

## 12. PALYNOLOGICAL STRATIGRAPHY OF DEEP SEA DRILLING PROJECT SITE 416

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### ABSTRACT

Samples from DSDP Hole 416A, Cores 53 to 9, contain both spores and dinoflagellate cysts. The palynomorphs indicate the presence of Kimmeridgian-Portlandian sediments (Cores 52 and 51) which are overlain by Berriasian (Cores 50 to 32), Valanginian (Cores 32 to 10), and Hauterivian (Core 9) strata.

### INTRODUCTION

Ninety samples from DSDP Cores 416A-53 to 416A-9 (Figure 1) were palynologically analyzed. The oldest sediments dated using spores and dinoflagellates were Kimmeridgian-Portlandian. These are overlain by Berriasian, Valanginian, and Hauterivian sediments. Samples below Core 416A-53 and Core 416A-9 were received too late to include data from them in this report.

Appendix A alphabetically lists all palynomorph species recorded from Hole 416A and references the specimens illustrated in this paper. All illustrated specimens are curated at the Geological Survey of Canada, Dartmouth, Nova Scotia, under GSC type Numbers 56697 to 56793.

Details of species occurrences and age assignments are given in the following biostratigraphic section.

### BIOSTRATIGRAPHY

#### Kimmeridgian-Portlandian

The interval between Samples 416A-52-3, 99 cm and 416A-51-1, 17 cm is dated palynologically as Upper Jurassic (undifferentiated Kimmeridgian-Portlandian.)

The specimens of *Senoniasphaera jurassica* differ from the type material in possessing a perforate periphragm. They are identical to specimens common in the Oxfordian-Kimmeridgian of the Scotian Shelf, offshore south-eastern Canada (Bujak and Williams, 1977) and the Upper Jurassic of the COST B-2 well, drilled in the Baltimore Canyon, offshore eastern United States (personal observation). Some specimens of *S. jurassica* described from the Kimmeridgian of southern England by Ioannides et al. (1977) also possess small perforations in the periphragm. The species *Ctenidodinium panneum* is known only from the Portlandian of southern England (Norris, 1965) and the Kimmeridgian-Portlandian of the Scotian Shelf (Bujak and Williams, 1977). *Systematophora* sp. B of Ioannides et al. (1977) from the Kimmeridgian of southern England may be conspecific with specimens described as *Systematophora turonica* from the Callovian-Kimmeridgian of the Scotian Shelf by Bujak and Williams (1977). *?Prolixosphaeridium torynum* has a known stratigraphic range of Kimmeridgian to

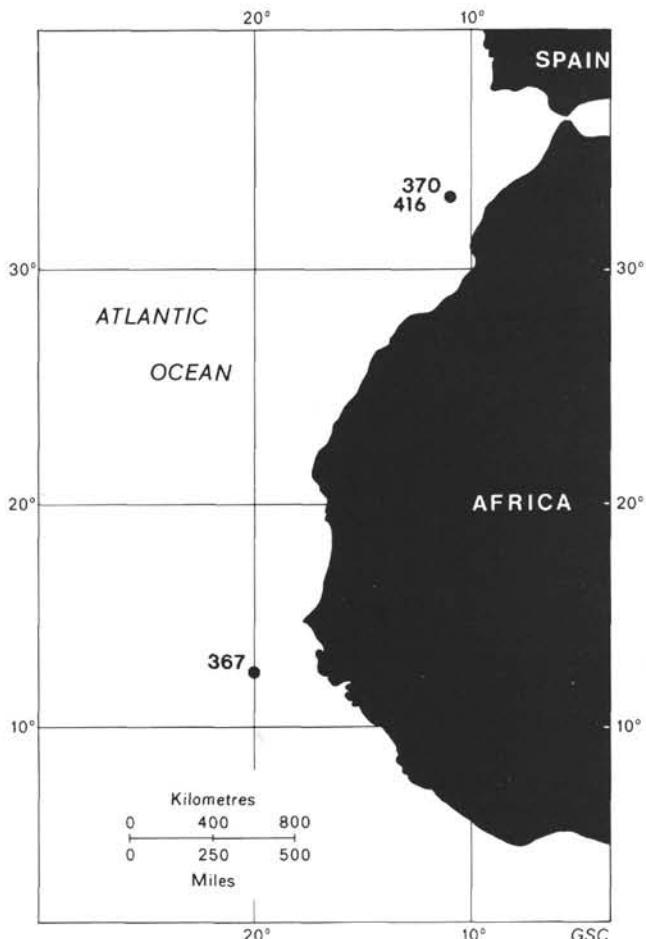


Figure 1. Location map, DSDP Sites 367, 370, and 416.

Neocomian (Cookson and Eisenack, 1960b; Ioannides et al., 1977). The stratigraphic range of *Muderongia simplex*, which was first described from the Valanginian-Barremian by Alberti (1961), has now been extended into the uppermost Oxfordian (Bujak and Williams, 1977). *Hystrichodinium* sp. A of Ioannides et al. (1977) from the Kimmeridgian of southern England is conspecific with specimens incorrectly named *Hystrichodinium*

*pulchrum* from the Kimmeridgian-Portlandian of the Scotian Shelf-Grand Banks by Bujak and Williams (1977).

Details of species occurrences are listed in Table 1.

### Berriasian

Berriasian sediments extend from Samples 416A-50-1, 49 cm to 416A-32-5, 11 cm, based on palynological analysis. Sample richness for spores and dinoflagellates varies greatly within this interval. Approximately 30 dinoflagellate species and over 20 spore species were recorded. Spores include *Appendicisporites jansonii*, *Cicatricosporites augustus*, *Cicatricosporites hughesi*, *Cicatricosporites auritus*, *Ephedripites* sp. C, *Lepolepidites psarosus*, *Pilosporites trichopapillosum*, *Trilobosporites apiverrucatus*, and *Trilobosporites jurassicus*. Except for the presence of *T. jurassicus*, this assemblage is typical of those present in the Neocomian of offshore eastern Canada (Bujak and Williams, in press).

The dinoflagellate assemblages are usually diverse for sediments of this age that have been previously described. Species present can be placed in one of three groups. First are species that have not been described from sediments older than Lower Cretaceous. These include *Endoscrinium campanulum* (Berriasian-Coniacian), *Hystrichosphaeridium recurvatum* (Valanginian-Maestrichtian), *Kleithriaspaeidium eoinodes* (Berriasian-Aptian), *Polysphaeridium warrenii* (Berriasian-Aptian), *Tanyosphaeridium boletum* (only described to date from the Barremian), and *Trichodinium castaneum* (Valanginian-Campanian). Second are species that are known from the Jurassic and Cretaceous. These include the dinoflagellates *Cyclonephelium distinctum*, *Muderongia simplex*, *Muderongia tetricantha*, *Gonyaulacysta fastigiata*, and *Tenua hystrix*, and the spores *Aequitiradites verrucosus*, *Callialasporites dampieri*, *Callialasporites trilobatus*, *Cicatricosporites australiensis*, *Corollina torosus*, *Klukisporites foveolatus*, *Klukisporites pseudoreticulatus*, *Leptolepidites psarosus*, *Pilosporites trichopapillosum*, and *Trilobosporites apiverrucatus*. Third, rare species occur that have previously been described only from the Jurassic, and that may range into the Lower Cretaceous or may represent reworking. These include *Ctenidodinium culmulum* (Kimmeridgian-Portlandian), *Gonyaulacysta ambigua* (Callovian-Portlandian), *Gonyaulacysta granulata* (Oxfordian-Portlandian), *Systematophora fasciculigera* (Oxfordian-Kimmeridgian), and *Systematophora orbifera* (Callovian-Kimmeridgian). *Scrinicassis dictyotus*, which also occurs in this interval, was first described from the Oxfordian-Tithonian of Australia and New Guinea by Cookson and Eisenack (1960) and was subsequently recorded by Habib (1972) from the "Early Cretaceous" and "probably Valanginian" of Site 105, western North Atlantic.

Details of species occurrences are listed in Table 2.

### Valanginian

Valanginian sediments extend from Sample 416A-32-3, 129 cm to 416A-10-1, 83 cm, on the basis of paly-

nological analysis. Most samples contain both spores and dinoflagellates; some are devoid of dinoflagellates, whereas a few samples contain extremely rich, diverse spore and dinoflagellate assemblages (e.g., 416A-12-4, 112-116 cm; 416A-31-3, 70-74 cm; 416A-28-3, 58-62 cm).

With the exception of rare specimens of *Ctenidodinium culmulum*, *Ctenidodinium schizoblatum*, *Gonyaulacysta ambigua*, and *Gonyaulacysta granulata*, which have previously been described only from the Jurassic, the dinoflagellate assemblages are diagnostic of Lower Cretaceous strata. Typical Cretaceous species not known from pre-Valanginian strata include *Ctenidodinium elegantulum*, *Hystrichosphaeridium recurvatum*, *Oligosphaeridium complex*, *?Spiniferites dentatus*, and *Systematophora complicata*.

Other species which occur in this interval with stratigraphic ranges restricted to the Cretaceous include *Achromosphaera neptuni* (Berriasian-Aptian), *Cribroperidinium orthoceras* (Berriasian-Cenomanian), *Cribroperidinium sepimentum* (?Hauterivian-Aptian), *Diancanthum hollisteri* (Berriasian-Valanginian), *Endoscrinium campanulum* (Berriasian-Coniacian), *Kleithriaspaeidium eoinodes* (Berriasian-Aptian), *Phoberocysta neocomica* (Berriasian-Aptian), *Pseudoceratium pelliferum* (Berriasian-Barremian), *Systematophora schindewolfii* (Berriasian-Aptian), *Tenua anaphrissa* (?Barremian-Aptian), and *Walloidium krutzschi* (Berriasian-Barremian). Details of species occurrences are given in Table 3.

### Hauterivian

Sample 416A-9-4, 31-35 cm is dated Hauterivian from comparison with the dinoflagellate assemblages present at Site 370 (Williams, in press). Species having earliest occurrences include *Cyclonephelium tabulatum*, described by Williams as *Cyclonephelium attadalicum*, *Meiourogonyaulax stoveri*, and *Oligosphaeridium pulcherrimum*. Details of species occurrences are in Table 4.

### ACKNOWLEDGMENTS

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**TABLE 1**  
Details of Spore and Dinoflagellate Species Occurrences in the Kimmeridgian-Portlandian Sequence, Site 416

Sample (Interval in cm)	Spore Species Bases	Dinoflagellate Species Bases	Dinoflagellate Species Tops	Common Species	
416A-51-1, 17-21	<i>Calliasporites trilobatus</i> <i>Contignisporites cooksonii</i> <i>Cyathidites australis</i> <i>Klukisporites foveolatus</i> <i>Klukisporites</i> sp. A (Pl. 11, Fig. 11-12)	<i>Ctenidodinium panneum</i> <i>Cometodinium</i> sp. A (Habib, 1972) <i>Gonyaulacysta granulata</i> <i>Hystrichodinium</i> sp. A (Ioannides et al., 1977) <i>Imbatodinium kondratjevi</i> <i>Muderongia simplex</i> <i>?Prolixosphaeridium torynum</i> <i>Systematophora fasciculigera</i> <i>Systematophora</i> sp. A (Habib, 1972) <i>Tenua hystrix</i> <i>Gonyaulacysta fastigiata</i> <i>Senoniasphaera</i> cf. <i>S. jurassica</i> (Pl. 3, Fig. 4) <i>Tenua verrucosa</i> ( <i>sensu</i> Habib, 1972)	<i>Ctenidodinium penneum</i> <i>Imbatodinium kondratjevi</i> <i>?Prolixosphaeridium torynum</i> <i>Senoniasphaera</i> sp. cf. <i>S. jurassica</i> <i>Systematophora fasciculigera</i>		<i>Gonyaulacysta granulata</i> <i>?Prolixosphaeridium torynum</i> <i>Senoniasphaera</i> sp. cf. <i>S. jurassica</i>
52-3, 94-99	<i>Aequitriradites spinulosus</i> <i>Callaloasporites dampieri</i> <i>Cerebropollenites mesozoicus</i> <i>Cicatricosporites hallei</i> <i>Concavissimisporites variterrucatus</i> <i>Klukisporites pseudoreticulatus</i> <i>Corollina torosus</i>				
53-1, 61-65					

**TABLE 2**  
Details of Spore and Dinoflagellate Species Occurrences in the Berriasian Sequence, Site 416

Sample (Interval in cm)	Spore Species Bases	Spore Species Tops	Dinoflagellate Species Bases	Dinoflagellate Species Tops	Common Species
416A-32-5, 11-15 34-1, 63-67 34-3, 24-28			(NO ADDITIONAL SPECIES) (NO ADDITIONAL SPECIES) (NO ADDITIONAL SPECIES)		
35-1, 69-73 35-3, 70-74	<i>Triletes</i> sp. A (Pl. 11, Fig. 4)		<i>Phoberocyta neocomica</i> <i>Trichodinium ciliatum</i>	<i>Trichodinium ciliatum</i>	
36-1, 124-128 37-1, 80-84	<i>Foraminisporites wonthaggiensis</i> <i>Perinopollenites elatooides</i>		<i>Muderongia</i> sp. cf. <i>M. simplex</i> (Pl. 5, Fig. 3, 5) <i>Cyclonephelium distinctum</i> <i>Cribroperidinium</i> sp. A (Pl. 2, Fig. 8-9) <i>Muderongia perforata</i> <i>Kleithrasphaeridium einooides</i>		
37-3, 101-105			(NO ADDITIONAL SPECIES)		
38-1, 78-82 40-1, 104-108			(BARREN)		
40-3, 60-64 40-5, 79-83			(NO ADDITIONAL SPECIES)		
41-1, 96-100	<i>Ephedripites</i> sp. A (Pl. 10, Fig. 7)	<i>Klukisporites</i> sp. A	<i>Achomosphaera neptuni</i> <i>Cyclonephelium distinctum</i> subsp. <i>brevispinatum</i> <i>Systematophora</i> sp. cf. <i>S. areolata</i> (Pl. 4, Fig. 4; Pl. 7, Fig. 6) <i>Hystrichosphaeridium recurvatum</i>		
41-3, 5-9 41-4, 70-75	<i>Deltoidospora psilostoma</i> <i>Rouseisporites reticulatus</i> <i>Aequitriradites verrucosus</i> <i>Appendicisporites jansoni</i>				
42-1, 75-79 42-3, 98-102 43-1, 104-108			(BARREN) (BARREN) (BARREN)		
43-3, 91-94	<i>Trilobosporites apiverrucatus</i>		<i>Muderongia tetracantha</i>	<i>Muderongia tetracantha</i>	<i>Muderongia simplex</i> <i>Muderongia tetracantha</i>
44-1, 43-47	<i>Calliasporites segmentatus</i> <i>Cicatricosporites hughesi</i> <i>Trilobosporites jurasicus</i> <i>Verrucosporites rotundus</i>		<i>Ctenidodinium culmulum</i> <i>Endosporites campanulum</i> <i>Polysphaeridium</i> sp. A (Pl. 1, Fig. 2; Pl. 8, Fig. 2, 4-5)		<i>Muderongia simplex</i> <i>Muderongia tetracantha</i> <i>Verrucosporites</i> spp.
45-1, 87-92 45-3, 45-49 46-1, 32-36 46-3, 114-118 47-1, 57-61			(BARREN) (BARREN) (BARREN) (BARREN) (BARREN)		
48-3, 129-132 49-1, 134-137			(NO ADDITIONAL SPECIES) (BARREN)		
50-1, 45-49	<i>Acanthotriletes varispinosus</i> <i>Cicatricosporites augustus</i> <i>Cicatricosporites australiensis</i> <i>Cicatricosporites auritus</i> <i>Leptolepidites psarosus</i>		<i>Pyxidiella</i> sp. A (Habib, 1972) <i>Scrinocassis dictyotus</i> ( <i>sensu</i> Habib, 1972) <i>Dingodinium cerviculum</i> <i>Tanyosphaeridium boletum</i>		
50-3, 58-62			(BARREN)		

