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# Silurian Palynomorphs

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The data obtained from an independent study of acritarchs, chitinozoans and miospores enables the determination of maximum age ranges of samples taken from three wells. These are shown in Fig. 8.

## ACRITARCHS

At present, samples have been examined from six wells – A1-46, Core 2; E1-81, Cores 3, 4; F1-46, Core 3; D-31, Core 1; A1-81, Core 3 and C1-31, Core 8. The last mentioned is considered no further here as all samples have to date proved barren. The oldest of the acritarch assemblages are recorded from E1-81, Cores 3, 4 between 1850ft. and 2340ft. (Fig. 8) and from A1-81, Core 3 between 3750ft. and 3773 ft. These are dominated by the polygonomorph acritarchs, *Veryhachium trispinosum* and *V. valiente* but also include acanthomorphs such as *Diexallophasis* and *Multiplicisphaeridium*. The lack of diagnostic acritarchs of post *convolutus* zone would indicate the age of the samples as Rhuddanian to Early Aeronian but no higher than *convolutus* zone. Wells A1-46, Core 2 between 9710 to 9721 ft. (Fig. 8); D1-31, Core 1, 6105 to 6160 ft. (Fig. 8) and F1-46, Core 3, 8852 to 8858 ft. all yield rich assemblages dominated by *Multiplicisphaeridium, Diexallophasis* and *Veryhachium* and characteristic species of *Visbysphaera, Cymbosphaeridium, Oppilatala* and *?Dateriocradus*. The presence of forms such as *Oppilatala eoplanktonica, ?Dateriocradus monterrosae, Multiplicisphaeridium arbusculiferum, Diexallophasis caperoradiola* and *Visbysphaera gotlandicum* indicate the assemblages are of post-*convolutus* zone age, thus late Aeronian, as an oldest date.

Regional palynological differences in the acritarch assemblages are observed between North Africa and Great Britain, which are consistent with the views of Cramer (1970 – see Silurian references) and Cramer & Diez (1972). During the Silurian the North African region belonged to one realm (the *Neoveryhachium carminae* "facies") and Great Britain to another, the *Deunffia-Domasia* realm. Hence genera such as *Deunffia* and *Domasia* which are characteristic in Great Britain of equivalent horizons to some of the Libyan material and which are particularly useful in the biozonation of such strata are absent. The attribution of the Libyan assemblages to precise horizon or horizons by comparison with the type area is thus hampered by such variations. *Neoveryhachium carminae* is recorded sporadically in most of the samples under study and is a dominant form in Well C1-44, located in Sirte Basin west of the study area.

## CHITINOZOANS

For a long time, well documented information concerning early Llandovery chitinozoans was lacking while uppermost Llandoverian, Wenlockian and Ludlovian assemblages are well known especially from studies carried out in Scandinavia, U.S.S.R., Belgium, Spain and North Africa. Recently investigations in Canada (Achab, 1981) and Estonia (Nestor, 1976, 1980 a-b) provided new data on Early Llandoverian chitinozoans. Four wells (E1-81, D1-31, A1-81 and A1-46) yielded the Silurian chitinozoan assemblages discussed here. Among the species recorded, several are believed to be new and are kept in open nomenclature. These taxa are: *Sphaerochitina* sp. A (E1-81, 2270ft; 2250 to 2270ft., and 1968 to 1988ft.), *Sphaerochitina* sp B. (D1-31, 6105 to 6106ft. and 6159 to 6160ft.), *Spinachitina* sp. B. (A1-81, 3750 to 3773ft., E1-81, 2250 to 2270ft.) *Spinachitina* sp. C (A1-81, 3750 to 3773 ft.) and *Angochitina* sp. A. The latter is restricted to one sample (1968 to 1988ft.) in Well E1-81, where it is abundant. Associated with these taxa are better known species such as *Conochitina edjelensis elongata, Conochitina armillata, Plectochitina pseudoagglutinans* and *"Sphaerochitina" vitrea*. All these species were described from strata referred to the "middle and late" Llandovery in the Sahara (Taugourdeau, 1963). Most of them are well represented in the four samples of Well D1-31 (6105 to 6106ft., 6120 to 6121ft., 6140 to 6141ft., and 6156 to 6160ft.).

The range of forms belonging to *Cyathochitina* (*C.* sp. B, Paris 1981 and *C.* cf. *campanulaeformis*) are useful for stratigraphical purposes. These taxa do not exceed the early part of the Telychian (sensu Cocks *et al.* 1984). Indeed, they are not yet represented in the uppermost Llandovery outcrops of Gotland (Laufeld, 1974). In addition *Cyathochitina* occurs in the Juuru (G1-2) and Raikküla (G3) Estonian stages, but is lacking in the Adavere stage (Nestor, 1976). In Anticosti Island (Canada), *Cyathochitina* s.s. is still present in the Jupiter Formation (Achab, 1981) while in Spain the genus does not reach the uppermost Llandoverian levels of the

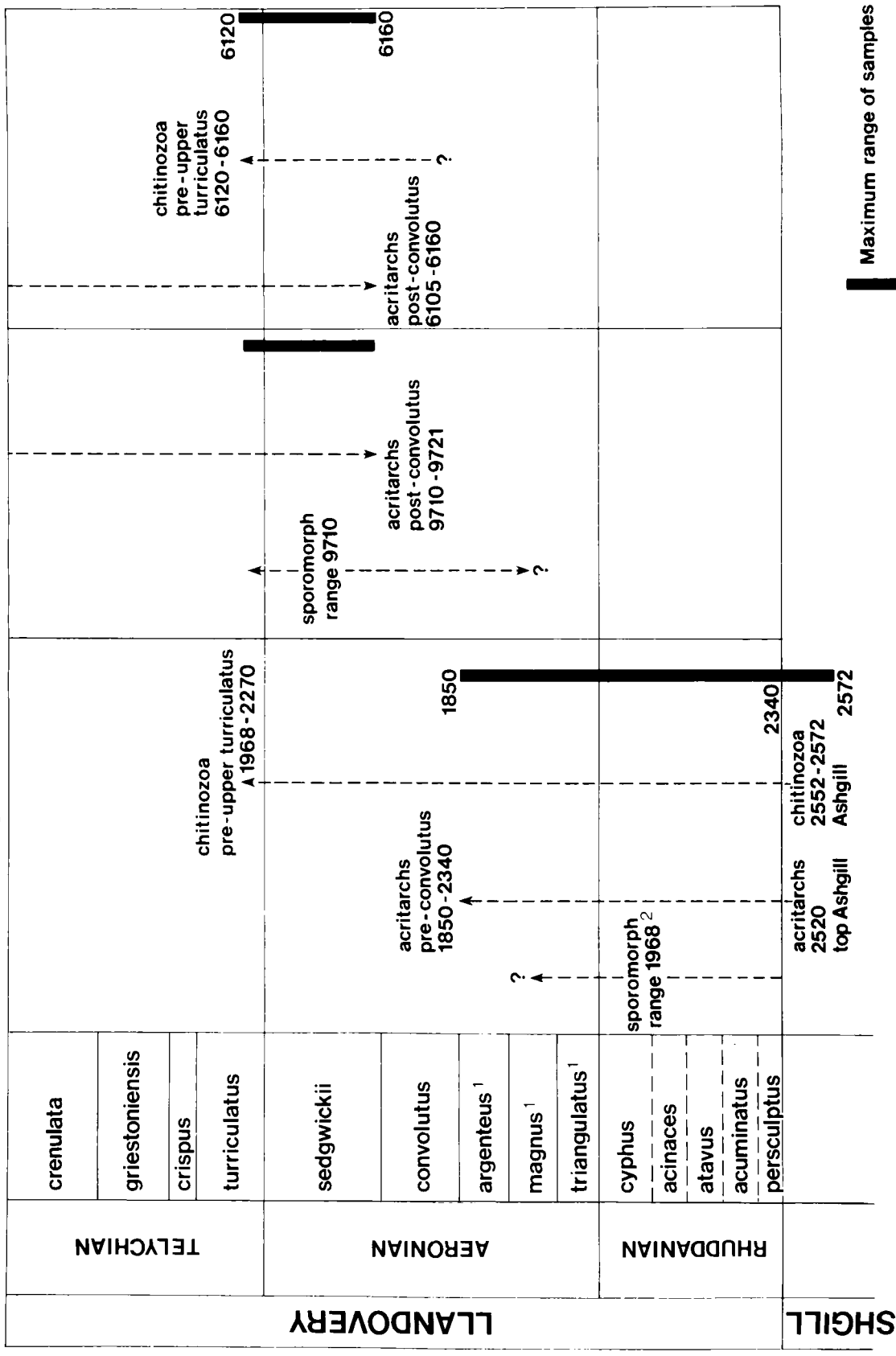


Fig. 8. Age determination of three selected wells using acritarchs, chitinozoans and miospores. 1. formerly *gregarius* (Berry & Boucot, 1970). 2. upper range *sensu* Berry *in* Gray & Boucot (1971).

