UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

ILLUSTRATIONS OF PLANT MICROFOSSILS FROM THE CHINLE FORMATION, GARFIELD COUNTY, UTAH

by

L. Imogene Doher

Open-File Report 82-1092

1982

Published palynomorph data on the Chinle Formation (Triassic) of the western United States is sparse. Part of the reason for this sparse data is the lack of favorable lithotypes. Of the many samples that have been processed and examined at the U.S. Geological Survey palynology laboratory in Denver, Colo., few have yielded significant assemblages.

This report documents an assemblage from the Shinarump Member of the Chinle Formation in southeastern Utah. The report is not a formal taxonomic study; no attempt was made to revise nomenclature, and no new genera or species are described. The photographs of taxa are for use as a laboratory guide for the preliminary identification and comparison of Triassic pollen and spores.

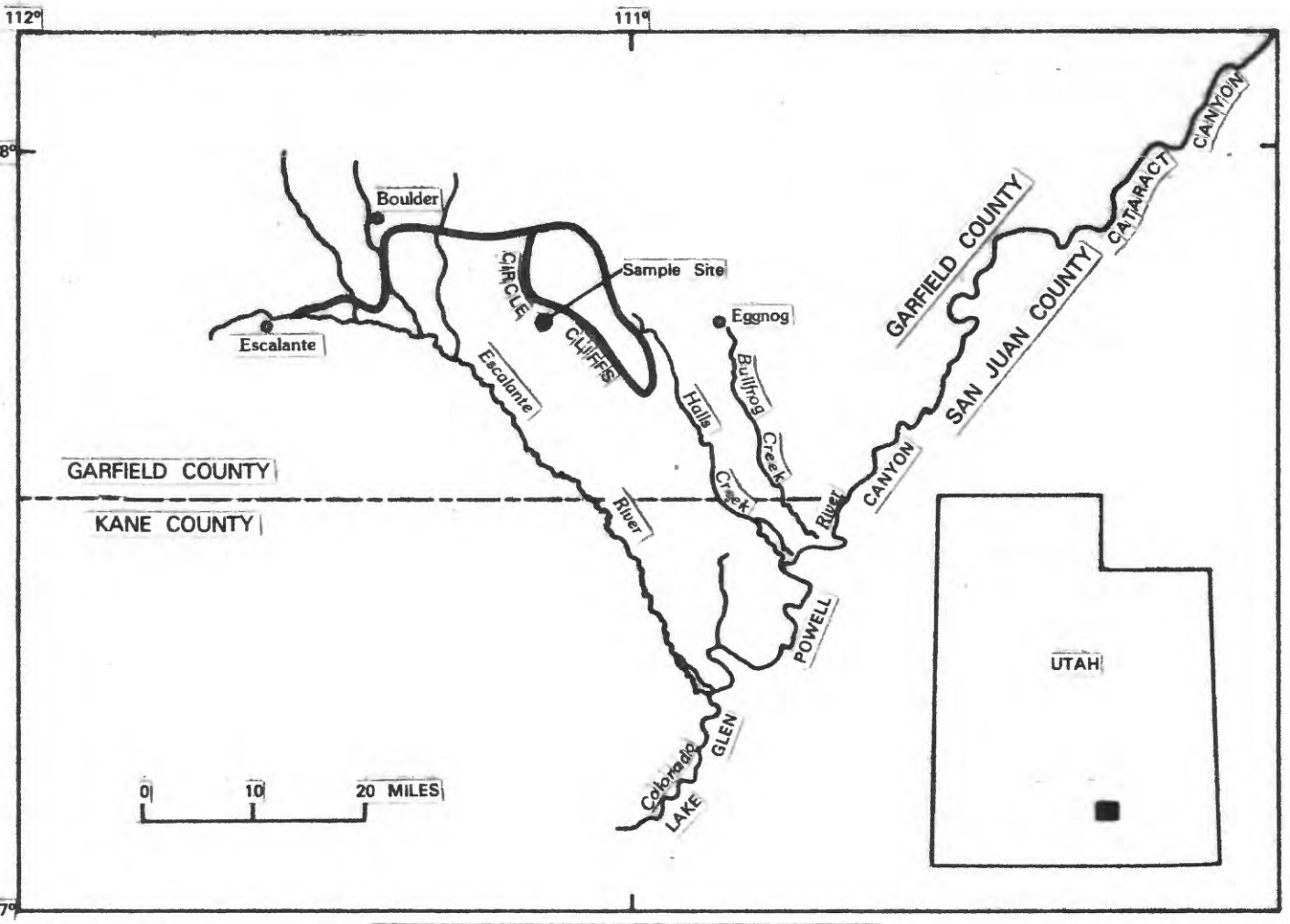
Identifications are primarily from the reports included in the bibliography.