TABLE 3  
Details of Spore and Dinoflagellate Species Occurrences in the Valanginian Sequence, Site 416

Sample (Interval in cm)	Spore Species Bases	Spore Species Tops	Dinoflagellate Species Bases	Dinoflagellate Species Tops	Common Species
416A-10-1, 83-86		<i>Appendicisporites jansonii</i> <i>Cicatricosporites augustus</i> <i>Cicatricosporites australiensis</i>		<i>Muderongia simplex</i>	
11-1, 64-68		<i>Aequitrtradites spinulosus</i> <i>Appendicisporites bilateralis</i> <i>Appendicisporites concentricus</i> <i>Cyathidites australis</i>			
11-3, 78-81		<i>Cicatricosporites subrotundus</i>		<i>Muderongia perforata</i> <i>Prolinoxphaeridium xanthiopyxides</i> <i>Spiniferites speciosus</i>	
11-5, 19-23		<i>Densoisporites velutus</i> <i>Klukisporites pseudoreticulatus</i> <i>Rouseisporites reticulatus</i>		<i>Endoscrinium campanulum</i>	
12-1, 112-115		<i>Concavissimisporites variverrucatus</i> <i>Leptolepidites psarosus</i>		<i>Tenua verrucosa</i> (sensu Habib, 1972)	
12-2, 62-66				<i>Cribroperidinium septimum</i> <i>Diakanthum hollisteri</i> <i>Perisseiasphaeridium sp. A</i> <i>Perisseiasphaeridium sp. B</i>	
12-4, 112-116	<i>Trilobosporites trioreticulatus</i>	<i>Contignisporites cooksonii</i> <i>Pilosispores sp. A</i>		<i>Gonyaulacysta granulata</i> <i>Tenua hystrix</i>	<i>Cicatricosporites hallei</i>
13-1, 138-141	<i>Appendicisporites bilateralis</i>				
14-1, 89-91		<i>Callialasporites segmentatus</i> <i>Cyathidites minor</i> <i>Trilobosporites apiverrucatus</i>		<i>Hystrichodinium pulchrum</i>	
14-3, 143-145		<i>Deltoidospora psilostoma</i>			<i>Cicatricosporites australiensis</i>
14-5, 41-42	<i>Pilosispores trichopapillous</i>	<i>Pilosispores trichopapillous</i> <i>Trilobosporites purverrulentus</i>	<i>Prolinoxphaeridium xanthiopyxides</i> <i>Trilobosporites purverrulentus</i>		
15-1, 41-45				<i>Kleithriasphaeridium fasciatum</i> <i>Systematophora fasciculigera</i> (sensu Habib, 1972)	
15-3, 54-58				<i>Cribroperidinium sp. A</i> <i>Systematophora complicata</i> <i>Systematophora fasciculigera</i> <i>Systematophora schindewolfii</i>	
15-5, 79-82 16-2, 91-92			(NO ADDITIONAL SPECIES) (NO ADDITIONAL SPECIES)		
16-4, 55-59		<i>Callialasporites trilobatus</i> <i>Costatoperforosporites foveolatus</i>	<i>Oligosphaeridium complex</i> <i>Oligosphaeridium sp. A, Pl. 4, fig. 1-2</i>	<i>Cyclonephelium distinctum</i> subsp. <i>brevispinatum</i> <i>Oligosphaeridium complex</i> <i>Oligosphaeridium sp. A</i>	<i>Cyclonephelium distinctum</i>
17-1, 65-69	<i>Costatoperforosporites foveolatus</i>	<i>Cicatricosporites auritus</i> <i>Foraminisporis wonthaggiensis</i> <i>Trilobosporites bernissartensis</i> <i>Trilobosporites jurasicus</i> <i>Perinopollenites elatoides</i>			
17-3, 122-124		<i>Aequitrtradites verrucosus</i> <i>Verrucosporites rotundus</i>			
18-1, 134-138		<i>Cicatricosporites hughesi</i>			
18-4, 40-43		<i>Cicatricosporites dorogensis</i>		<i>Ctenidodinium culmulum</i>	
19-1, 142-148			(NO ADDITIONAL SPECIES)		
19-3, 36-39		<i>Acanthotriletes varispinosus</i> <i>Ephedripites sp. A</i> <i>Klukisporites foveolatus</i>		<i>Dingodinium cerviculum</i> <i>Pyxidiella sp. A</i> (Habib, 1972) <i>Tenua anaphrissa</i>	<i>Cyclonephelium distinctum</i> subsp. <i>brevispinatum</i> <i>Pseudoceratium pelliferum</i>
19-5, 82-86	<i>Pilosispores sp. A</i>	<i>Laricoidites magnus</i>		<i>Polysphaeridium sp. A</i>	
20-1, 21-25					
21-1, 66-69		<i>Lycopodiumsporites crassimacerius</i>	<i>Canningia colliveri</i>		
21-3, 121-125			(NO ADDITIONAL SPECIES)		
21-5, 17-21			<i>Cribroperidinium orthoceras</i>	<i>Cribroperidinium orthoceras</i> <i>Muderongia sp. cf. M. simplex</i>	
22-1, 128-132	<i>Trilobosporites purverrulentus</i>				

22-3, 38-41			(NO ADDITIONAL SPECIES)	
22-5, 51-54			(NO ADDITIONAL SPECIES)	
23-1, 107-111		<i>Cyclonephelium vannophorum</i>	<i>Hystrichodinium</i> sp. A (Ioannides et al., 1977)	
23-2, 67-71			<i>Gonyaulacysta fastigiata</i>	
23-4, 72-77			<i>Hystrichosphaeridium recurvatum</i>	
24-1, 90-95	<i>Cyathidites minor</i> <i>Densosporites velatus</i>			<i>Pseudoceratium pelliferum</i>
24-3, 57-61		<i>Leptolepidites verrucatus</i>	<i>Canningia</i> sp. A <i>Oligosphaeridium perforatum</i> <i>Seritocassis dictyon</i> ( <i>sensu</i> Habib, 1972)	<i>Canningia</i> sp. A <i>Ephedripites</i> sp. A
25-1, 60-66				<i>Pseudoceratium pelliferum</i>
25-3, 90-94			<i>Canningia</i> sp. A (Pl. 6, Fig. 5-6) <i>Oligosphaeridium perforatum</i> <i>Perisselaspheeridium</i> sp. B (Pl. 4, Fig. 12)	<i>Kalyphea monoceras</i> <i>Pseudoceratium pelliferum</i>
26-1, 98-102		<i>Systematophora complicata</i>		
26-3, 50-53			(NO ADDITIONAL SPECIES)	
26-5, 88-92			<i>Tenua</i> sp. A	
27-1, 64-67			(NO ADDITIONAL SPECIES)	
27-3, 7-11		<i>Tenua</i> sp. A (Pl. 6, Fig. 1,2)		
27-5, 121-125			(NO ADDITIONAL SPECIES)	
28-1, 30-34	<i>Distaltriangulispores perplexus</i>	<i>Distaltriangulispores perplexus</i>		<i>Leptodinium</i> sp. A <i>Prolixosphaeridium mixtispinosum</i> <i>Systematophora</i> sp. cf. <i>S. areolata</i>
28-3, 58-62	<i>Cicaticosisporites dorogensis</i> <i>Trilobospores bernissartensis</i>	<i>Cerebropollenites masozoicus</i>	<i>Systematophora schindewolfii</i>	
28-5, 27-30				<i>Systematophora</i> sp. A (Habib, 1972)
29-1, 18-22	<i>Appendicispores concentricus</i> <i>Laricoidites magnus</i>			<i>Kallosphaeridium</i> sp. A
29-4, 142-146			(NO ADDITIONAL SPECIES)	
29-6, 57-61			<i>Kleithriaspheeridium fasciatum</i> <i>Perisselaspheeridium</i> sp. A (Pl. 4, Fig. 10)	
30-1, 99-103	<i>Leptolepidites verrucatus</i>		<i>Cribroperidinium septimentum</i> <i>Tenua anaphrysia</i> <i>Wallodinium kutzschii</i>	<i>Achomosphaera neptuni</i> <i>Chlamydophorella</i> sp. A <i>Ctenidiodinium elegantulum</i> <i>Wallodinium kutzschii</i>
30-3, 46-49	<i>Cicaticosisporites subtrotundus</i> <i>Lycopodiumspores crassi-macerius</i>	<i>Triletes</i> sp. A		
30-5, 77-81			(NO ADDITIONAL SPECIES)	
31-1, 15-19				<i>Khukisporites pseudoreticulatus</i>
31-3, 70-74			<i>Ctenidiodinium elegantulum</i> <i>Hystrichodinium pulchrum</i> <i>Kalyphea monoceras</i> <i>Leptodinium</i> sp. A (Pl. 2, Fig. 7) <i>Polysphaeridium warrenii</i> <i>Prolixosphaeridium mixtispinosum</i>	<i>Achomosphaera neptuni*</i> <i>Chlamydophorella</i> sp. A* <i>Cometodinium</i> sp. A* <i>Cyclonephelium distinctum*</i> <i>Diacanthum hollisteri</i> <i>Gonyaulacysta fastigiata</i> <i>Hystrichodinium pulchrum</i> <i>Kalyphea monoceras</i> <i>Kleithriaspheeridium coinooides</i> <i>Polysphaeridium warrenii</i> <i>Polysphaeridium</i> sp. A <i>Prolixosphaeridium mixtispinosum</i> <i>Prolixosphaeridium granulosum</i> <i>Systematophora</i> cf. <i>areolata</i> * <i>Tanyosphaeridium boletum</i> <i>Tenua hystrix*</i>
31-5, 80-84			<i>Kallosphaeridium</i> sp. A (Pl. 3, Fig. 3)	*Abundant (more than 50 specimens)
32-1, 27-31			(BARREN)	
32-3, 125-129			<i>Chlamydophorella</i> sp. A (Pl. 3, Fig. 8,9) <i>Discanthurum hollisteri</i> <i>Prolixosphaeridium granulosum</i> <i>Pseudoceratium pelliferum</i> <i>Spiniferites speciosus</i> <i>Systematophora fasciculigera</i> ( <i>sensu</i> Habib, 1972)	

TABLE 4  
Details of Spore and Dinoflagellate Occurrences in the Hauterivian Sequence, Sample 416A-9-4, 31-35

Spore Species Tops	Dinoflagellate Species Bases	Dinoflagellate Species Tops
<i>Calliasporites dampieri</i>	<i>Cyclonephilum tabulatum</i>	<i>Canningia colliveri</i>
<i>Cicatricosporites hallei</i>	<i>Melourogonyaulax stoveri</i>	<i>Cometodinium</i> sp. A (Habib, 1972)
<i>Corollina torosus</i>	<i>Oligosphaeridium pulcherrimum</i>	<i>Cyclonephilum distinctum</i>
<i>Trilobosporites trioreticulatus</i>		<i>Cyclonephilum tabulatum</i>
		<i>Cyclonephilum vannophorum</i>
		<i>Kleithriasphaeridium coinoes</i>
		<i>Melourogonyaulax stoveri</i>
		<i>Oligosphaeridium pulcherrimum</i>
		<i>Phoberocysta neocomica</i>
		<i>Polyphaleridium multispinosum</i>
		<i>Polyphaleridium warrenii</i>
		<i>Prolixosphaeridium granulosum</i>
		<i>Pseudoceratium pelliferum</i>
		<i>Tanyosphaeridium belotum</i>

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- Norris, G., 1965. Archeopyle structures in Upper Jurassic dinoflagellates from southern England, *New Zealand Journal of Geological Geophysics*, v. 8, p. 792-806.
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## APPENDIX A

Alphabetic listings of dinoflagellate and spore species recorded in this study. Plate and figure numbers are given for all illustrated taxa.