Formigoso Formation (Cramer & Diez, 1978). From these data it seems likely that the Silurian samples from Wells E1-81, A1-81 and D1-31 (except in D1-31, 6105 to 6106 ft., where *Cyathochitina* was not recorded) are not younger than the early Telychian. In addition, in Well D1-31 the occurrence of a few individuals of *Conochitina proboscifera* and *C. (Densochitina) densa* is noted, both species are well represented in the uppermost Llandovery and early Wenlock of Gotland (Laufeld, 1974).

On the basis of chitinozoans, the age assignment of level 9710 ft. in Well A1-46 is more difficult to establish. Indeed the individuals are rare and the occurrence of a form, closely related to *Margachitina leonensis* from the Pridoli of Spain (Cramer, 1964), in association with Early Silurian taxa (*P. deichaii* and *C. edjelensis elongata*, and a form quite similar to *P. spongiosa*), is still unexplained, even though a late Llandovery age is expected for this assemblage.

## MIOSPORES

Silurian miospores have been obtained from core material of two wells, E1-81, (1968 to 1973 ft.) and A1-46 (9710 to 9721 ft.). The assemblages from the two wells are distinct although showing some features in common. The older of the two miospore assemblages (Well E1-81) consists entirely of dyads and tetrads with some possible alete spores. Dyads e.g. *Dyadospora murusdensa*, and 'permanent' tetrads, *Nodospora* sp., are the most common. Some of the dyads are surrounded completely by a diaphanous sheath. In these respects, and in the absence of single grain trilete miospores (i.e. those separated from tetrads), the Well E1-81 assemblages resemble those from the Medina Group (Rhuddanian, early Llandovery) of the Niagara Gorge (Miller & Eames, 1982). However, the North African assemblage contains occasional specimens of "loose" tetrads, which may suggest a younger age, but is otherwise less diverse than the Niagara Gorge assemblages. The provisional age for this level is early Llandovery and probably Rhuddanian. The basis for this age is partly the close similarities with the Rhuddanian assemblages from Niagara Gorge. In addition Hoffmeister's (1959) Libyan assemblages containing *Ambitisporites* were dated on graptolites as early to middle Llandovery and the Well E1-81 assemblage is therefore probably older but few well-dated spore assemblages have been described of this age.

A more varied and younger assemblage occurs in the sample from Well A1-46 (9710 to 9721 ft.). Two species of dyad are present *Dyadospora murusdensa* and *D. murusattenuata*, associated with "permanent" tetrads *Nodosphaera* sp., and *Rugosphaera* sp., and trilete spores *Ambitisporites dilutus*. The age of this assemblage is post Rhuddanian to earliest Telychian, approximately Aeronian but probably not earliest Aeronian. This correlation is made on the assumption that the early/middle Llandovery age of Hoffmeister's material (Berry, *in* Gray and Boucot, 1971) is roughly equivalent to the middle of the *magnus* zone (early Aeronian).

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**Explanation of Plate 8**
All figures are × 500

Fig. 1. *Saharidia* sp. 1 Combaz, 1967. A1-46, Core 2, 9714 ft., Slide 2, P43/3, AGC 79.

Fig. 2. *Saharidia* sp. 2 Combaz, 1967. F1-46, Core 3, 8852 ft., Slide 1, K49, AGC 80.

Fig. 3. *Saharidia* sp. 2 Combaz, 1967. F1-46, Core 3, 8855 ft., Slide 1, E37, AGC 81.

Fig. 4. *Tasmanites* sp. (Newton) Eisenack, 1958. F1-46, Core 3, 8852 ft., Slide 2, D26/2, AGC 82.

Fig. 5. *Pterospermella* sp. Eisenack, 1972. A1-46, Core 2, 9721 ft., Slide 1, G29/4, AGC 83.

Fig. 6. *Pterospermella* sp. Eisenack, 1972. F1-46, Core 3, 8854 ft., 5 in., Slide 1, K27/4, AGC 84.

Fig. 7. ?*Leiosphaeridia* sp. (Eisenack) Downie & Sarjeant, 1963. D1-31, Core 1, 6105-6106 ft., S. G. 6105-6106/39, AGC 85.

Fig. 8. *Leiosphaeridia* sp. (Eisenack) Downie & Sarjeant, 1963. A1-46, Core 2, 9721 ft., Slide 2, S42/4, AGC 86.

Fig. 9. *Leiosphaeridia* sp. (Eisenack) Downie & Sarjeant, 1963. A1-46, Core 2, 9721 ft., Slide 1, Q32/2, AGC 87.

Fig. 10. *Leiosphaeridia wenlockia* Downie, 1959. F1-46, Core 3, 8855 ft. 5 in., Slide 1, E41, AGC 88.

Fig. 11. *Leiosphaeridia wenlockia* Downie, 1959. E1-81, Core 3, 1968-1988 ft., Slide 1, N40/4, AGC 89.

Fig. 12. *Lophosphaeridium parverarum* Stockmans & Willière, 1963. E1-81, Core 4, 2270 ft., Slide 1, L45/3, Cluster, AGC 90.

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Plate 8


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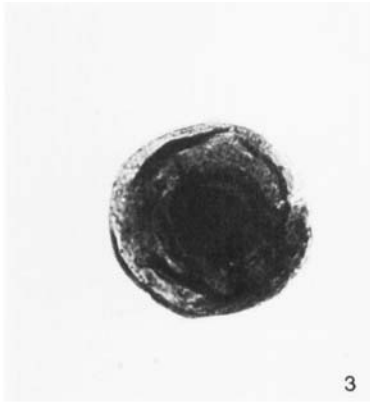
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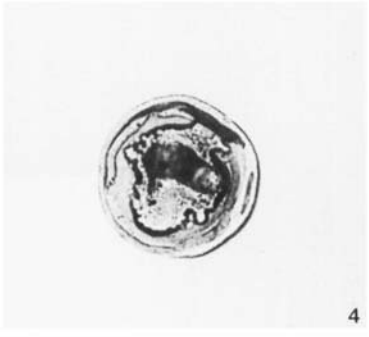
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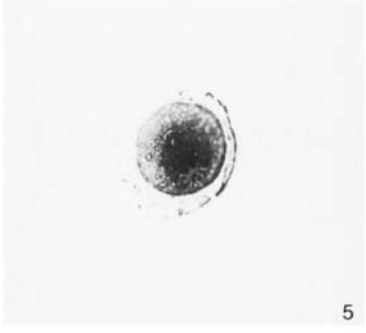
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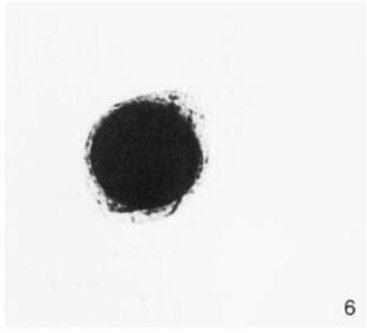
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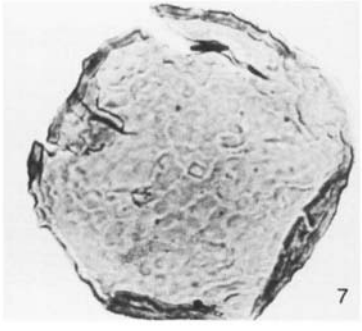
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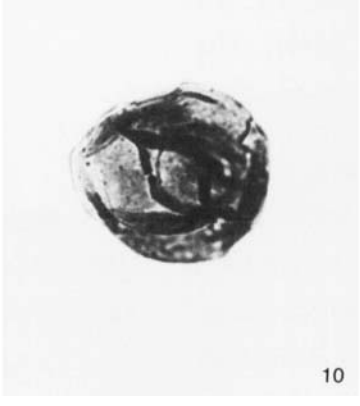
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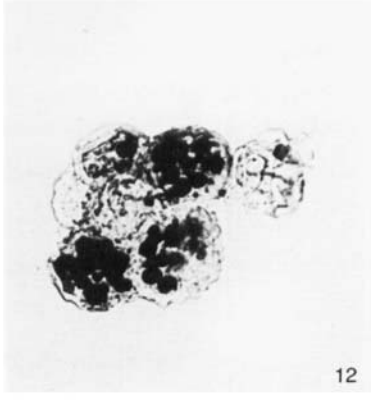
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**Explanation of Plate 9**
All figures are × 500

Fig. 1. *Eupoikilofusa striatifera* (Cramer) Cramer, 1970. F1-46, Core 3, 8854 ft. 5 in., Slide 1. G42/3, AGC 91.