The pollen and spores illustrated here were obtained from a single surface sample, collected by R. A. Scott, from a coal lens in the lower part of the Chinle Formation, in the Circle Cliffs, Garfield County, Utah. The locality is a bulldozed outcrop of the Shinarump Member 0.80 km east of the point where Death Hollow Canyon crosses the contact between the Moenkopi Formation and the Chinle Formation, in the NE1/4NW1/4 sec. 8 (unsurveyed), T. 35 S., R. 7 E., Garfield County, Utah. The locality is in the Wagon Box Mesa 15-minute quadrangle, Utah.

All specimens illustrated in this report are preserved on slides deposited in the paleobotanical collection of the U.S. Geological Survey, Denver. The specimens may be located on the slides by the mechanical stage coordinates given in the figure explanations. The coordinates for the center point of a 1x3-in. standard microscope slide are 108.0x12.3 mm, for the specimens shown in this report. The method of accurately locating the center of a standard microscope slide has been described by Tschudy (1966, p. D78). With the slide label to the observer's left, the vertical coordinates decrease toward the near edge of the slide, and the horizontal coordinates decrease toward the right edge of the slide. Some coordinates are followed by the letter K, which indicates that the slide should be placed on the microscope stage with the label to the right. Coordinates not followed by K indicate that the slide should be placed on the microscope stage with the label to the left.

Photograpic prints of the illustrations in this report may be obtained from the following address:

Photographic Library, MS 914
U.S. Geological Survey
Box 25046, Federal Center
Denver CO 80225
Phone 303-234-4004



INDEX MAP SHOWING COLLECTING LOCALITY

SELECTED BIBLIOGRAPHY

Bharadwaj, D. C., and Singh, H. P., 1963, An upper Triassic miospore assemblage from the coals of Lunz, Austria: Palaeobotanist, v. 12, no. 1, p. 28-44, 5 pls.

Clarke, R. F. A., 1965, Keuper miospores from Worcestershire, England: Palaeontology, v. 8, pt. 2, p. 294-321, 5 pls.

Cornet, Bruce, 1977, The palynostratigraphy and age of the Newark Supergroup: University Park, Pennsylvania State University Ph.D. thesis, 527 p.

Cornet, Bruce, and Traverse, Alfred, 1975, Palynological contributions to the chronology and stratigraphy of the Hartford Basin in Connecticut and Massachusetts: Geoscience and Man, v. 11, p. 1-33, 8 pls.

Couper, R. A., 1958, British Mesozoic microspores and pollen grains: Palaeontographica, v. 103, Abt. B., nos. 4-6, p. 75-179, 17 pls.

Daugherty, L. H., 1941, The upper Triassic flora of Arizona, with a discussion of its geologic occurrence, by H. R. Stanger: Carnegie Institution of Washington Publication 526, 108 p., 1 pl.

De Jersey, N. J., 1962, Triassic spores and pollen grains from the Ipswich Coalfield: Queensland Geological Survey Publication 307, 18 p., 6 pls.

_____1968, Triassic spores and pollen grains from the Clematis Sandstone: Queensland Geological Survey Publication 338, Palaeontology Paper 14, 44 p., 5 pls.

_____1969, Triassic microfloras from the Wandoan Formation: Queensland Geological Survey, Report 31, 30 p., 2 pls.

_____1972, Triassic miospores from the Esk Beds: Queensland Geological Survey Publication 357, Palaeontology Paper 32, 40 p., 5 pls.

De Jersey, N. J., and Hamilton, M., 1967, Triassic spores and pollen grains from the Moolayember Formation: Queensland Geological Survey Publication 336, Palaeontology Paper 10, 61 p., 9 pls.