- Acanthotriletes varispinosus* Pocock.  
*Achromosphaera neptuni* (Eisenack) Davey and Williams. Plate 5, Figures 7, 8. Plate 9, Figure 3.  
*Aequitriradites spinulosus* (Cookson and Dettmann) Cookson and Dettmann.  
*Aequitriradites verrucosus* (Cookson and Dettmann) Cookson and Dettmann. Plate 10, Figures 1-3.  
*Amphorula metaelliptica* Dodekova. Plate 3, Figure 10.  
*Appendicisporites bilateralis* Singh.  
*Appendicisporites concentricus* Kemp. Plate 10, Figure 11.  
*Appendicisporites jansonii* Pocock.  
*Calliasporites dampieri* (Balme) Dev.  
*Calliasporites segmentatus* (Balme) Dev.  
*Calliasporites trilobatus* (Balme) Dev. Plate 11, Figure 6.  
*Canningia colliveri* Cookson and Eisenack.  
*Canningia* sp. A. Plate 6, Figures 5, 6.  
*Cerebropollenites mesozoicus* (Couper) Nilsson.  
*Chlamydophorella* sp. A. Plate 3, Figures 8, 9.  
*Cicatricosporites augustus* Singh.  
*Cicatricosporites australiensis* (Cookson) Potonié.  
*Cicatricosporites dorogensis* Potonié and Gelletich.  
*Cicatricosporites hallei* Delcourt and Sprumont.  
*Cicatricosporites hughesi* Dettmann. Plate 10, Figures 4, 5.  
*Cicatricosporites subrotundus* Brenner.  
*Cicatricosporites auritus* Singh. Plate 10, Figures 8, 9.  
*Cometodinium* sp. A (Habib, 1972). Plate 3, Figures 11, 12; Plate 9, Figures 4, 6.  
*Concavissimisporites variverrucatus* (Couper) Brenner.  
*Contignisporites cooksoni* (Balme) Dettmann. Plate 10, Figure 10.  
*Corollina torosus* (Reissinger) Klaus.  
*Costatoperforosporites foveolatus* Deák.  
*Cribroperidinium orthoceras* (Eisenack) Davey.  
*Cribroperidinium septimentum* Neale and Sarjeant.  
*Cribroperidinium* sp. A. Plate 2, Figures 8, 9.  
*Ctenidodinium culmulum* (Norris) Lentin and Williams.  
*Ctenidodinium elegantulum* Millioud. Plate 3, Figure 6.  
*Ctenidodinium panneum* (Norris) Lentin and Williams.
- Cyathidites australis* Couper.  
*Cyathidites minor* Couper.  
*Cyclonephilum distinctum* Deflandre and Cookson. Plate 7, Figures 1, 4.  
*Cyclonephilum distinctum* subsp. *brevispinatum* (Millioud) Lentin and Williams. Plate 6, Figures 3, 4.  
*Cyclonephilum tabulatum* Davey and Verdier.  
*Cyclonephilum vannophorum* Davey.  
*Deltoidospora psilosoma* Rouse.  
*Densoisporites velatus* Weyland and Krieger.  
*Diacanthum holisteri* Habib.  
*Dingodinium cerviculum* Cookson and Eisenack. Plate 5, Figure 6.  
*Distaltrianguliporites perplexus* (Singh) Singh.  
*Endoscrinium campanulum* (Gocht) Vozzennikova.  
*Ephedripites* sp. A. Plate 10, Figure 7.  
*Foraminisporis wonthaggiensis* (Cookson and Dettmann) Dettmann.  
*Gonyaulacysta fastigiata* Duxbury. Plate 9, Figures 1, 2.  
*Gonyaulacysta granulata* (Klement) Sarjeant.  
*Hystrichodinium pulchrum* Deflandre.  
*Hystrichodinium* sp. A (Ioannides et al., 1977). Plate 5, Figures 9, 10.  
*Hystrichosphaeridium recurvatum* (White) Davey and Williams. Plate 1, Figure 12.  
*Imbatodinium kondratjevii* Vozzennikova. Plate 2, Figure 4.  
*Kallosphaeridium* sp. A. Plate 3, Figure 3.  
*Kalyptea monoceras* Cookson and Eisenack. Plate 5, Figure 11.  
*Kleithriasphaeridium eoinodes* (Eisenack) Davey. Plate 4, Figures 3-9.  
*Kleithriasphaeridium fasciatum* (Davey and Williams) Davey.  
*Klukisporites foveolatus* Pocock.  
*Klukisporites pseudoreticulatus* Couper.  
*Klukisporites* sp. A. Plate 11, Figures 11, 12.  
*Laericidites magnus* (Potonié) Potonié, Thomson and Thiergart.  
*Leptodinium* sp. A. Plate 2, Figure 7.  
*Leptolepidites psarosus* Norris. Plate 11, Figure 9.  
*Leptolepidites verrucatus* Couper. Plate 11, Figure 7.  
*Lycopodiumsporites crassimacerius* Hedlund.  
*Meiourogonyaulax stoveri* Millioud.  
*Muderongia perforata* Alberti.  
*Muderongia simplex* Alberti. Plate 5, Figures 2, 4.  
*Muderongia* sp. cf. *M. simplex*. Plate 5, Figures 3, 5.  
*Muderongia tetracantha* (Gocht) Alberti.  
*Oligosphaeridium complex* (White) Davey and Williams.  
*Oligosphaeridium perforatum* (Gocht) Davey and Williams.  
*Oligosphaeridium pulcherrimum* (Deflandre and Cookson) Davey and Williams.  
*Oligosphaeridium* sp. A. Plate 4, Figures 1, 2.  
*Perinopollenites elatoides* Couper.  
*Perisseasphaeridium* sp. A. Plate 4, Figure 10.  
*Perisseasphaeridium* sp. B. Plate 4, Figure 12.  
*Phoberocysta neocomica* (Gocht) Millioud.  
*Pilosisporites trichopapillosus* (Thiergart) Delcourt and Sprumont.  
*Pilosisporites* sp. A. Plate 11, Figures 1-3.  
*Polyphaleridium multispinosum* Davey. Plate 1, Figures 3, 4; Plate 8, Figure 1.  
*Polysphaeridium warrenii* Habib. Plate 1, Figure 1.  
*Polysphaeridium* sp. A. Plate 1, Figure 2; Plate 8, Figures 2, 4, 5.  
*Prolixosphaeridium granulosum* (Deflandre) Davey et al. Plate 1, Figure 11; Plate 8, Figure 6.  
*Prolixosphaeridium mixtispinosum* (Klement) Davey et al.  
*Prolixosphaeridium torynum* (Cookson and Eisenack) Eisenack and Kjellström. Plate 3, Figure 7.  
*Prolixosphaeridium xanthiopyxides* (O. Wetzel) Davey et al.  
*Pseudoceratium pelliferum* Gocht. Plate 2, Figures 1-3; Plate 9, Figure 5.  
*Pyxidiella* sp. A. (Habib, 1972). Plate 2, Figure 6.  
*Rouseisporites reticulatus* Pocock. Plate 11, Figure 10.  
*Scrinioscassis dictyotus* (Cookson and Eisenack) Beju (*sensu* Habib, 1972). Plate 3, Figures 1, 2.  
*Senoniasphaera* sp. cf. *S. jurassica* (Gitmez and Sarjeant) Lentin and Williams. Plate 3, Figure 4.  
*Spiniferites dentatus* (Gocht) Lentin and Williams.  
*Spiniferites speciosus* (Deflandre) Sarjeant.  
*Systematophora* sp. cf. *S. areolata* Klement. Plate 4, Figure 4; Plate 7, Figure 6.

*Systematophora complicata* Neale and Sarjeant.  
*Systematophora fasciculigera* Klement. Plate 4, Figure 7.  
*Systematophora fasciculigera* Klement (*sensu* Habib, 1972).  
*Systematophora schindewolfii* (Alberti) Downie and Sarjeant. Plate 4,  
Figures 5, 6.  
*Systematophora* sp. A (Habib, 1972). Plate 4, Figure 8.  
*Tanyosphaeridium boletum* Davey. Plate 1, Figures 5-9; Plate 8,  
Figure 3.  
*Tenua anaphrissa* (Sarjeant) Benedek.  
*Tenua hystrix* Eisenack. Plate 3, Figure 5; Plate 7, Figures 2, 5.  
*Tenua verrucosa* Sarjeant (*sensu* Habib, 1972).

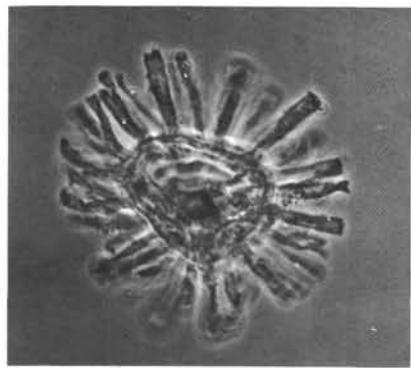
*Tenua* sp. A. Plate 6, Figures 1, 2.  
*Trichodinium ciliatum* Gocht.  
*Trilobosporites apiverrucatus* Couper.  
*Trilobosporites bernissartensis* (Delcourt and Sprumont) Potonié.  
*Trilobosporites jurasicus* Pocock. Plate 11, Figure 5.  
*Trilobosporites purverulentus* (Verbitskaya) Dettmann.  
*Trilobosporites trioreticulosus* Cookson and Dettmann.  
*Triletes* sp. A. Plate 11, Figure 4.  
*Verrucosporites rotundus* Singh.  
*Wallodinium krutzschii* (Alberti) Habib. Plate 2, Figure 5.

PLATE 1

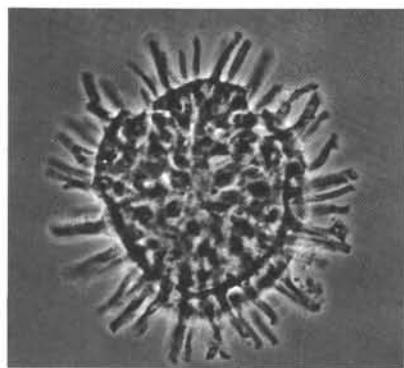
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- Figure 1      *Polysphaeridium warrenii*. Sample 18-4, 40-43 cm. GSC No. 56697.
- Figure 2      *Polysphaeridium* sp. A. Sample 31-3, 70-74 cm. GSC No. 56698.
- Figure 3      *Polysphaeridium multisporosum*. Sample 31-3, 70-74 cm. GSC No. 56699.
- Figure 4      *Polysphaeridium multisporosum*. Sample 29-6, 57-61 cm. GSC No. 56700.
- Figure 5      *Tanyosphaeridium boletum*. Sample 15-1, 41-45 cm. GSC No. 56701.
- Figure 6      *Tanyosphaeridium boletum*. Sample 24-3, 57-61 cm. GSC No. 56702.
- Figure 7      *Tanyosphaeridium boletum*. Sample 27-1, 64-67 cm. GSC No. 56703.
- Figures 8, 9    *Tanyosphaeridium boletum*. Sample 16-4, 55-59 cm. GSC No. 56704.
- Figure 10     Specimen intermediate between *Tanyosphaeridium boletum*, *Prolixosphaeridium granulosum* and *Polysphaeridium multisporosum*. Sample 31-3, 70-74 cm. GSC No. 56705.
- Figure 11     *Prolixosphaeridium granulosum*. Sample 31-3, 70-74 cm. GSC No. 56706.
- Figure 12     *Hystrichosphaeridium recurvatum*. Sample 31-3, 70-74 cm. GSC No. 56707.

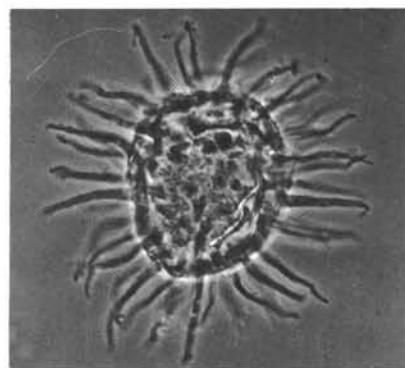
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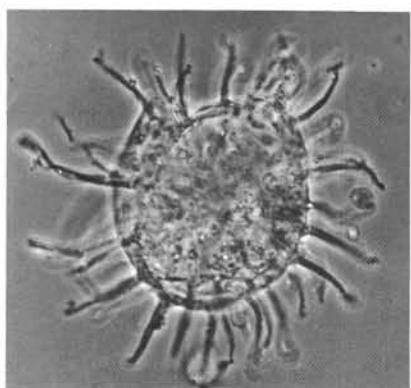
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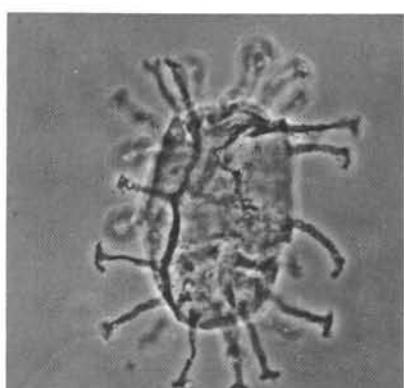
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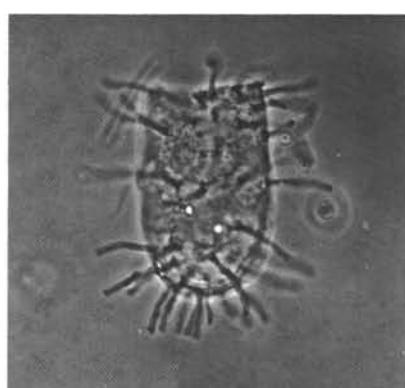
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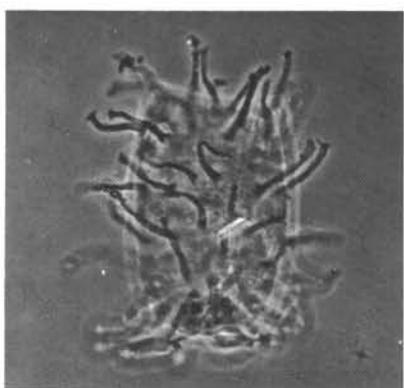
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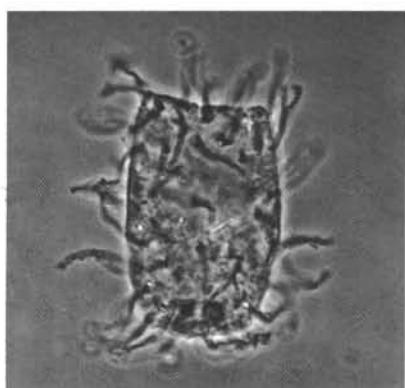
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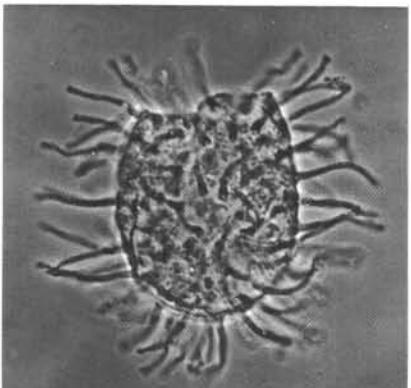
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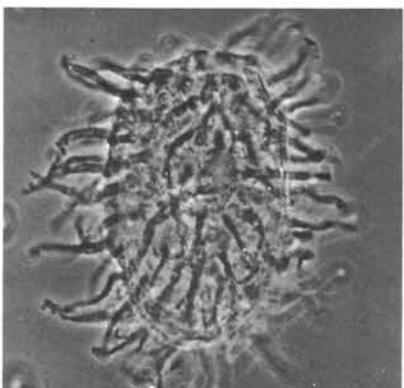
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11