Fig. 2. *Eupoikilofusa striatifera* (Cramer) Cramer, 1970. F1-46, Core 3, 8854 ft. 5 in., Slide 1. R42, AGC 92.

Fig. 3. *Leiofusa tumida* Downie, 1959. F1-46, Core 3, 8854 ft. 5 in., Slide 1. R29, AGC 93.

Fig. 4. *Leiofusa banderillae* Cramer, 1964. F1-46, Core 3, 8852 ft. Slide 1. S45/3, AGC 94.

Fig. 5. *Leiofusa banderillae* Cramer, 1964. F1-46, Core 3, 8852 ft. Slide 1. D26, AGC 95.

Fig. 6. *Leiofusa fusiformis* (Eisenack) Eisenack, 1938. D1-31, Core 1, 6105-6106 ft., Slide 1, F47, AGC 96.

Fig. 7. *Veryhachium wenlockium* Formgroup Downie, 1959. F1-46, Core 3, 8852 ft., Slide 1, M40/4, AGC 97.

Fig. 8. *Veryhachium trispinosum* Formgroup (Eisenack) Cramer, 1964. J1-81A, 12800-12850 ft., S.G. 12800-12850/35, AGC 98. (Ordovician specimen).

Fig. 9. *Veryhachium valiente* Cramer, 1964. D1-31, Core 1, 6140-6141 ft., Slide 1, M57, AGC 99.

Fig. 10. *Neoveryhachium carminae* (Cramer) Cramer, 1970. F1-46, Core 3, 8852 ft., Slide 1, 030/3, AGC 100.

Fig. 11. *?Dateriocradus monterrosae* (Cramer) Dorning, 1981. F1-46, Core 3, 8855 ft., Slide 1, M33/1, AGC 101.

Fig. 12. *Dictyotidium dictyotum* (Eisenack) Eisenack, 1955. F1-46, Core 3, 8852 ft., Slide 1, L41/1, AGC 102.

Fig. 13. *Buedingiisphaeridium* sp. D1-31, Core 1, 6140-6141 ft., Slide 1, K57, AGC 103.

Fig. 14. *Tunisphaeridium parvum* Deunff & Evitt, 1968. D1-31, Core 1, 6140-6141 ft., Slide 1, K45/1, AGC 104.

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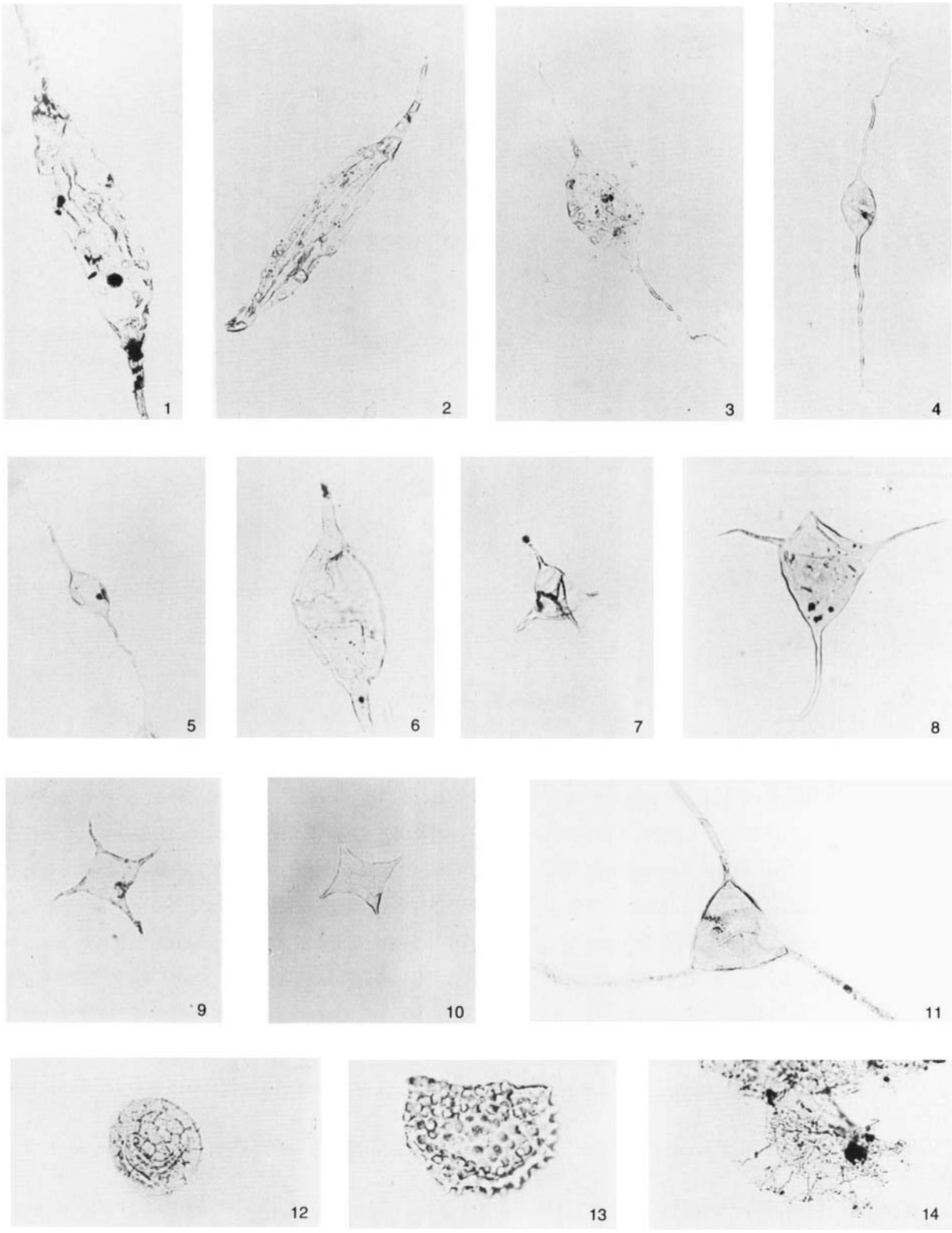
Plate 9



**Explanation of Plate 10**
All figures are × 500

Fig. 1. *Cymbosphaeridium pilaris* (Cramer) Lister, 1970. F1-46, Core 3, 8854ft. 5in., Slide 1, J36/4, AGC 105.

Fig. 2. *Oppilatala eoplanktonica* Loeblich & Wicander, 1976. F1-46, Core 3, 8858ft., Slide 1, H39/1, AGC 106.

Fig. 3. *Oppilatala eoplanktonica* Loeblich & Wicander, 1976. F1-46, Core 3, 8854ft. 5in., Slide 1, E24, AGC 107.

Fig. 4. *Oppilatala eoplanktonica* Loeblich & Wicander, 1976. F1-46, Core 3, 8852ft., Slide 1, E42, AGC 108.

Fig. 5. *Oppilatala eoplanktonica* Loeblich & Wicander, 1976. D1-31, Core 3, 6159-6160ft., Slide 1, G47/2, AGC 109.

Fig. 6. *Multiplicisphaeridium fisherii* (Cramer) Lister, 1970. F1–46, Core 3, 8855ft., Slide 1, K44, AGC 110.