Dunay, R. E., 1972, The palynology of the Triassic Dockum Group of Texas, and its application to stratigraphic problems of the Dockum Group: University Park, Pennsylvania State University Ph.D. thesis, 382 p.

Dunay, R. E., and Fisher, M. J., 1974, Late Triassic palynofloras of North America and their European correlatives, in Permian and Triassic palynology: Review of Palaeobotany and Palynology, v. 17, no. 1-2, p. 179-186.

_____1979, Palynology of the Dockum Group (upper Triassic), Texas, U.S.A.: Review of Palaeobotany and Palynology, v. 28, no. 1, p. 61-92, 5 pls.

Dunay, R. E., and Traverse, A., 1971, Preliminary report on Triassic spores and pollen of the Dockum Group, Texas Panhandle: Geoscience and Man, v. 3, p. 65-68, 2 pls.

Fisher, M. J., 1972, The Triassic palynofloral succession in England: Geoscience and Man, v. 4, p. 101-109, 2 pls.

Fisher, M. J., and Bujak, J., 1975, Upper Triassic palynofloras from Arctic Canada: Geoscience and Man, v. 11, p. 87-94, 2 pls.

Geiger, M. E., and Hopping, C. A., 1968, Triassic stratigraphy of the southern North Sea Basin: Royal Society of London Philosophical Transactions, ser. B, v. 254, p. 1-36, 4 pls.

Herbst, Rafael, 1970, Estudio palinológico de la cuenca Ischigualasto-Villa Unión (Triásico), Provincias de San Juan-La Rioja: Ameghiniana, v. 7, no. 1, p. 83-97, 2 pls.
Jain, R. K., 1968, Middle Triassic pollen grains and spores from Minas de Petroleo beds of the Cacheuta Formation (Upper Gondwana), Argentina: Palaeontographica, ser. B., v. 122, pts. 1-3, p. 1-47, 12 pls.
Jansonius, J., 1962, Palynology of Permian and Triassic sediments, Peace River area, western Canada: Palaeontographica, ser. B., v. 110, pts. 1-4, p. 35-98, 6 pls.
Kavary, Emadeddin, 1972, Significant upper Triassic microspores from Bleiberg, Austria: Austria, Geologische Bundesanstalt, Jahrbuch, Sonderband, no. 19, p. 87-104, 3 pls.
Krausel, Richard, and Leschik, Georg, 1956, Die Keuperflora von Neuewelt bei Basel, with a section on Die Iso- und Mikrosporen, by Georg Leschik: Schweizerische Palaeontologische Abhandlungen, Memoires Suisses de Paleontologie, v. 72, p. 5-70, 10 pls.
Leschik, Georg, 1956, Sporen aus dem Salzton des Zechsteins von Neuhof (bei Fulda): Palaeontographica, ser. B., v. 100, nos. 4-6, p. 122-142, 3 pls.
Mädler, K., 1964, Die geologische Verbreitung von sporen und pollen in der Deutschen Trias: Beihefte zum Geologischen Jahrbuch, v. 65, p. 1-147, 12 pls.
McGregor, D. C., 1965, Illustrations of Canadian fossils. Triassic, Jurassic, and lower Cretaceous spores and pollen of Arctic Canada: Canada Geological Survey Paper 64-55, 32 p., 10 pls.
Morbey, S. J., 1975, The palynostratigraphy of the Rhaetian stage, upper Triassic, in the Kendelbachgraben, Austria: Palaeontographica, ser B., v. 152, pts. 1-3, p. 1-75, 19 pls.
Nilsson, Tage, 1958, Über das Vorkommen eines mesozoischen Sapropelgesteins in Schonen: Lund Universitet Årsskrift, v. 54, no. 10, p. 1-111, 8 pls.
Norris, G., 1965, Triassic and Jurassic miospores and acritarchs from the Beacon and Ferrar groups, Victoria Land, Antarctica: New Zealand Journal of Geology and Geophysics, v. 8, no. 2, p. 236-277, 7 pls.
Orbell, G., 1973, Palynology of the British Rhaeto-Liassic: Great Britian Geological Survey Bulletin, no. 44, p. 1-44, 5 pls.
Pautsch, M. E., 1971, Sporomorphs of the upper Triassic from a borehole at Trzciana near Mielec (South Poland): Acta Palaeobotanica, v. 12, no. 1, p. 1-59, 19 pls.
_____1973, Upper Triassic spores and pollen from the Polish Carpathian Foreland: Micropaleontology, v. 19, no. 2, p. 129-149, 5 pls.
Playford, Geoffrey, 1965, Plant microfossils from Triassic sediments near Poatina, Tasmania: Geological Society of Australia Journal, v. 12, no. 2, p. 173-210, 6 pls.
Playford, Geoffrey, and Dettmann, M. E., 1965, Rhaeto-Liassic plant microfossils from the Leigh Creek Coal Measures, South Australia: Senckenbergiana Lethaea, v. 46, nos. 2-3, p. 127-181, 6 pls.
Schultz, Georg, and Hope, R. C., 1973, Late Triassic microfossil flora from the Deep River Basin, North Carolina: Palaeontographica, ser. B, v. 141, pts. 3-6, p. 63-88, 4 pls.