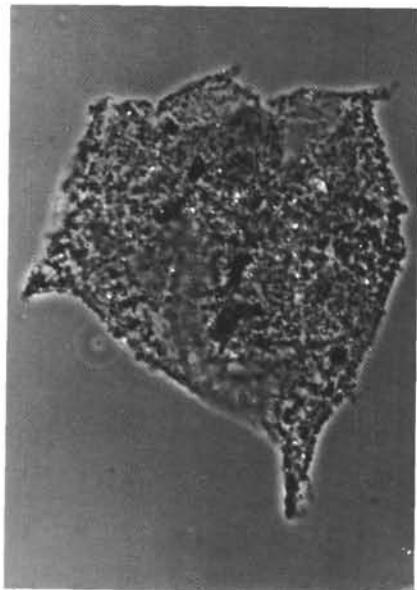
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30  $\mu\text{m}$

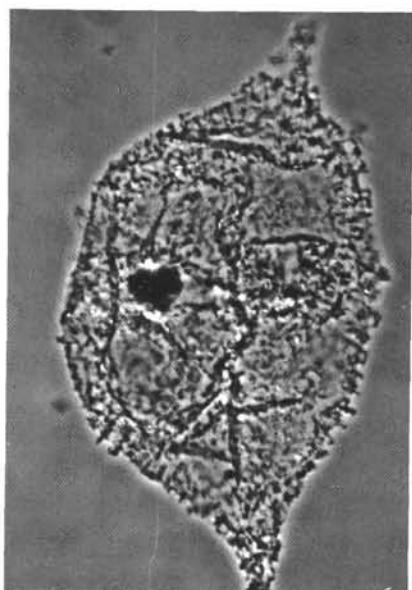
PLATE 2  
Bar on all figures equals 30  $\mu\text{m}$ .

- Figure 1      *Pseudoceratium pelliferum*. Sample 14-3, 143–145 cm. GSC No. 56708.
- Figure 2      *Pseudoceratium pelliferum*, form with strongly reduced postcingular horn. Sample 25-1, 60–66 cm. GSC No. 56709.
- Figure 3      *Pseudoceratium pelliferum*, form with reduced postcingular horn. Sample 25-1, 60–66 cm. GSC No. 56710.
- Figure 4      *Imbatodinium kondratjevii*, form with ?? intercalaries removed. Sample 51-1, 17–21 cm. GSC No. 56711.
- Figure 5      *Wallodinium krutzschi*. Sample 30-1, 99–103 cm. GSC No. 56712.
- Figure 6      *Pyxidiella* sp. A (Habib, 1972). Sample 19-3, 36–39 cm. GSC No. 56713.
- Figure 7      *Leptodinium* sp. A. Sample 28-1, 30–34 cm. GSC No. 56714.
- Figure 8      *Cribroperidinium* sp. A. Sample 24-3, 57–61 cm. GSC No. 56715.
- Figure 9      *Cribroperidinium* sp. A. Sample 51-1, 17–21 cm. GSC No. 56716.

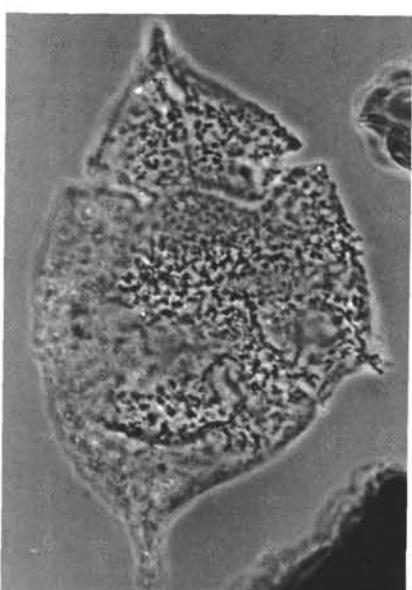
PLATE 2



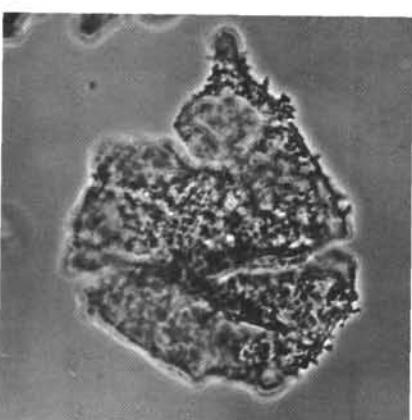
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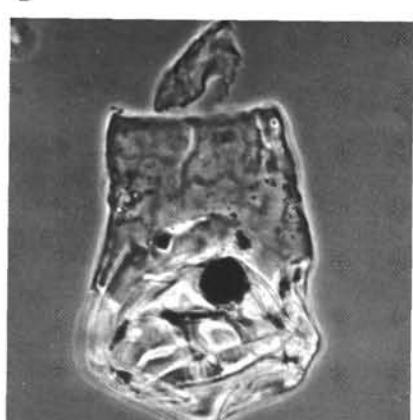
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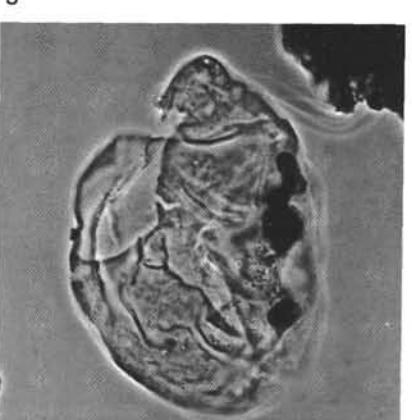
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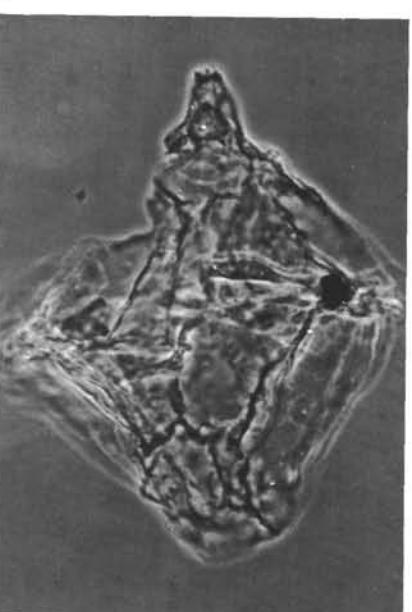
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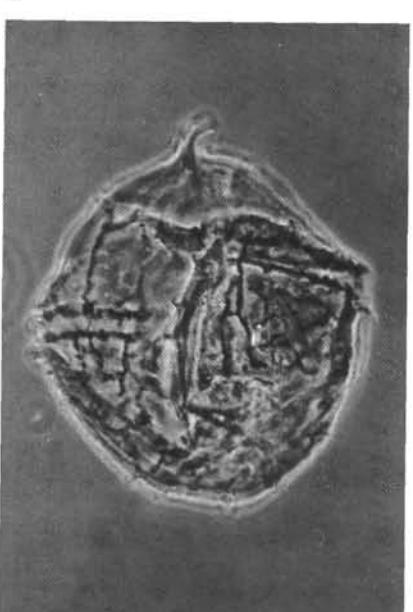
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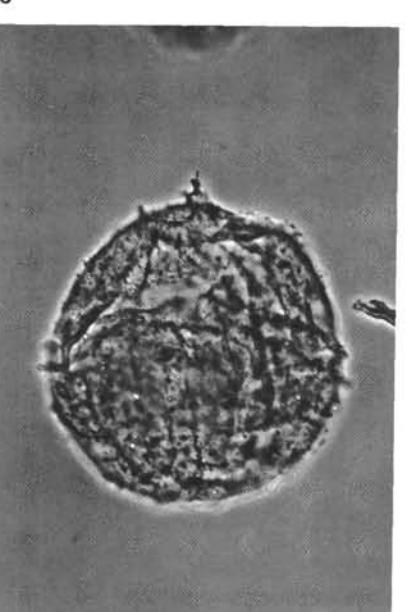
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7



8



9

30  $\mu$ m

PLATE 3

Bar on all figures equals 30  $\mu\text{m}$ .

- Figures 1, 2      *Scriniocassis dictyotus*. Sample 41-4, 70-75 cm.  
GSC No. 56717.
- Figure 3      *Kallosphaeridium* sp. A. Sample 29-1, 18-22 cm.  
GSC No. 56718.
- Figure 4      *Senoniasphaera* sp. cf. *S. jurassica*. Sample 51-1,  
17-21 cm. GSC No. 56719.
- Figure 5      *Tenua hystrix*. Sample 31-3, 70-74 cm. GSC No.  
56720.
- Figure 6      *Ctenidodinium elegantulum*. Sample 30-1, 99-103  
cm. GSC No. 56721.
- Figure 7      ?*Prolixosphaeridium torynum*. Sample 51-1,  
17-21 cm. GSC No. 56722.
- Figure 8      *Chlamydophorella* sp. A. Sample 30-1, 99-103  
cm. GSC No. 56723.
- Figure 9      *Chlamydophorella* sp. A. Sample 30-1, 99-103  
cm. GSC No. 56724.
- Figure 10      *Amphorula metaelliptica*. Sample 51-1, 17-21 cm.  
GSC No. 56725.
- Figure 11      *Cometodinium* sp. A (Habib, 1972). Sample 31-3,  
70-74 cm. GSC No. 56726.
- Figure 12      *Cometodinium* sp. A (Habib, 1972). Sample 30-5,  
77-81 cm. GSC No. 56727.

## PLATE 3

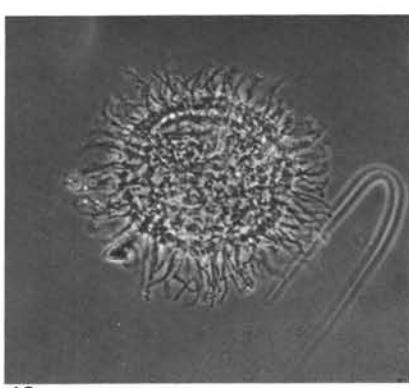
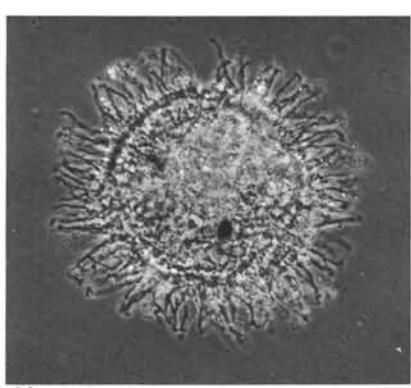
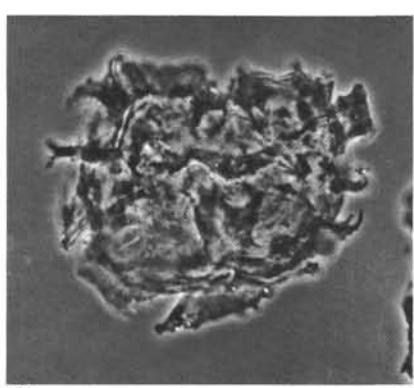
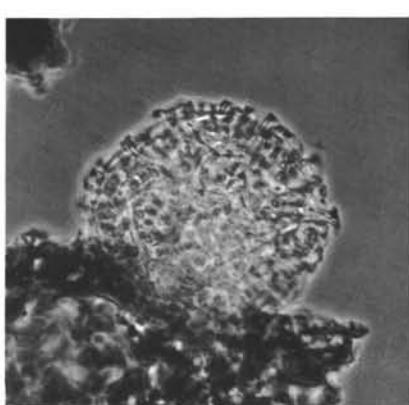
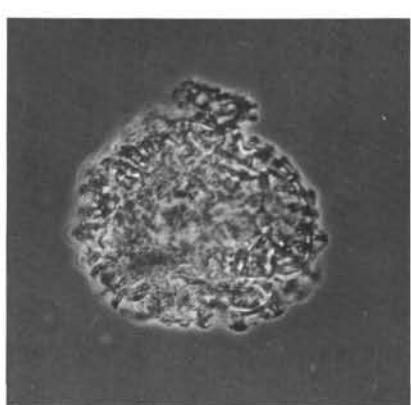
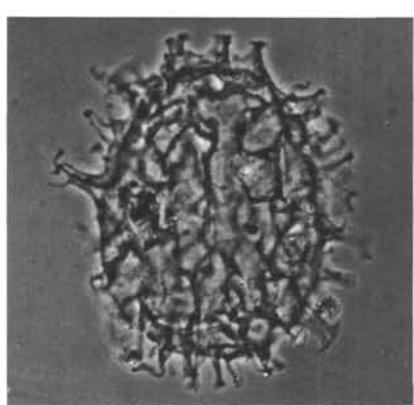
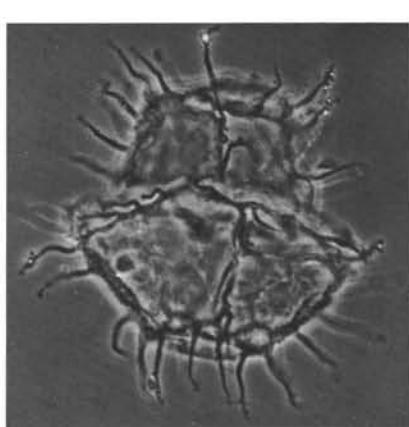
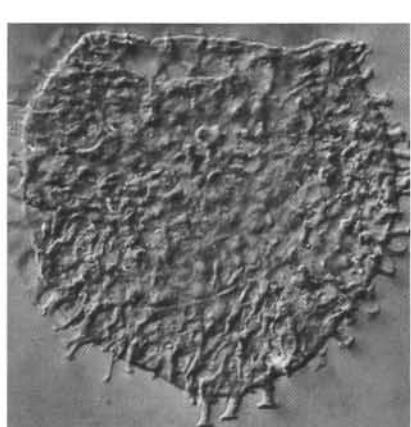
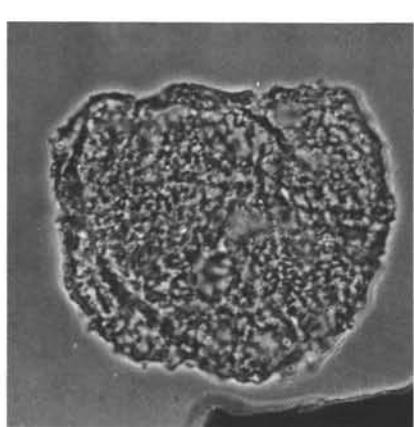
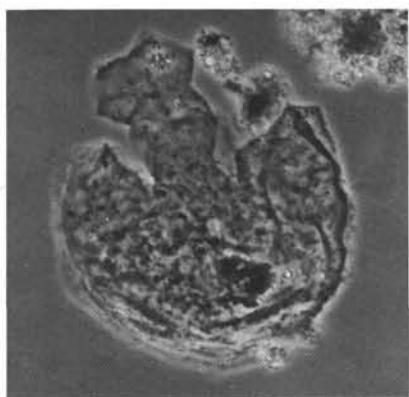
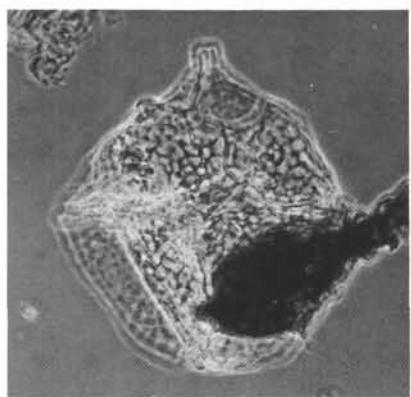
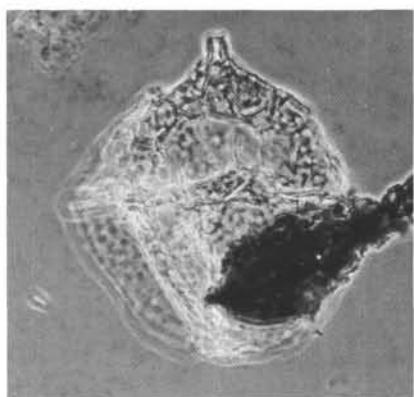
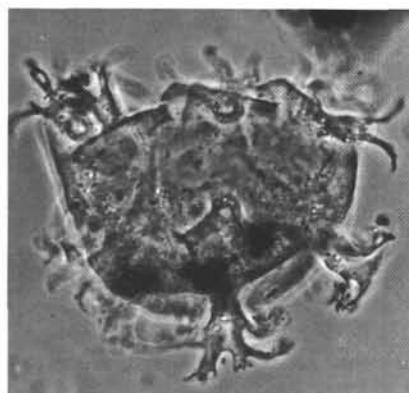
30  $\mu\text{m}$