Fig. 7. *Multiplicisphaeridium fisherii* (Cramer) Lister, 1970. F1–46, Core 3, 8855ft., Slide 1, T35/3, AGC 111.

Fig. 8. *Multiplicisphaeridium ?fisherii* (Cramer) Lister, 1970. F1–46, Core 3, 8852ft., Slide 1, H36/1, AGC 112.

Fig. 9. *Multiplicisphaeridium fisherii* (Cramer) Lister, 1970. F1–46, Core 3, 8852ft., Slide 1, H39, AGC 113.

Fig. 10. *Multiplicisphaeridium arbusculiferum* (Downie) Staplin, Jansonius & Pocock, 1965. F1-46, Core 3, 8858ft., Slide 1, H46, AGC 114.

Fig. 11. *Multiplicisphaeridium ramusculosum* (Deflandre) Lister, 1970. F1-46, Core 3, 8858ft., Slide 1, F47/3, AGC 115.

Fig. 12. *Multiplicisphaeridium ramusculosum* (Deflandre) Lister, 1970. D1-31, Core 1, 6105-6106ft., Slide 1, J51/4, AGC 116.

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Plate 10


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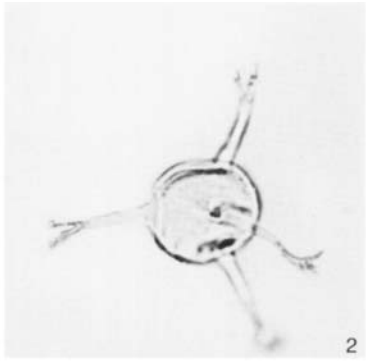
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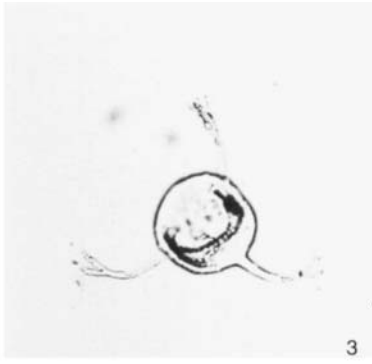
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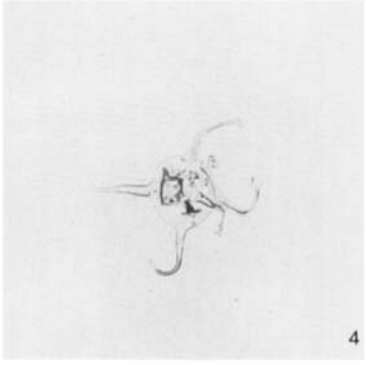
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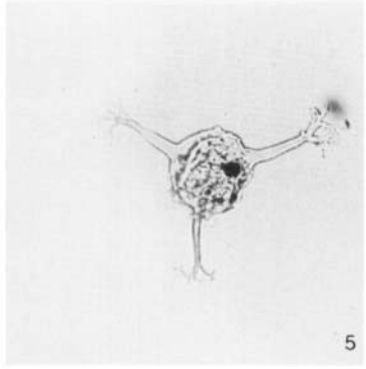
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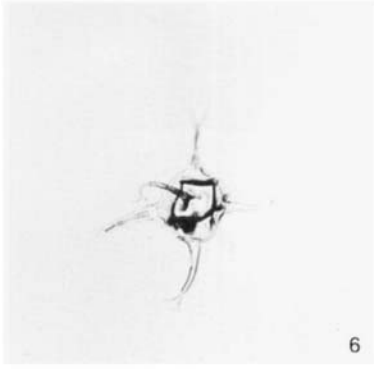
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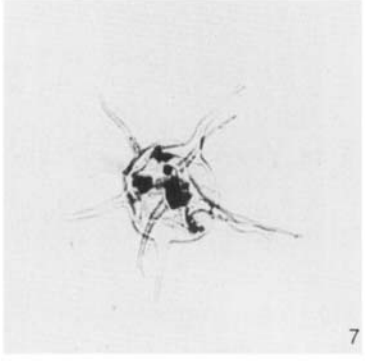
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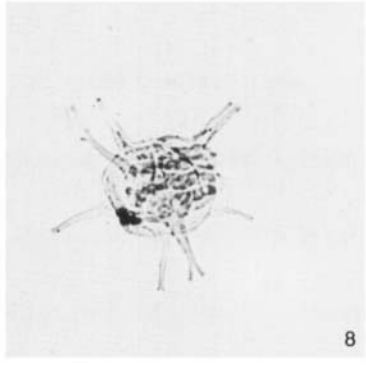
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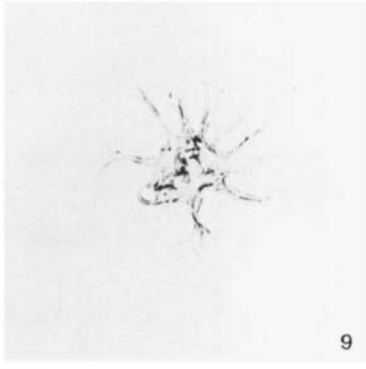
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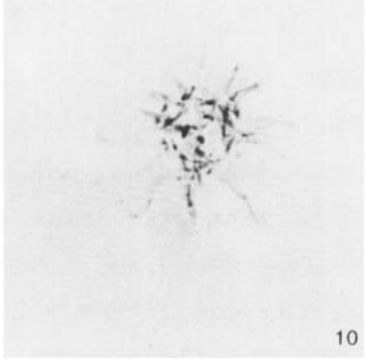
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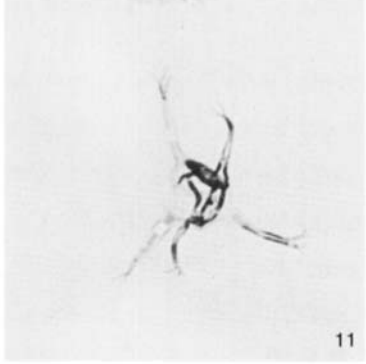
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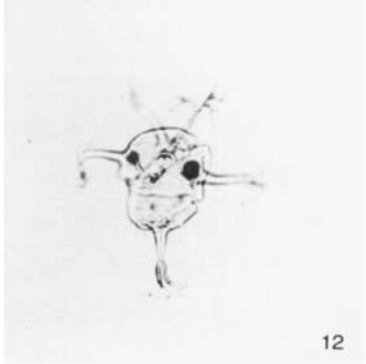
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**Explanation of Plate 11**
All figures are × 500

Fig. 1. *Diexallophasis denticulata* (Stockmans & Willière) Loeblich 1969. F1-46, Core 3, 8855ft., Slide 1, E39, AGC 117.

Fig. 2. *Diexallophasis denticulata* (Stockmans & Willière) Loeblich, 1969. D1-31, Core 1, 6140-6141ft., Slide 1, H46/4, AGC 118.

Fig. 3. *Diexallophasis caperoradiola* Loeblich 1969. F1-46, Core 3, 8854ft. 5in., Slide 1, L31/1, AGC 119.

Fig. 4. *Diexallophasis caperoradiola* Loeblich 1969. F1-46, Core 3, 8852ft., Slide 1, G34/4, AGC 120.

Fig. 5. *Diexallophasis denticulata* (Stockmans & Willière) Loeblich 1969. F1-46, Core 3, 8852ft., Slide 1, 039/4, AGC 121.

Fig. 6. *Diexallophasis caperoradiola* Loeblich 1969. D1-31, Core 1, 6159-6160ft., Slide 1, 052, AGC 122.

Fig. 7. *Visbysphaera microspinosa* (Eisenack) Lister 1970. F1-46, Core 3, 8852ft., Slide 1, D29/4, AGC 123.

Fig. 8. *Visbysphaera microspinosa* (Eisenack) Lister 1970. F1-46, Core 3, 8852ft., Slide 1, G34/3, AGC 124.

Fig. 9. *Visbysphaera microspinosa* (Eisenack) Lister 1970. F1-46, Core 3, 8852ft., Slide 1, Q35/3, AGC 125.

Fig. 10. *Visbysphaera gotlandicum* (Eisenack) Lister 1970. D1-31, Core 1, 6159-6160ft., Slide 1, M42/1, AGC 126.

