, T. R. 1970. The acritarchs and chitinozoa from the Wenlock and Ludlow Series of the Ludlow and Millichope areas, Shropshire. Part I. *Palaeontogr. Soc. [Monogr.]* 1–100.
- LOEBLICH, A. R. JUN. 1970. Morphology, ultrastructure and distribution of Paleozoic acritarchs, pp. 705–788. In YOCHELSON, E. L. (ed.). *Proceedings of the North American Paleontological Convention Chicago, 1969*, Vol. II, pt. G. Allen Press, Lawrence.
- and TAPPAN, H. 1969. Acritarch excystment and surface ultrastructure with descriptions of some Ordovician taxa. *Revta esp. Micropaleont.* **1**, 45–57.
- STOCKMANS, F. and WILLIERE, Y. 1963. Les Hystrichospheres ou mieux les acritarches du Silurien belge. Sondage de la Brasserie Lust a Courtrai (Kortrijk). *Bull. Soc. belge Géol. Paléont. Hydrol.*, **71**, 450–481.

ANN BROOKE REAUGH
GeoChem Laboratories, Inc.
1143-C Brittmore Road
Houston
Texas 77043
U.S.A.

Manuscript received 11 August 1976

Revised manuscript received 20 December 1977