PLATE 4

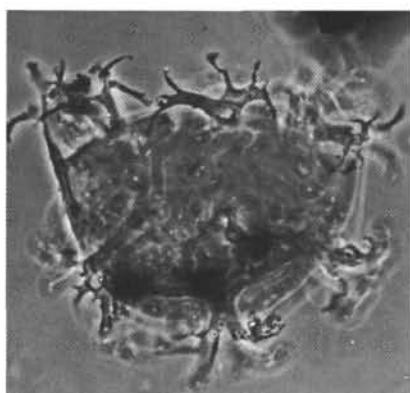
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- Figures 1, 2      *Oligosphaeridium* sp. A. Sample 9-4, 31–35 cm.  
GSC No. 56728.
- Figure 3            *Kleithriaspaeridium eoinodes*. Sample 31-3, 70–  
74 cm. GSC No. 56729.
- Figure 4            *Systematophora* sp. cf. *S. areolata*. Sample 31-3,  
70–74 cm. GSC No. 56730.
- Figures 5, 6        *Systematophora schindewolfii*. Sample 16-4, 55–  
59 cm. GSC No. 56731.
- Figure 7            *Systematophora fasciculigera*. Sample 51-1, 17–21  
cm. GSC No. 56732.
- Figure 8            *Systematophora* sp. A (Habib, 1972). Sample  
28-5, 27–30 cm. GSC No. 56733.
- Figure 9            *Kleithriaspaeridium eoinodes*. Sample 30-1, 99–  
103 cm. GSC No. 56734.
- Figure 10          *Perisseiasphaeridium* sp. A. Sample 14-5, 41–42  
cm. GSC No. 56735.
- Figure 11          *Systematophora* sp. Sample 9-4, 31–35 cm. GSC  
No. 56736.
- Figure 12          *Perisseiasphaeridium* sp. B. Sample 25-1, 60–66  
cm. GSC No. 56737.

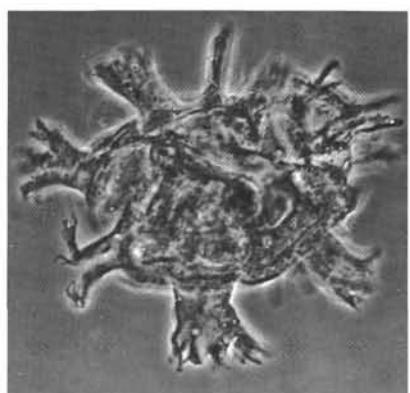
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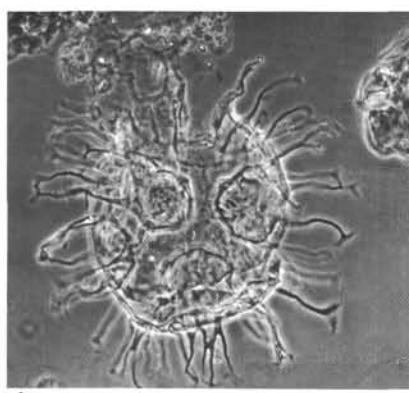
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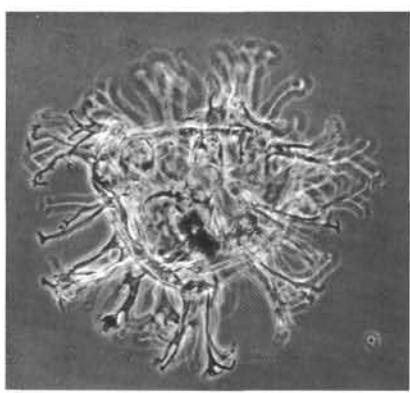
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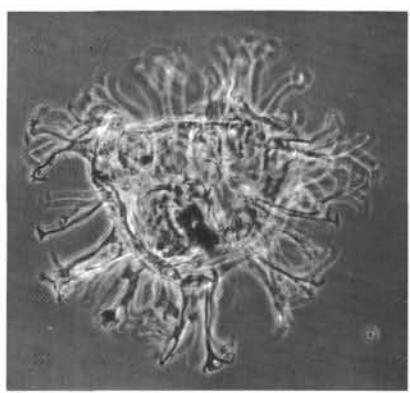
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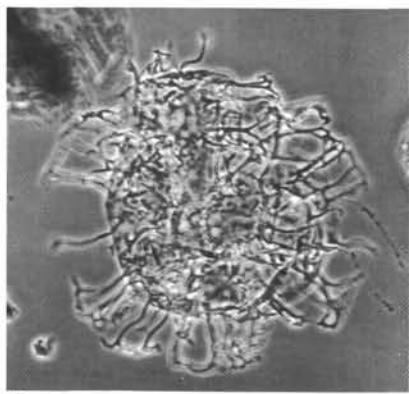
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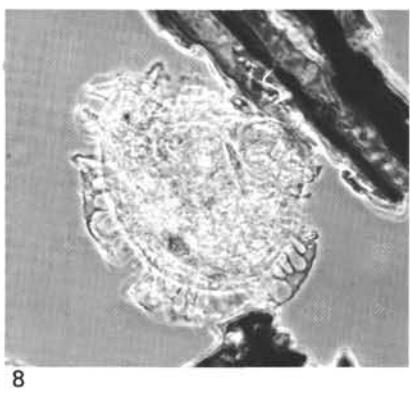
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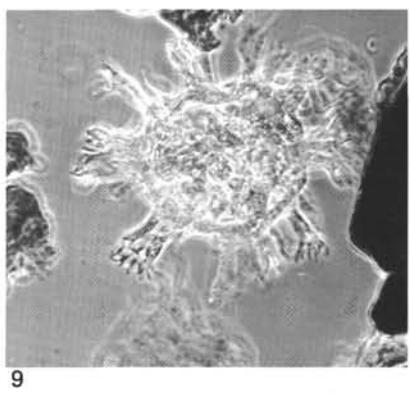
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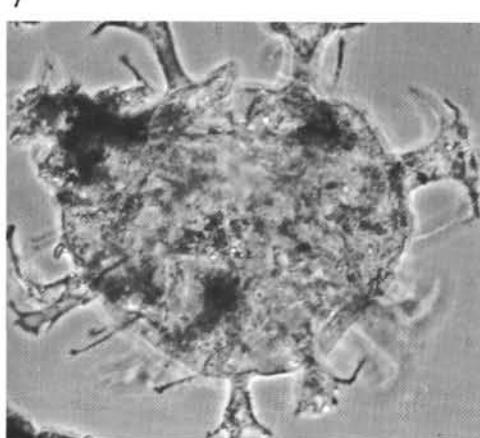
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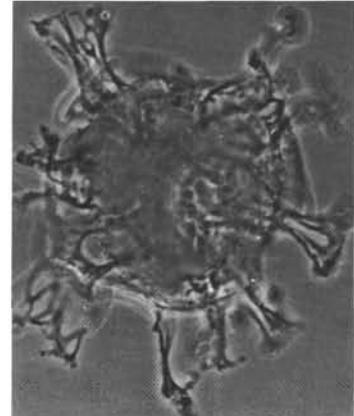
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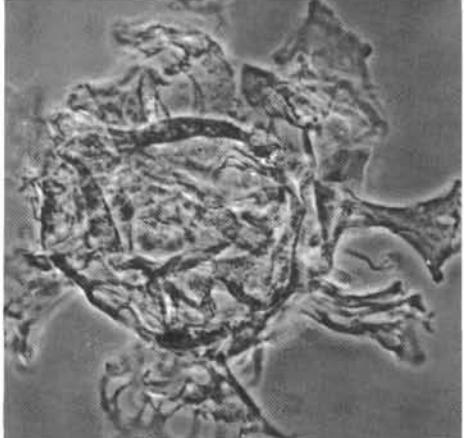
9



10



11



12

30  $\mu\text{m}$

PLATE 5

Bar on all figures equals 30  $\mu\text{m}$ .

- Figure 1 *Phoberocysta* sp. cf. *P. neocomica*. Sample 23-1, 107-111 cm. GSC No. 56738.
- Figure 2 *Muderongia simplex*. Sample 28-1, 30-34 cm. GSC No. 56739.
- Figure 3 *Muderongia* sp. cf. *M. simplex*. Sample 36-1, 124-128 cm. GSC No. 56740.
- Figure 4 *Muderongia simplex*. Sample 36-1, 124-128 cm. GSC No. 56741.
- Figure 5 *Muderongia* sp. cf. *M. simplex*. Sample 12-2, 62-66 cm. GSC No. 56742.
- Figure 6 *Dingodinium cerviculum*. Sample 41-1, 96-100 cm. GSC No. 56743.
- Figure 7 *Achomosphaera neptuni*. Sample 31-3, 70-74 cm. GSC No. 56744.
- Figure 8 *Achomosphaera neptuni*. Sample 41-1, 96-100 cm. GSC No. 56745.
- Figure 9 *Hystrichodinium* sp. A (Ioannides et al., 1977). Sample 24-3, 57-61 cm. GSC No. 56746.
- Figure 10 *Hystrichodinium* sp. A (Ioannides et al., 1977). Sample 51-1, 17-21 cm. GSC No. 56747.
- Figure 11 *Kalyptea monoceras*. Sample 25-3, 90-94 cm. GSC No. 56748.