Schuurman, W. M. L., 1976, Aspects of late Triassic palynology; 1, On the morphology, taxonomy and stratigraphical-geographical distribution of the form genus Ovalipollis: Review of Palaeobotany and Palynology, v. 21, no. 4, p. 241-266, 8 pls.

Stone, J. F., 1978, Pollen and spores, Chapter V in S. R. Ash, ed., Geology, paleontology, and paleoecology of a Late Triassic lake, western New Mexico: Brigham Young University Geology Studies, v. 25, pt. 2, p. 45-59.

Tschudy, R. H., 1966, Associated megaspores and microspores of the Cretaceous genus Ariadnaesporites Potonie, 1956, emend., in Geological Survey research 1966: U.S. Geological Survey Professional Paper 550-D, p. D76-D82.

Visscher, H., and Commissaris, A. L. T. M., 1968, Middle Triassic pollen and spores from the lower Muschelkalk of Winterswijk (the Netherlands): Pollen et Spores, v. 10, no. 1, p. 161-176, 7 pls.

Figure 1.--Magnification X 1000.

A. Monosulcites sp. Locality D1341, slide 7, coordinates 119.1 x 2.9 K.

B. Monosulcites sp. Locality D1341, slide 5, coordinates 124.2 x 6.5 K.

C. Monosulcites sp. Locality D1341, slide 8, coordinates 105.2 x 7.9.

D. Monosulcites sp. Locality D1341, slide 1, coordinates 107.9 x 16.1.

E. Monosulcites sp. Locality D1341, slide 9, coordinates 134.3 x 17.3 K.

F. Monosulcites sp. Locality D1341, slide 1, coordinates 105.6 x 7.0 K.