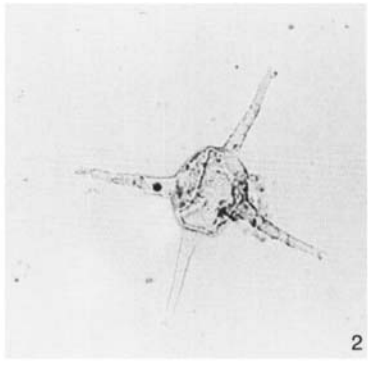
Fig. 11. *Visbysphaera microspinosa* (Eisenack) Lister 1970. F1-46, Core 3, 8852ft., Slide 1, Q34/4, AGC 127.

Fig. 12. *?Tylotopalla* sp. Loeblich, 1969. A1-46, Core 2, 9710ft., Slide 2, N50/3, AGC 128.

P. J. Hill
Llandovery Acritarchs

Plate 11


1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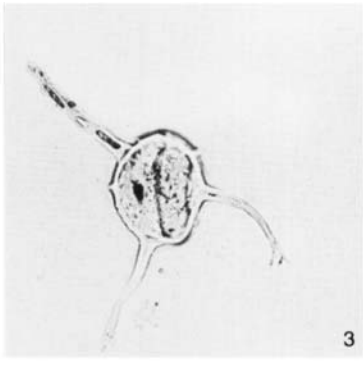
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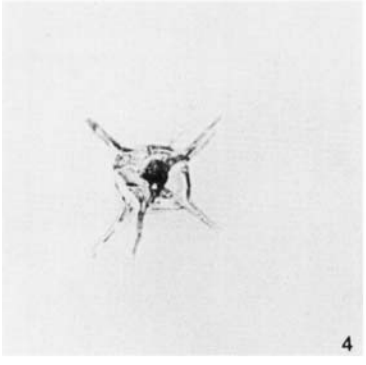
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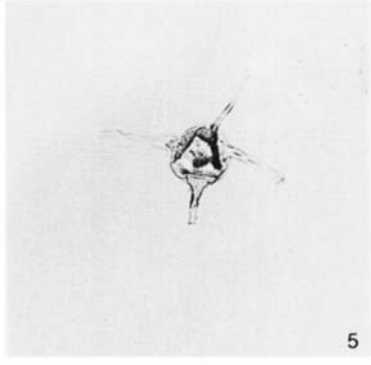
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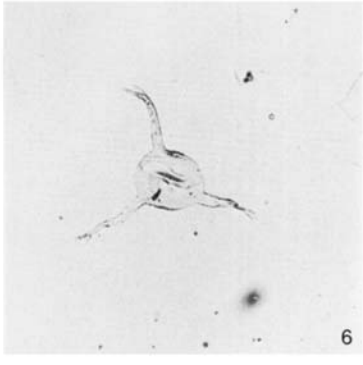
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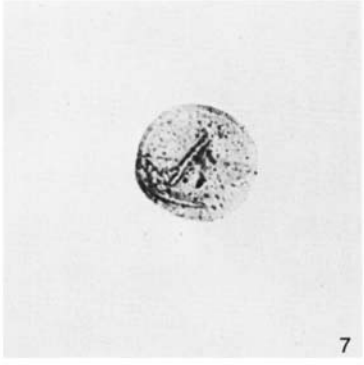
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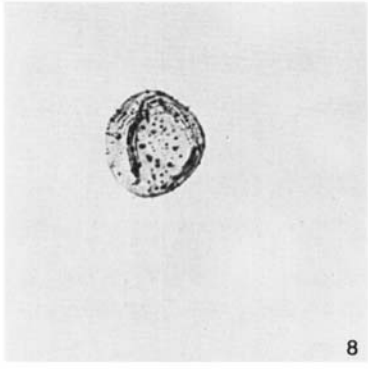
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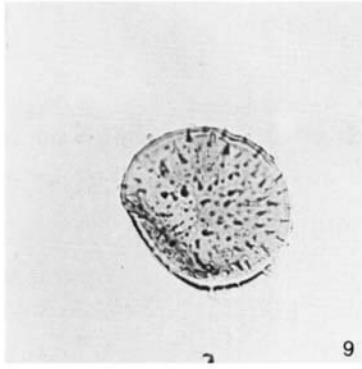
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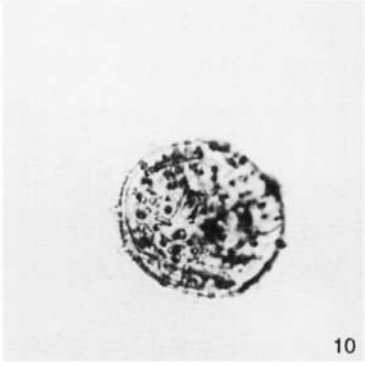
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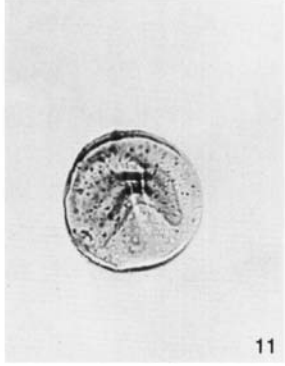
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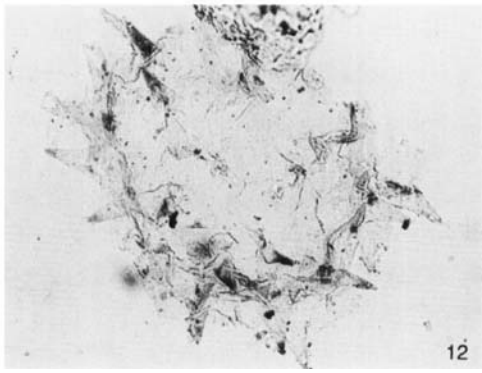
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**Explanation of Plate 12**

Fig. 1. *Plectochitina* sp. aff. *sylvanica* (Jenkins, 1970). A1-81, 3750-3773 ft., Slide 8, 032, ×300, AGC 129. (*P. sylvanica* is an Ashgillian species).

Fig. 2. *Spinachitina* sp. B. A1-81, 3750-3773 ft., Slide 8, 036, ×300, AGC 130.

Fig. 3. *Spinachitina* sp. B. A1-81, 3750-3773 ft., Slide 8, Q37/2, ×300, AGC 131.

Fig. 4 a-b. *Belonechitina postrobusta* ?(Nestor, 1980a). A1-81. 3750-3773 ft., Slide 8, Q37/1, 4a: ×300; 4b: ×1000, AGC 132. (*B. postrobusta* is restricted to the Early Llandovery).

Fig. 5 a-b. *Plectochitina pseudoagglutinans* (Taugourdeau, 1963). A1-81. 3750-3773 ft., Slide 8, 038, 5a: ×300; 5b: ×1000, AGC 133. ("Middle-Upper" Llandovery).

Fig. 6. *Spinachitina* sp. C. A1-81, 3750-3773 ft., Slide 8, P37/3, ×350, AGC 134.

Fig. 7 a-b. *Spinachitina* sp. B. A1-81, 3750-3773 ft., Slide 8, P34/2, 7a: ×300; 7b: ×1500, AGC 135.

Fig. 8. *Ancyrochitina laevaensis* Nestor, 1980a. A1-81, 3750-3773 ft., Slide 8, P32, ×400, AGC 136. (Earliest Llandovery).