## PLATE 5

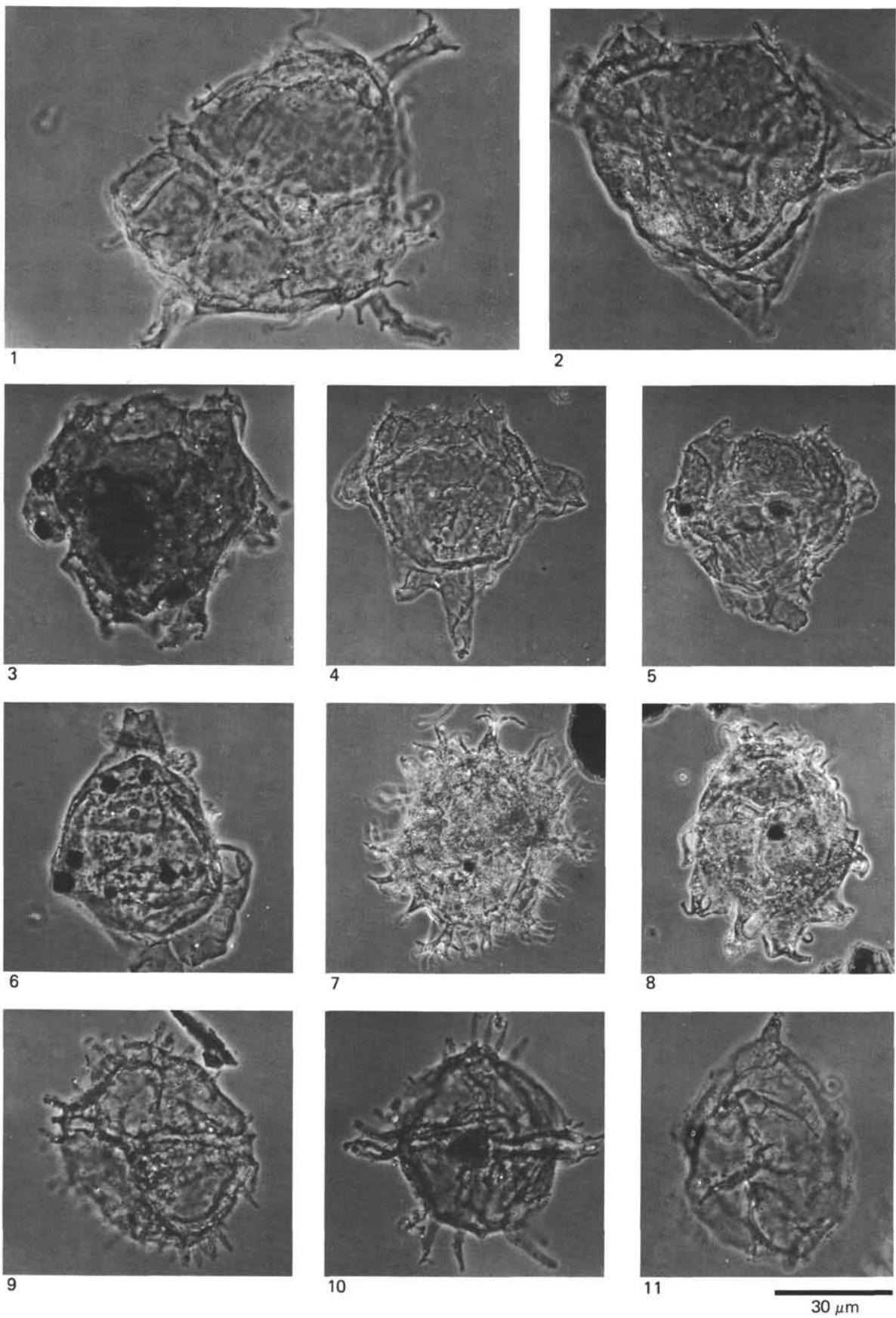


PLATE 6

Bar on all figures equals 30  $\mu\text{m}$ .

- Figures 1, 2      *Tenua* sp. A. Sample 12-2, 62–66 cm. GSC No. 56749.
- Figures 3, 4      *Cyclonephelium distinctum* subsp. *brevispinatum*. Sample 16-4, 55–59 cm. GSC No. 56750.
- Figure 5            *Canningia* sp. A. Sample 24-3, 57–61 cm. GSC No. 56751.
- Figure 6            *Canningia* sp. A. Sample 24-3, 57–61 cm. GSC No. 56752.

PLATE 6

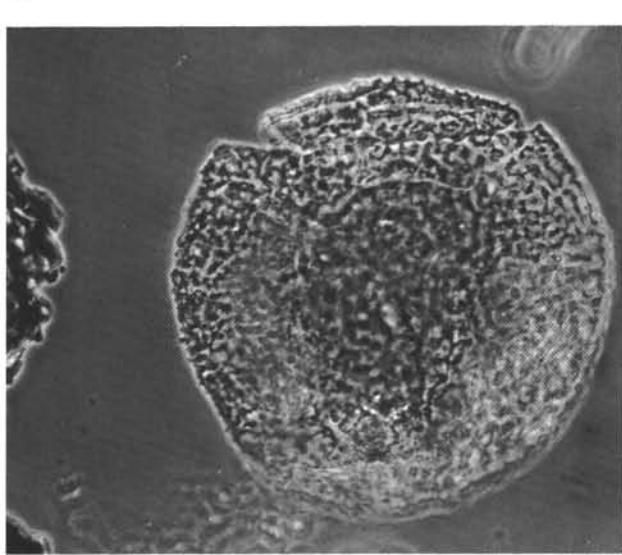
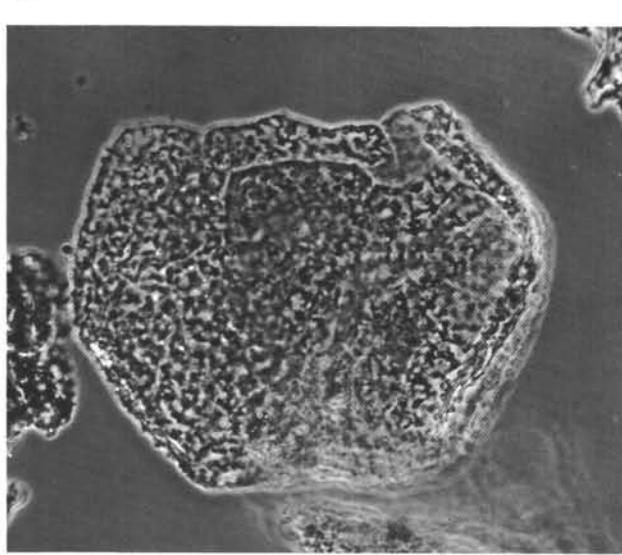
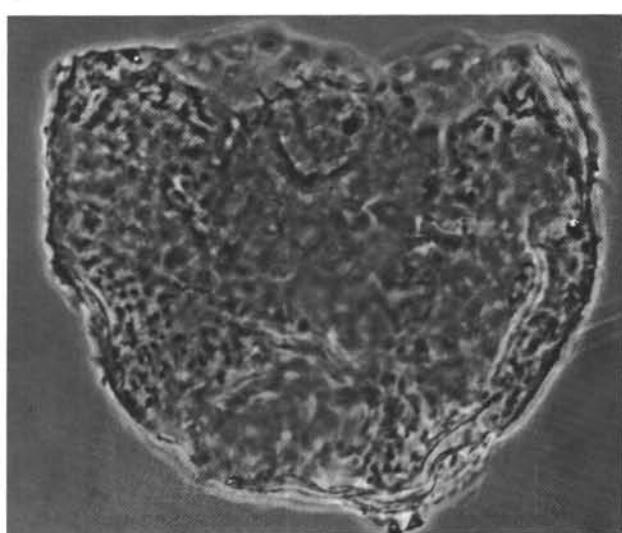
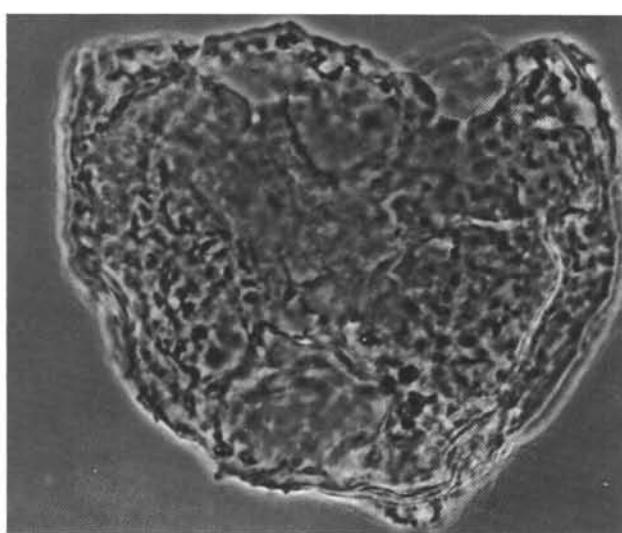
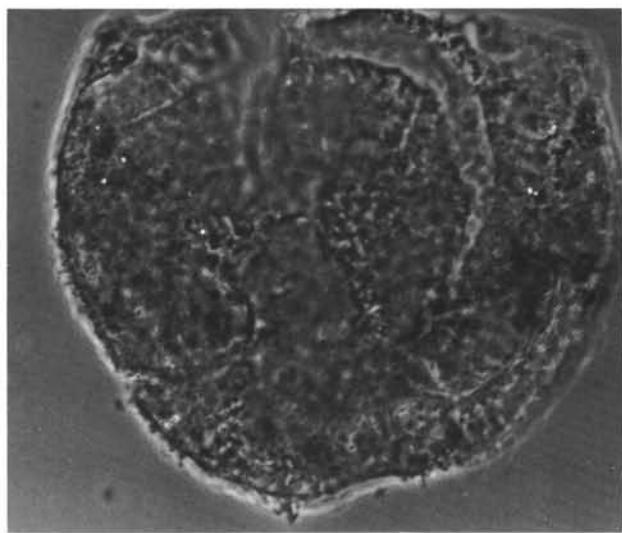
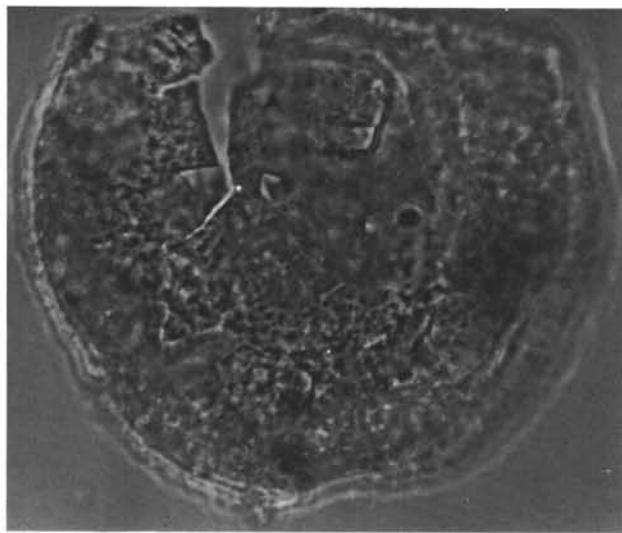
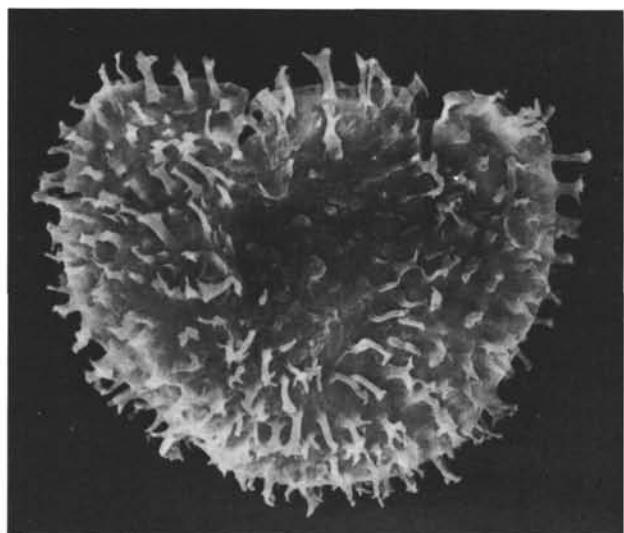


PLATE 7

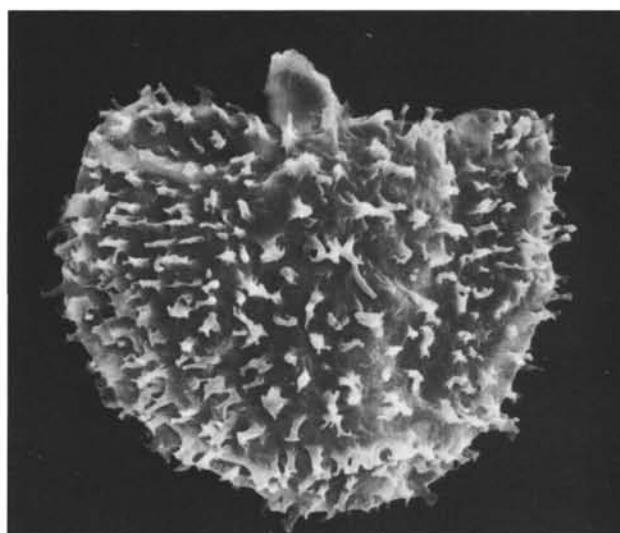
Bar on all figures equals 30  $\mu\text{m}$ .

- Figure 1      *Cyclonephelium distinctum*. Sample 31-3, 70-74 cm. GSC No. 56753.
- Figure 2      *Tenua hystrix*. Sample 31-3, 70-74 cm. GSC No. 56754.
- Figure 3      Specimen intermediate between *Cyclonephelium distinctum* and *Tenua hystrix*. Sample 31-3, 70-74 cm. GSC No. 56755.
- Figure 4      *Cyclonephelium distinctum*. Sample 31-3, 70-74 cm. GSC No. 56756.
- Figure 5      Specimen of *Tenua hystrix* showing partial delineation of paraplates by spines. Sample 31-3, 70-74 cm. GSC No. 56757.
- Figure 6      *Systematophora* sp. cf. *S. areolata*. Sample 31-3, 70-74 cm. GSC No. 56758.