G. Monosulcites sp. Locality D1341, slide 5, coordinates 128.7 x 4.8 K.

H. Granamonocolpites luisae (Jain) Herbst, 1970. Locality D1341, slide 1, coordinates 116.8 x 9.2 K.

I. Granamonocolpites luisae (Jain) Herbst, 1970. Locality D1341, slide 1, coordinates 128.3 x 2.2 K.

J. Granamonocolpites luisae (Jain) Herbst, 1970. Locality D1341, slide 5, coordinates 104.2 x 6.2 K.

K. Granamonocoplites luisae (Jain) Herbst, 1970. Locality D1341, slide 5, coordinates 111.8 x 5.0 K.

L. Granamonocolpites luisae (Jain) Herbst, 1970. Locality D1341, slide 10, coordinates 124.9 x 1.3 K.

M. Granamonocolpites luisae (Jain) Herbst, 1970. Locality D1341, slide 2, coordinates 115.6 x 13.6 K.

N. Granamonocolpites luisae (Jain) Herbst, 1970. Locality D1341, slide 110, coordinates 105.2 x 17.3.

O. Monolete, reticulate spore, undetermined. Locality D1341, slide 1, coordinates 115.1 x 1.0 K.

P. cf. Corollina. Locality D1341, slide 7, coordinates 104.6 x 10.8 K.

Q. Cycadopites sp. Locality D1341, slide 133, coordinates 107.1 x 20.3.

R. Monolete, reticulate spore, undetermined. Locality D1341, slide 6, coordinates 113.6 x 22.7 K.

S. Bharadwajipollenites sp. Jain, 1968. Locality D1341, slide 8, coordinates 102.3 x 6.9.

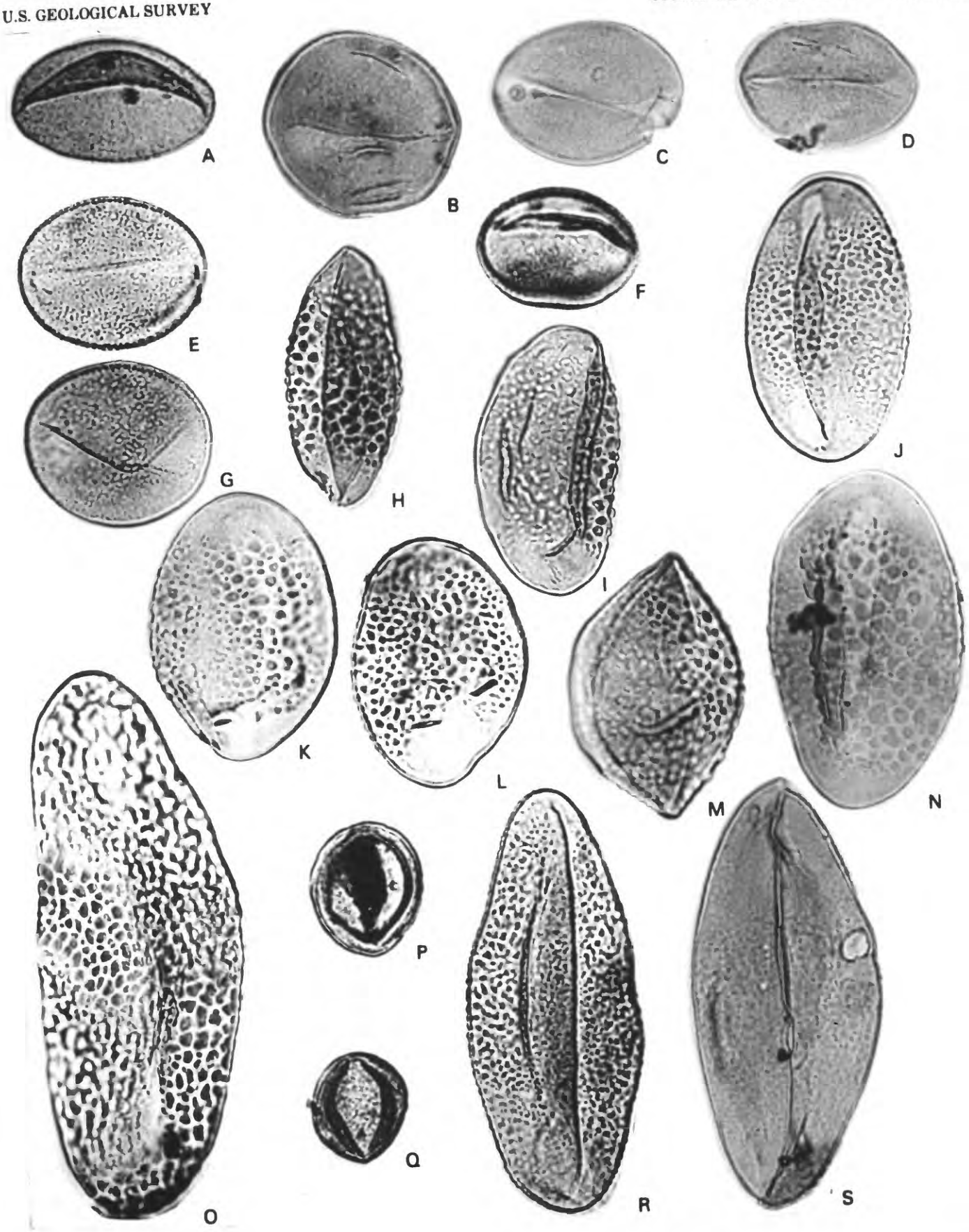

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S

Figure 2.--Magnification X 1000.