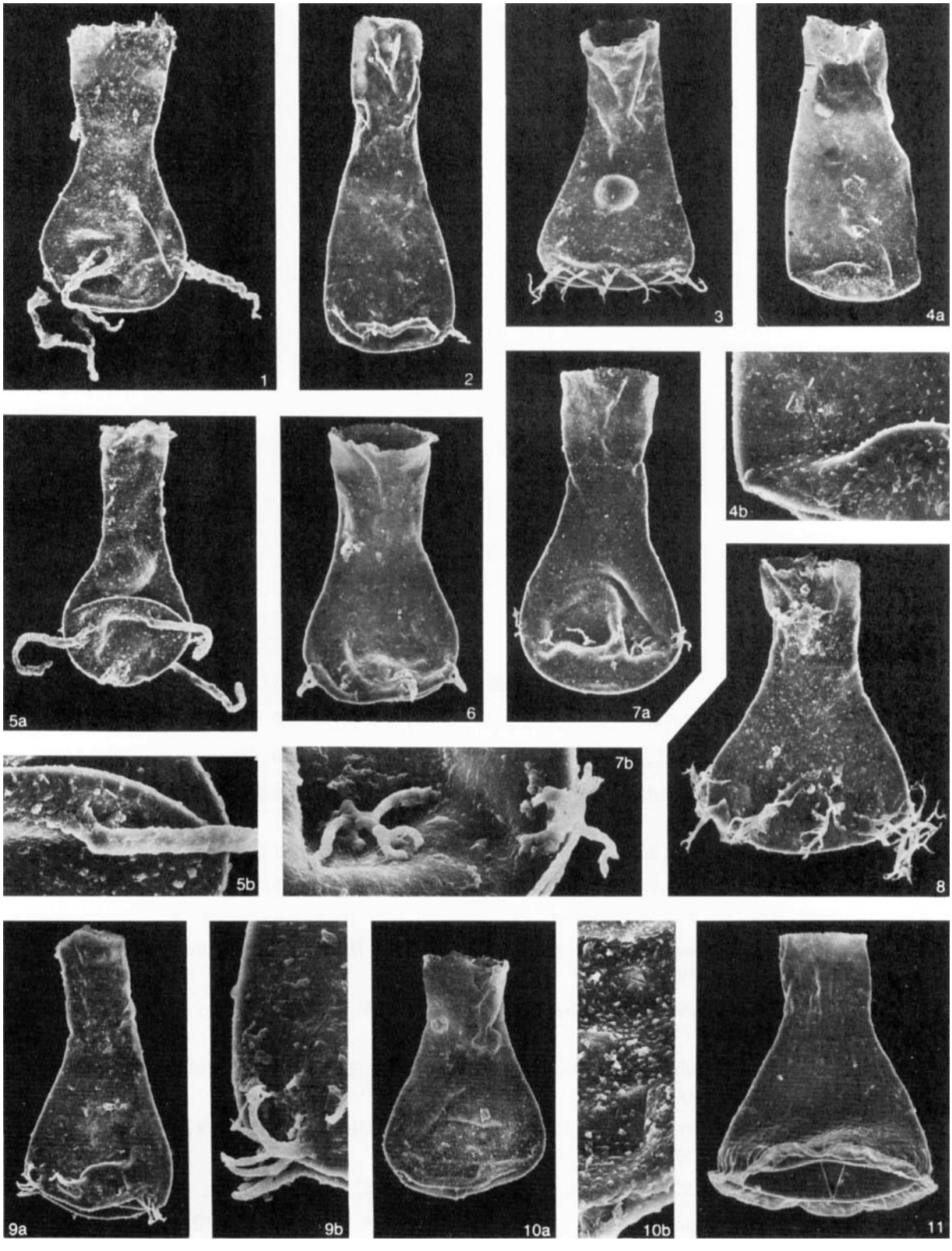
Fig. 9 a-b. *Spinachitina* sp. B. E1-81, 2250-2270 ft., Slide 8, P40/3, 9a: ×300; 9b: ×1000, AGC 137. (Early Llandovery).

Fig. 10a-b. *Sphaerochitina* sp. A. E1-81, 2250-2270 ft., Slide 6, P40/4, 10a: ×300; 10b: ×1250, AGC 138. (Early Llandovery).

Fig. 11. *Cyathochitina* sp. B. Paris, 1981. (=*C. kuckerciana* Eisenack *in* Achab, 1981 pl. 4, fig. 15). E1-81, 2250-2270 ft., Slide 6, N39, ×200, AGC 139.

F. Paris
Llandovery Chitinozoans

Plate 12



**Explanation of Plate 13**

Fig. 1a-b. *Angochitina* sp. A. E1-81, 1968-1988ft., Slide 7, S37/1, 1a: ×250; 1b: ×2000, AGC 140.

Fig. 2a-b. *Angochitina* sp. A. E1-81, 1968-1988ft., Slide 7, 034/3, 2a: ×250; 2b: ×1500, AGC 141.

Fig. 3. *Ancyrochitina ancyrea* (Eisenack, 1931). E1-81, 1968-1988ft., Slide 7, M36/3, ×250, AGC 142. (Late Ashgill – Early Lochkovian).

Fig. 4. *Angochitina* sp. A. E1-81, 1968-1988ft., Slide 7, P34/1, ×250, AGC 143.

Fig. 5. *Pterochitina deichaii* Taugourdeau, 1963. A1-46, 9710ft., Slide 12, N33/4, ×500, AGC 144. ("Middle-Upper" Llandovery).

Fig. 6. *Conochitina edjelensis elongata* Taugourdeau, 1963. E1-81, 1968-1988ft., Slide 7, L34, ×250, AGC 145. ("Middle-Upper" Llandovery).

Fig. 7. *Plectochitina spongiosa* ?(Achab, 1977b). A1-46, 9710ft., Slide 12, N36, ×300, AGC 146. (*P. spongiosa* is an Ashgill – Early Llandovery ? species).

Fig. 8. *Plectochitina pseudoagglutinans* (Taugourdeau, 1963). E1-81, 1968-1988ft., Slide 7, K37, ×300, AGC 147. ("Middle-Upper" Llandovery).

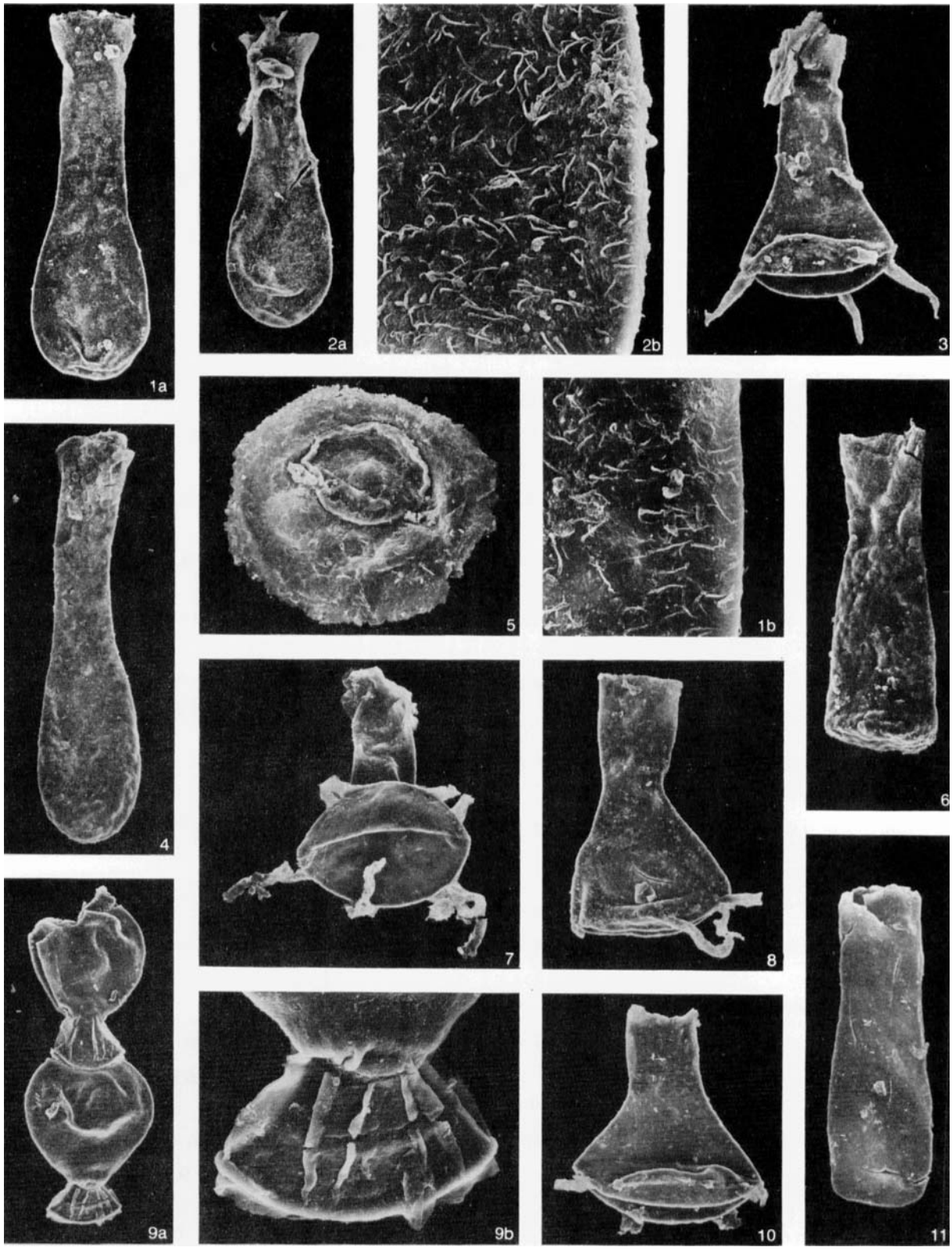
Fig. 9a-b. ?*Margachitina leonensis* (Cramer, 1964). A1-46, 9710ft., Slide 12, N37, 9a: ×300; 9b: ×1250, AGC 148. (*M. leonensis* is a Pridolian species).