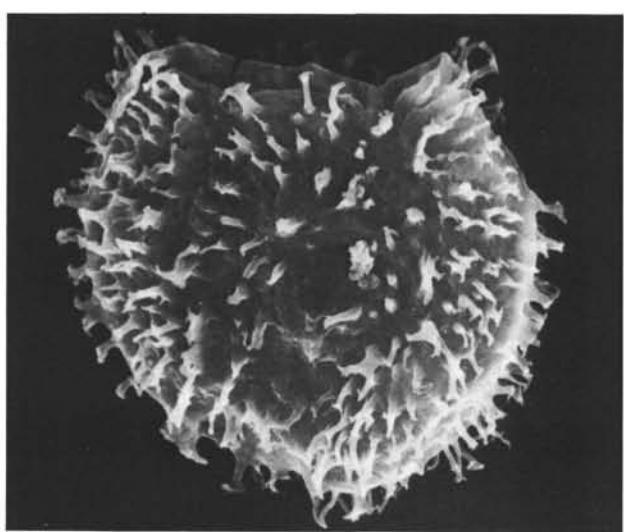
## PLATE 7



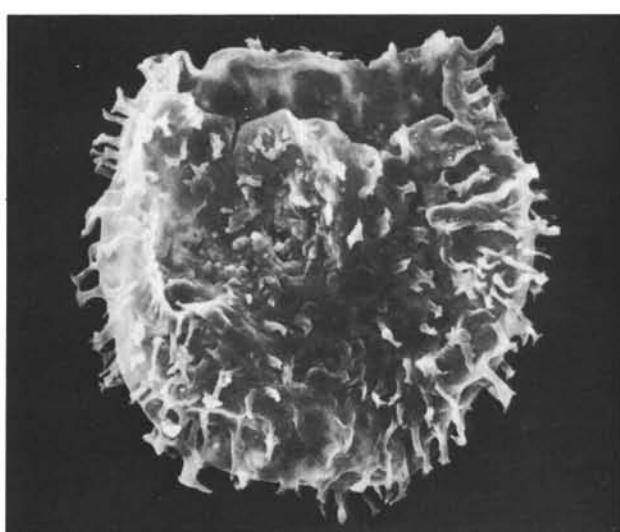
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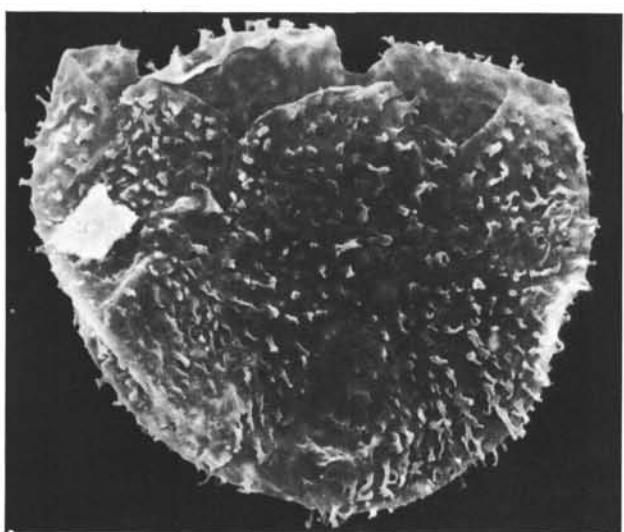
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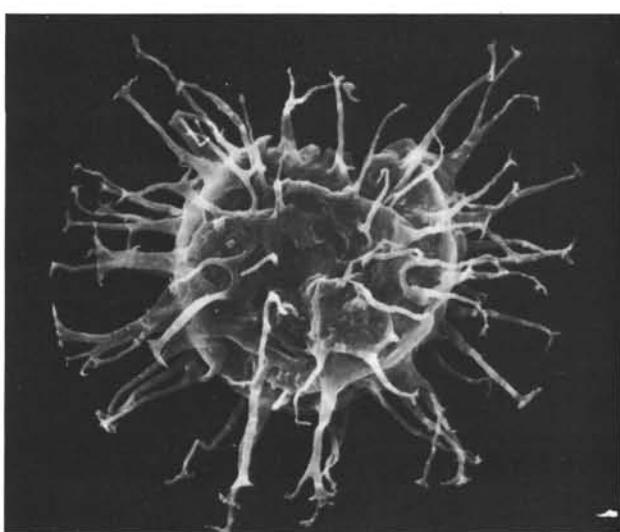
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4



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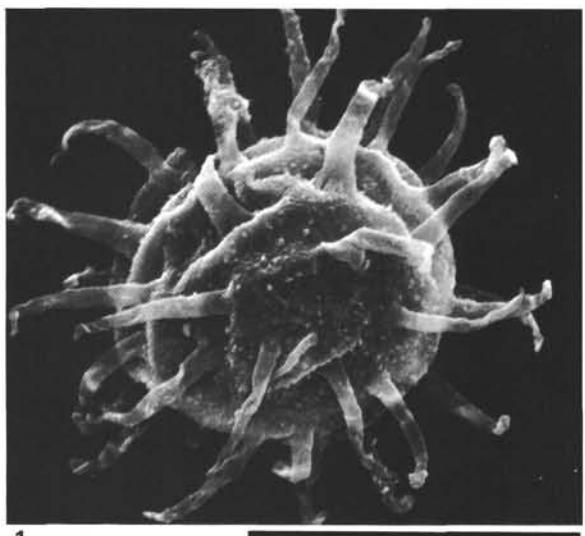
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30  $\mu\text{m}$

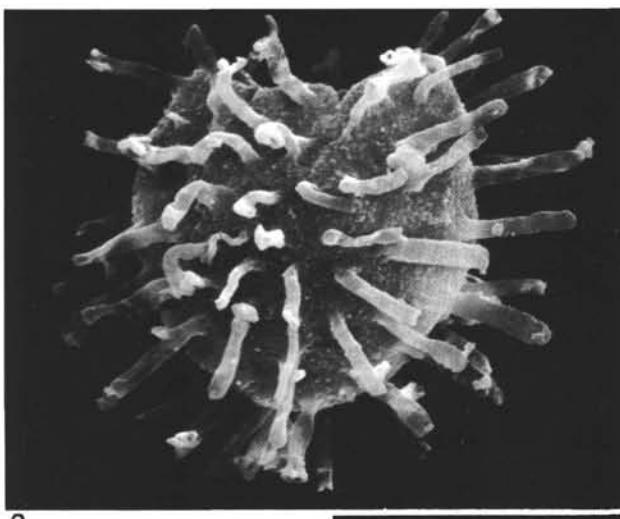
PLATE 8  
Bar on all figures equals 30  $\mu\text{m}$ .

- Figure 1      *Polysphaeridium multisporosum*. Sample 31-3,  
                  70-74 cm. GSC No. 56759.
- Figure 2      *Polysphaeridium* sp. A. Sample 31-3, 70-74 cm.  
                  GSC No. 56760.
- Figure 3      *Tanyosphaeridium boletum*. Sample 31-3, 70-74  
                  cm. GSC No. 56761.
- Figure 4      *Polysphaeridium* sp. A. Sample 31-3, 70-74 cm.  
                  GSC No. 56762.
- Figure 5      *Polysphaeridium* sp. A. Sample 31-3, 70-74 cm.  
                  GSC No. 56763.
- Figure 6      *Prolixosphaeridium granulosum*. Sample 31-3,  
                  70-74 cm. GSC No. 56764.

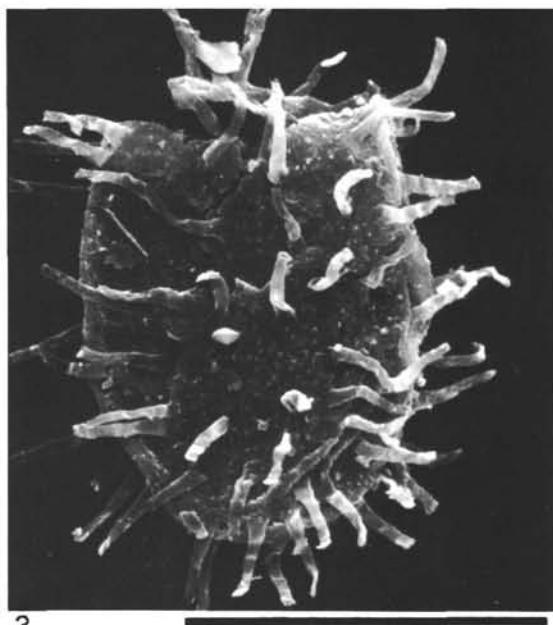
## PLATE 8



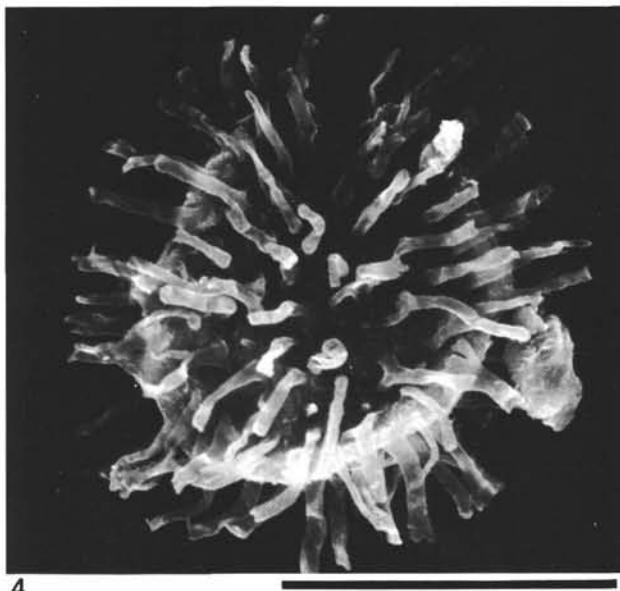
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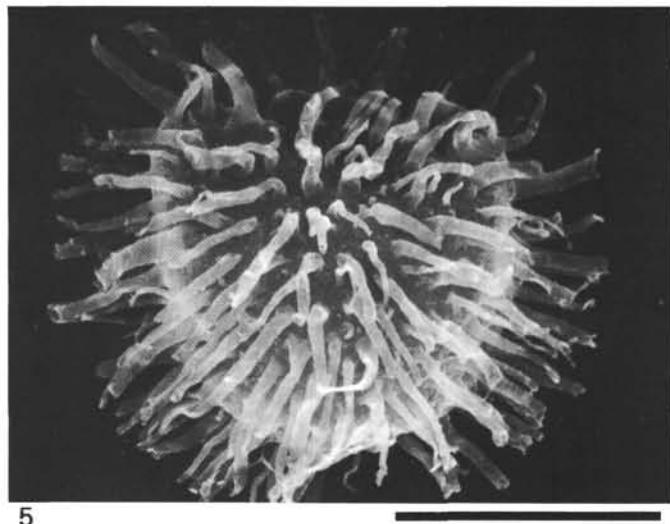
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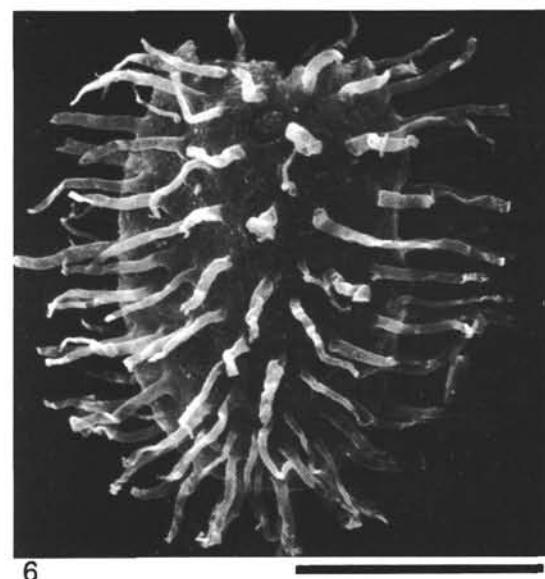
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4



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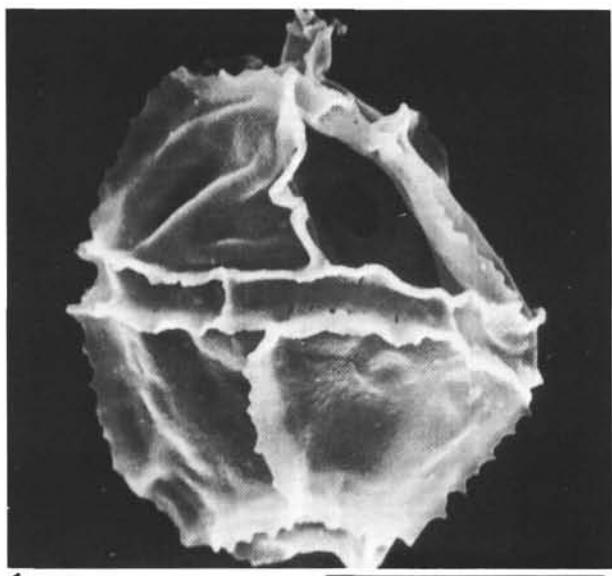
6

PLATE 9

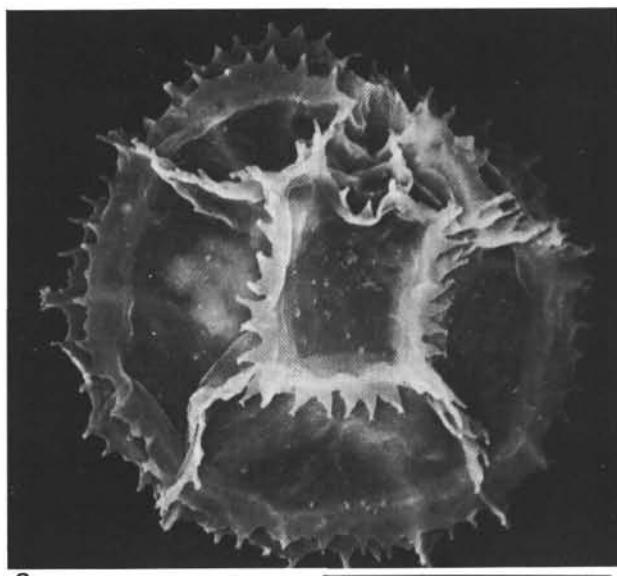
Bar on all figures equals 30  $\mu\text{m}$ .

- Figure 1 *Gonyaulacysta fastigiata*. Sample 31-3, 70-74 cm.  
GSC No. 56765.
- Figure 2 *Gonyaulacysta fastigiata*. Polar view of autapex.  
Sample 31-3, 70-74 cm. GSC No. 56766.
- Figure 3 *Achomosphaera neptuni*. Sample 31-3, 70-74 cm.  
GSC No. 56767.
- Figure 4 *Cometodinium* sp. A (Habib, 1972). Sample 31-3,  
70-74 cm. GSC No. 56768.
- Figure 5 *Pseudoceratium pelliferum* with a strongly re-  
duced postcingular horn. Sample 31-3, 70-74 cm.  
GSC No. 56769.
- Figure 6 *Cometodinium* sp. A (Habib, 1972). Sample 31-3,  
70-74 cm. GSC No. 56770.