A. Cyathidites australis Couper, 1953. Locality D1341, slide 7, coordinates 119.0 x 2.9 K.

B. Calamospora sp. Locality D1341, slide 8, coordinates 96.4 x 15.4.

C. Calamospora sp. Locality D1341, slide 1, coordinates 124.5 x 5.1 K.

D. Calamospora sp. Locality D1341, slide 5, coordinates 102.7 x 6.7 K.

E. Punctatisporites sp. Locality D1341, slide 1, coordinates 106.6 x 6.3.

F. Calamospora sp. Locality D1341, slide 1, coordinates 103.0 x 23.2.

G. Calamospora sp. Locality D1341, slide 6, coordinates 109.0 x 7.3.

H. Punctatisporites cf. P. fissus Leschik 1956. Locality D1341, slide 9, coordinates 135.3 x 17.5.

I. Retusotriletes sp. Locality D1341, slide 8, coordinates 103.5 x 20.0.

J. Calamospora cf. C. mesozoica Couper, 1958. Locality D1341, slide 5, coordinates 128.2 x 6.1 K.

K. Calamospora cf. C. mesozoica Couper, 1958. Locality D1341, slide 1, coordinates 103.0 x 11.2.

L. Same as K. Interference contrast.

M. Todisporites marginalis Bharadwaj and Singh, 1963. Locality D1341, slide 8, coordinates 109.0 x 17.5

N. Todisporites sp. Locality D1341, slide 7, coordinates 105.3 x 17.5 K.

O. Todisporites major Couper, 1958. Locality D1341, slide 5, coordinates 126.8 x 3.5 K.

P. Todisporites major Couper, 1958. Locality D1341, slide 1, coordinates 121.3 x 7.0 K.

Q. Microreticulatisporites cf. M. fuscus (Nilsson) Morbey, 1975. Locality D1341, slide 5, coordinates 107.5 x 11.6.

R. Trilete spore, undetermined. Locality D1341, slide 5, coordinates 120.5 x 7.2 K.

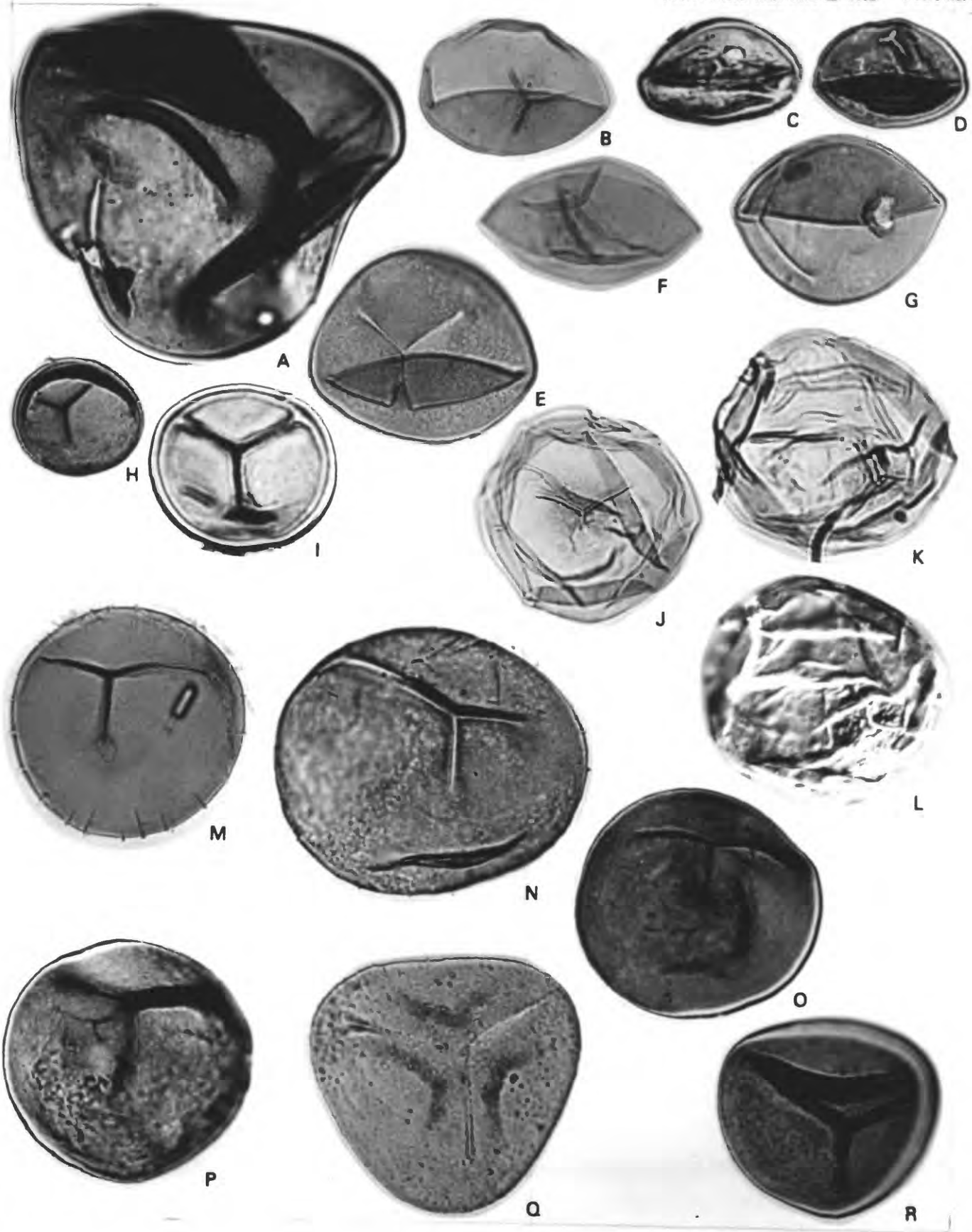

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R

Figure 3.--Magnification x 1000.

A. Punctatisporites toralis Leschik 1956. Locality D1341, slide 5, coordinates 128.8 x 11.9 K.