Fig. 10. *Plectochitina* sp. A-46, 9710ft., Slide 12, N33, ×350, AGC 149.

Fig. 11. *Conochitina edjelensis elongata* Taugourdeau, 1963. A1-46, 9710ft., Slide 12, N37/2, ×250, AGC 150. ("Middle-Upper" Llandovery).

F. Paris
Llandovery Chitinozoans

Plate 13



**Explanation of Plate 14**

Fig. 1a-b. *Conochitina proboscifera* Eisenack, 1937. D1-31, 6120-6121ft., Slide 10, P37, 1a: ×250; 1b: ×1000, AGC 151. (Late Llandovery – Early Wenlock).

Fig. 2. *Conochitina armillata* Taugourdeau & Jekhowsky, 1960. D1-31, 6159-6160ft., Slide 9, K40/4, ×250, AGC 152. ("Middle-Upper" Llandovery).

Fig. 3. *Conochitina armillata* Taugourdeau & Jekhowsky, 1960. D1-31, 6159-6160ft., Slide 9, K40/4, ×250, AGC 153. ("Middle-Upper" Llandovery).

Fig. 4. *Ancyrochitina* cf. *tomentosa* Taugourdeau & Jekhowsky, 1960. D1-31, 6159-6160ft., Slide 9, N40, ×400, AGC 154. (*A. tomentosa* ranges from the Wenlock ? up to the Lochkovian).

Fig. 5. *Cyathochitina* cf. *campanulaeformis* (Eisenack, 1931). (= *C. campanulaeformis in* Achab, 1981, pl. 5, fig. 18). D1-31, 6159-6160ft., Slide 9, L35/4, ×200, AGC 155. (*C. campanulaeformis* s.l. ranges from the Llanvirn up to the Llandovery, where it never exceeds the Fronian).

Fig. 6. *Pterochitina deichaii* Taugourdeau, 1963. D1-31, 6159-6160ft., Slide 9, P36, ×500, AGC 156. ("Middle-Upper" Llandovery).

Fig. 7. *Calpichitina* (*Densochitina*) *densa* (Eisenack, 1962). D1-31, 6120-6121ft., Slide 10, P37, ×500, AGC 157. (Late Llandovery – Early Wenlock).

Fig. 8a-b. *Conochitina armillata* Taugourdeau & Jekhowsky, 1960. D1-31, 6105-6106ft., Slide 11, P33, 8a: ×300; 8b: ×1000, AGC 158. ("Middle-Upper" Llandovery).

Fig. 9a-b. *Sphaerochitina* sp. A. D1-31, 6159-6160ft., Slide 9, L38/3, 9a: ×300; 9b: ×1000, AGC 159.

Fig. 10. *Pterochitina deichaii* Taugourdeau, 1963. D1-31, 6120-6121ft., Slide 10, T36, ×500, AGC 160. ("Middle-Upper" Llandovery).

Fig. 11a-b. *Sphaerochitina* sp. B. D1-31, 6159-6160ft., Slide 9, N36, 11a: ×300; 11b: ×1000, AGC 161.

Fig. 12. *Ancyrochitina onniensis* ?Jenkins, 1967. D1-31, 6159-6160ft., Slide 9, N38/3, ×400, AGC 162. (*A. onniensis* ranges from Late Caradoc up to Ashgill).

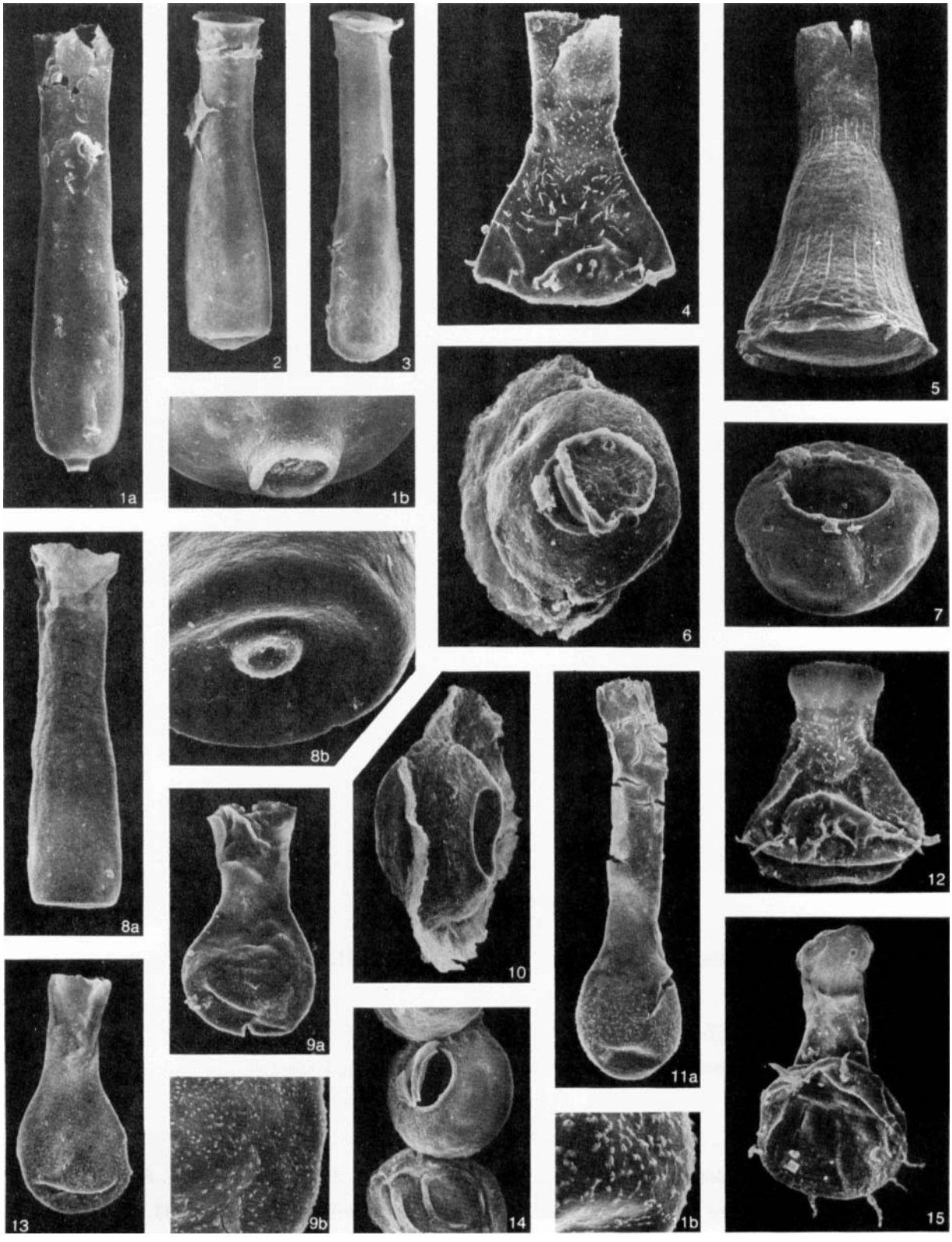
Fig. 13. *Sphaerochitina* sp. A. D1-31, 6159-6160ft., Slide 9, N40/2, ×300, AGC 163.