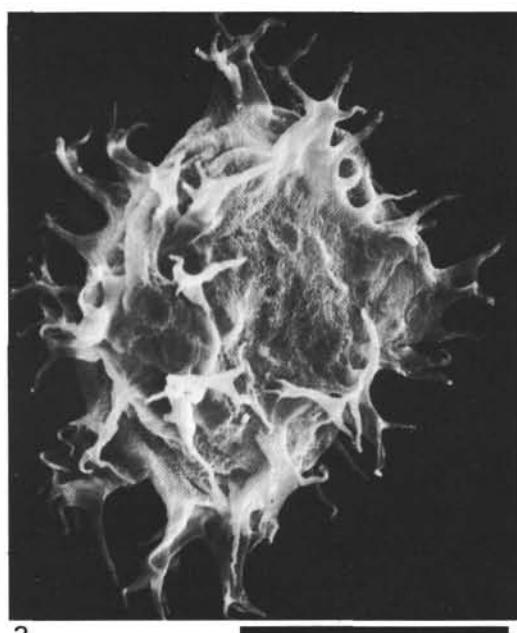
## PLATE 9



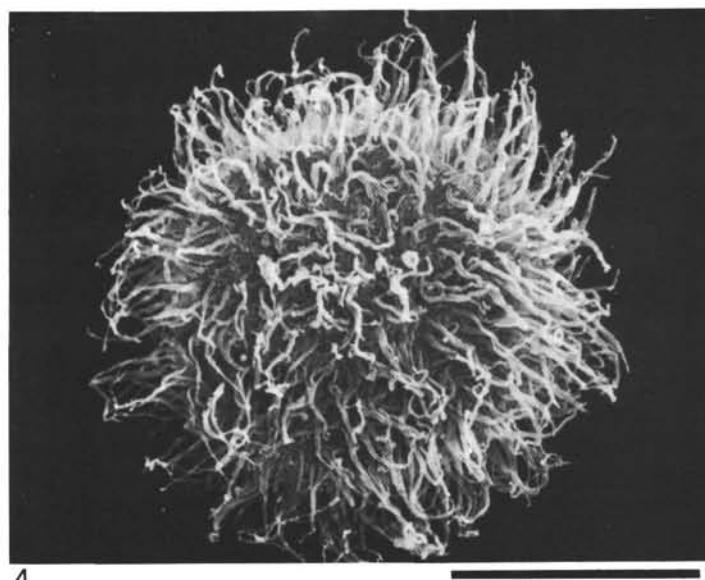
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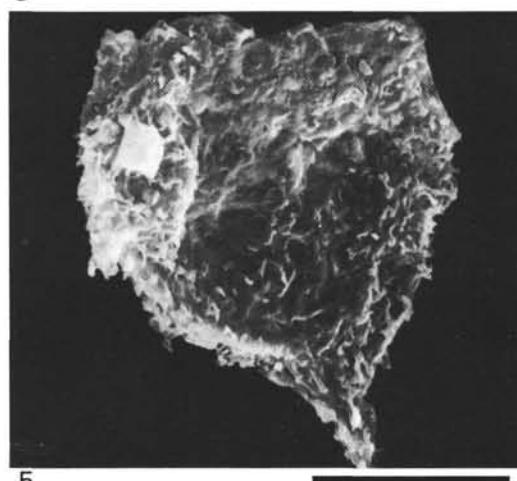
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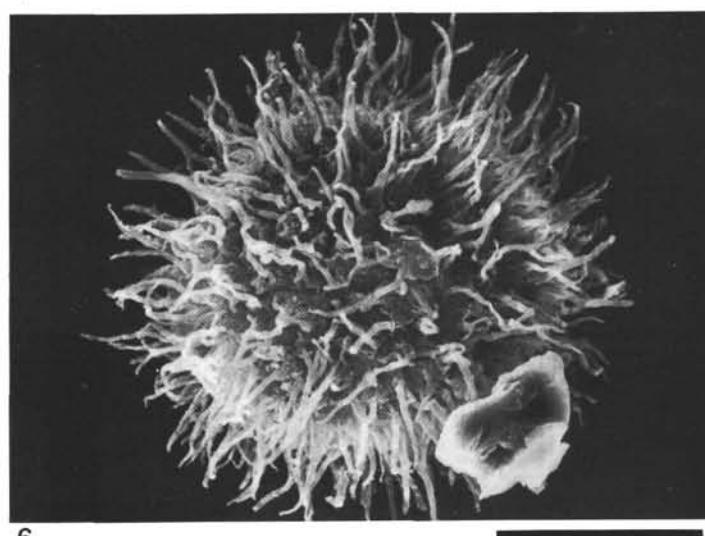
3



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PLATE 10

Bar on all figures equals 30  $\mu\text{m}$ .

- Figures 1, 2     *Aequitriradites verrucosus*. Sample 24-3, 57-61 cm. GSC No. 56771.
- Figure 3        *Aequitriradites verrucosus*. Sample 41-4, 70-75 cm. GSC No. 56772.
- Figure 4        *Cicatricosisporites hughesi*. Sample 24-3, 57-61 cm. GSC No. 56773.
- Figure 5        *Cicatricosisporites hughesi*. Sample 16-4, 55-59 cm. GSC No. 56774.
- Figure 6        *Cicatricosisporites* sp. Sample 11-5, 19-23 cm. GSC No. 56775.
- Figure 7        *Ephedripites* sp. A. Sample 24-3, 57-61 cm. GSC No. 56776.
- Figure 8        *Cicatricosoporites auritus*. Sample 16-4, 55-59 cm. GSC No. 56777.
- Figure 9        *Cicatricosoporites auritus*. Sample 24-3, 57-61 cm. GSC No. 56778.
- Figure 10       *Contignisporites cooksonii*. Sample 51-1, 17-21 cm. GSC No. 56779.
- Figure 11       *Appendicisporites concentricus*. Sample 17-1, 65-69 cm. GSC No. 56780.
- Figure 12       *Verrucosaporites* sp. Sample 11-1, 64-68 cm. GSC No. 56781.

## PLATE 10

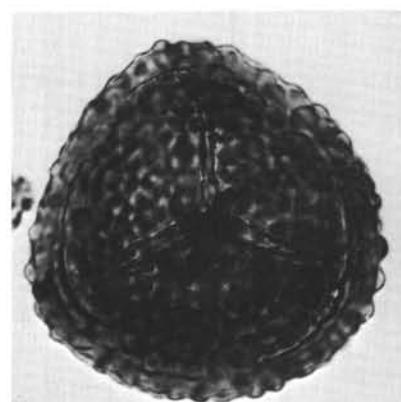
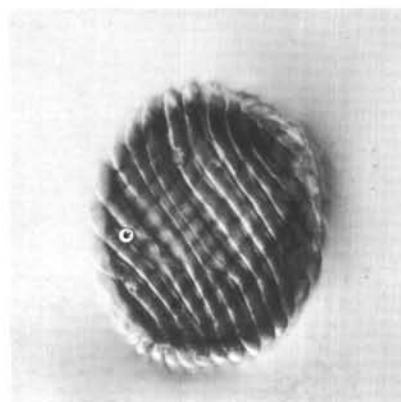
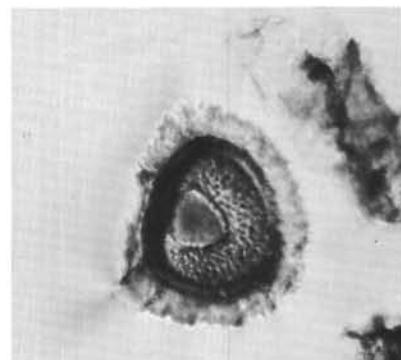
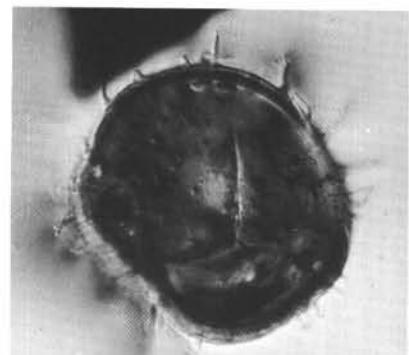


PLATE 11  
Bar on all figures equals 50  $\mu\text{m}$ .

- Figure 1      *Pilosporites* sp. A. Sample 13-1, 138-141 cm.  
GSC No. 56782.
- Figure 2      *Pilosporites* sp. A. Sample 12-4, 112-116 cm.  
GSC No. 56783.
- Figure 3      *Pilosporites* sp. A. Sample 19-5, 82-86 cm. GSC  
No. 56784.
- Figure 4      *Triletes* sp. A. Sample 15-3, 54-58 cm. GSC No.  
56785.
- Figure 5      *Trilobosporites jurassicus*. Sample 17-1, 65-69  
cm. GSC No. 56786.
- Figure 6      *Callialasporites trilobatus*. Sample 16-4, 55-59  
cm. GSC No. 56787.
- Figure 7      *Leptolepidites verrucatus*. Sample 24-3, 57-61 cm.  
GSC No. 56788.
- Figure 8      *Verrucosporites* sp. Sample 11-5, 19-23 cm.  
GSC No. 56789.
- Figure 9      *Leptolepidites psarosus*. Sample 34-1, 63-67 cm.  
GSC No. 56790.
- Figure 10     *Rouseisporites reticulatus*. Sample 22-3, 38-41  
cm. GSC No. 56791.
- Figure 11     *Klukisporites* sp. A. Sample 41-4, 70-75 cm. GSC  
No. 56792.
- Figure 12     *Klukisporites* sp. A. Sample 51-1, 17-21 cm. GSC  
No. 56793.

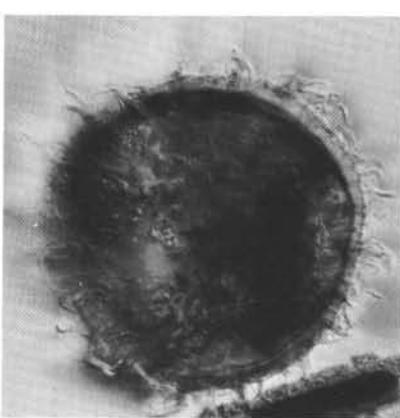
## PLATE 11



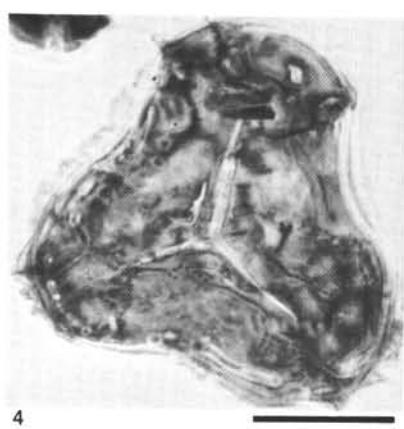
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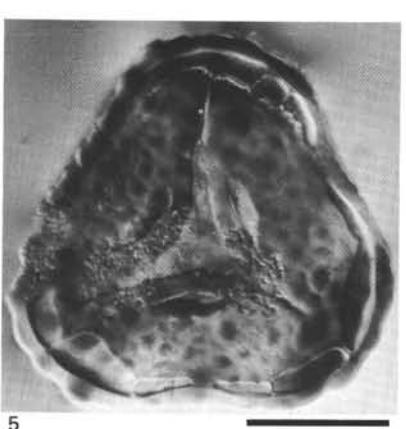
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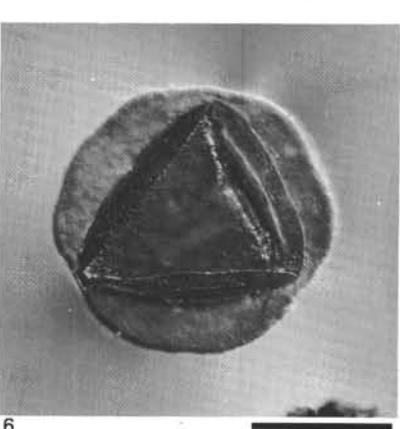
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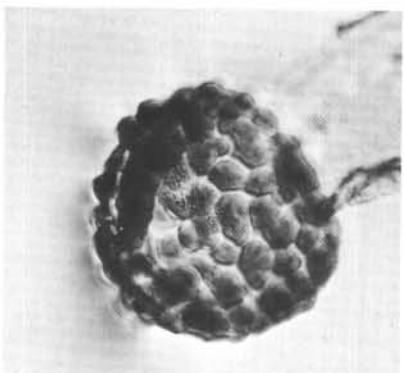
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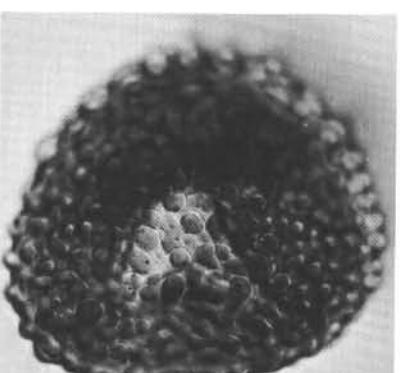
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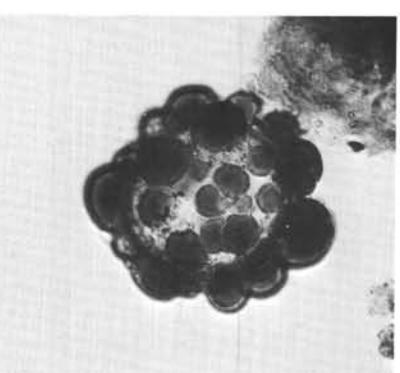
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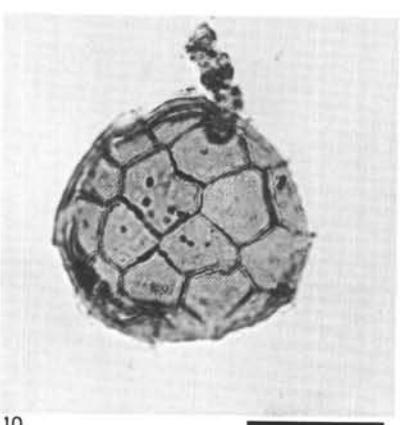
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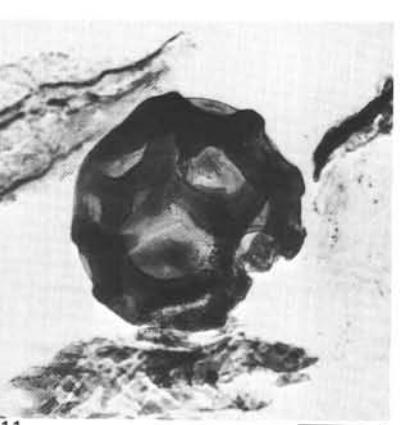
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