Fig. 14. *Calpichitina* (*Densochitina*) *densa* (Eisenack, 1962). D1-31, 6159-6160ft., Slide 9, L40/2, ×400, AGC 164. (Late Llandovery – Early Wenlock).

Fig. 15. *Ancyrochitina* sp. aff. *ansarviensis* Laufeld, 1974. D1-31, 6105-6106ft., Slide 11, 030, ×400, AGC 165. (*A. ansarviensis* is an Early Wenlock species).

F. Paris
Llandovery Chitinozoans

Plate 14



**Explanation of Plate 15**
All figures are × 1000

Fig. 1. cf. *Tetrahedraletes medinensis* Strother & Traverse, 1979. E1-81, 2520-2550ft., L39/2, AGC 166.

Fig. 2. "Loose" tetrad. E1-81, 1968-1973ft., Q33/4, AGC 167.

Fig. 3. "Permanent" tetrad. E1-81, 2520-2550ft., R33/2, AGC 168.

Fig. 4. cf. *Nodospora burnhamensis* Strother & Traverse, 1979. E1-81, 1968-1973ft., P33, AGC 169.

Fig. 5. "Loose" tetrad. E1-81, 2520-2550ft., D40, AGC 170.

Fig. 6. "Loose" tetrad. E1-81, 2520-2550ft., N44/3, AGC 171.

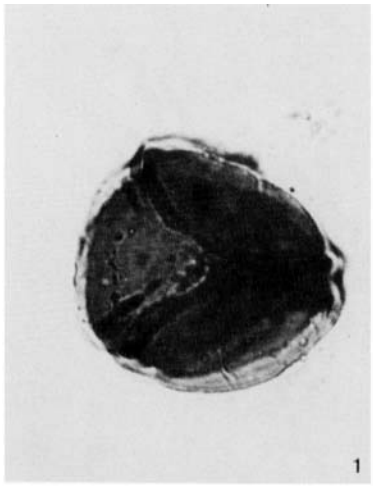
Fig. 7. *Dyadospora* cf. *murusdensa* Strother & Traverse, 1979. E1-81, 2520-2550ft., E35, AGC 172.

Fig. 8. *Dyadospora murusdensa* Strother & Traverse, 1979. E1-81, 1968-1973ft., K31-L31, AGC 173.

Fig. 9. *Dyadospora murusdensa* Strother & Traverse, 1979. E1-81, 1968-1973ft., 034, AGC 174.

J. B. Richardson
Llandovery Miospores

Plate 15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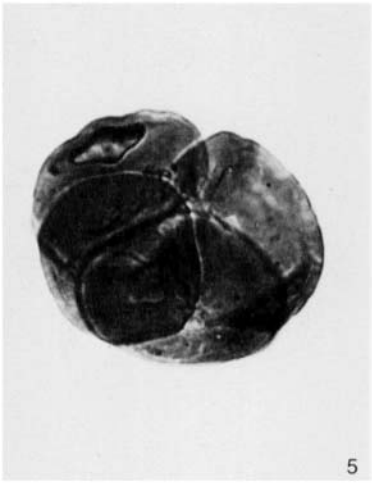
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**Explanation of Plate 16**
All figures are × 1000

Fig. 1. *Archaeozonotriletes* cf. *chulus* var. *nanus* Richardson & Lister, 1969. A1-46, Core 2, 9710ft., Slide 816K, F32, AGC 175.

Fig. 2. Tetrad A1-46, Core 2, 9710ft., Slide 816K, Q43, AGC 176.

Fig. 3. *Ambitisporites dilutus* (Hoffmeister) Richardson & Lister, 1969. A1-46, Core 2, 9710ft., Slide 816A, F38/4, AGC 177.

Fig. 4. *Archeozonotriletes* cf. *chulus* var. *chulus* Richardson & Lister, 1969. A1-46, Core 2, 9710ft., Slide 816, Q43, AGC 178.

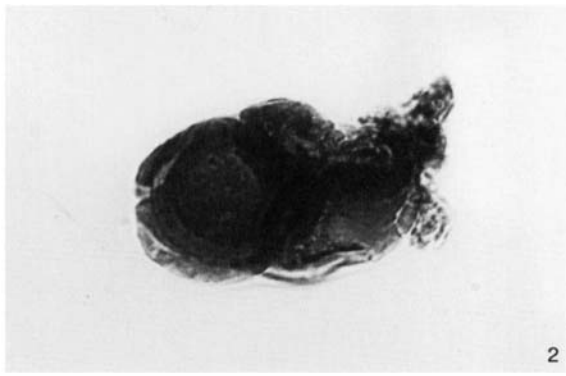
Fig. 5. *Ambitisporites dilutus* (Hoffmeister) Richardson & Lister, 1969. A1-46, Core 2, 9710ft., Slide 816K, P41/3, AGC 179.

Fig. 6. *Ambitisporites dilutus* (Hoffmeister) Richardson & Lister, 1969. A1-46, Core 2, 9710ft., Slide 816A, R41, AGC 180.

J. B. Richardson
Llandovery Miospores

Plate 16


1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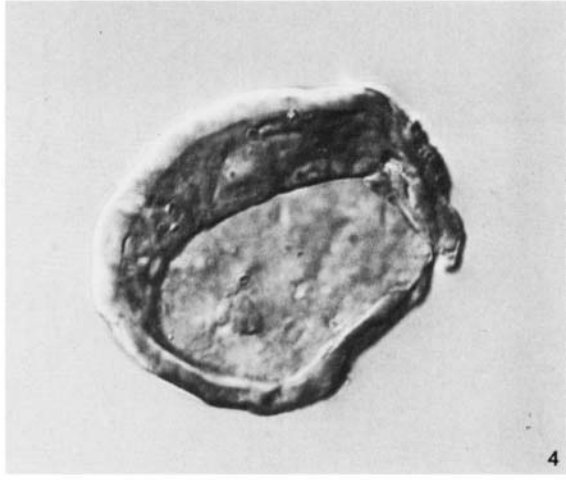
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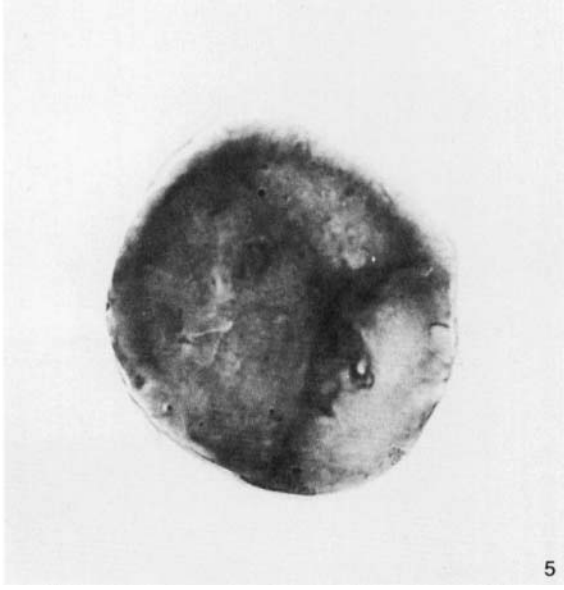
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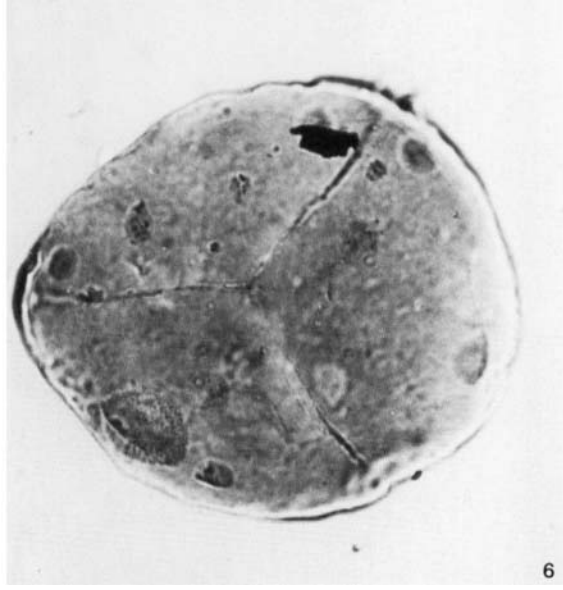
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