B. Apiculatisporites sp. Locality D1341, slide 9, coordinates 122.7 x 9.5 K.

C. Apiculatisporites sp. Locality D1341, slide 1, coordinates 125.9 x 1.7 K.

D. Apiculatisporites sp. Locality D1341, slide 1, coordinates 109.3 x 16.2

E. Lycopodiumsporites sp. Locality D1341, slide 8, coordinates 109.8 x 12.1 (distal focus).

F. Lycopodiumsporites sp. Locality D1341, slide 8, coordinates 109.8 x 12.1 (proximal focus).

G. Lycopodiumsporites sp. Locality D1341, slide 9, coordinates 118.0 x 6.3 K.

H. Lycopodiumsporites sp. Locality D1341, slide 7, coordinates 110.4 x 17.8 K.

I. Triletes klausii Bharadwaj and Singh 1964. Locality D1341, slide 1, coordinates 100.0 x 22.3.

J. Triletes klausii Bharadwaj and Singh 1964. Locality D1341, slide 8, coordinates 85.6 x 15.2.

K. Deltoidispora sp. Locality D1341, slide 107, coordinates 102.3 x 21.8.

L. ?Discisporites sp. Locality D1341, slide 7, coordinates 110.2 x 16.7 K.

M. Dictophyllidites mortoni (De Jersey) Playford and Dettman, 1965. Locality D1341, slide 1, coordinates 115.3 x 18.9 K.

N. Dictyophyllidites mortoni (De Jersey) Playford and Dettmann, 1965. Locality D1341, slide 2, coordinates 108.9 x 21.3 K.

O. Dictyophyllidites cf. D. harrisii Couper, 1958. Locality D1341, slide 7, coordinates 104.1 x 16.3 K.

P. Deltoidospora sp. Locality D1341, slide 8, coordinates 105.6 x 16.1.

Q. Trilete spore, undetermined. Locality D1341, slide 8, coordinates 88.8 x 20.0.

R. Trilete spore, undetermined. Locality D1341, slide 1, coordinates 126.3 x 3.3 K.

S. Trilete spore, undetermined. Locality D1341, slide 71, coordinates 89.3 x 3.7.

T. Trilete spore, undetermined. Locality D1341, slide 8, coordinates 108.5 x 17.3.

U. Trilete spore, undetermined. Locality D1341, slide 1, coordinates 127.7 x 2.2 K.

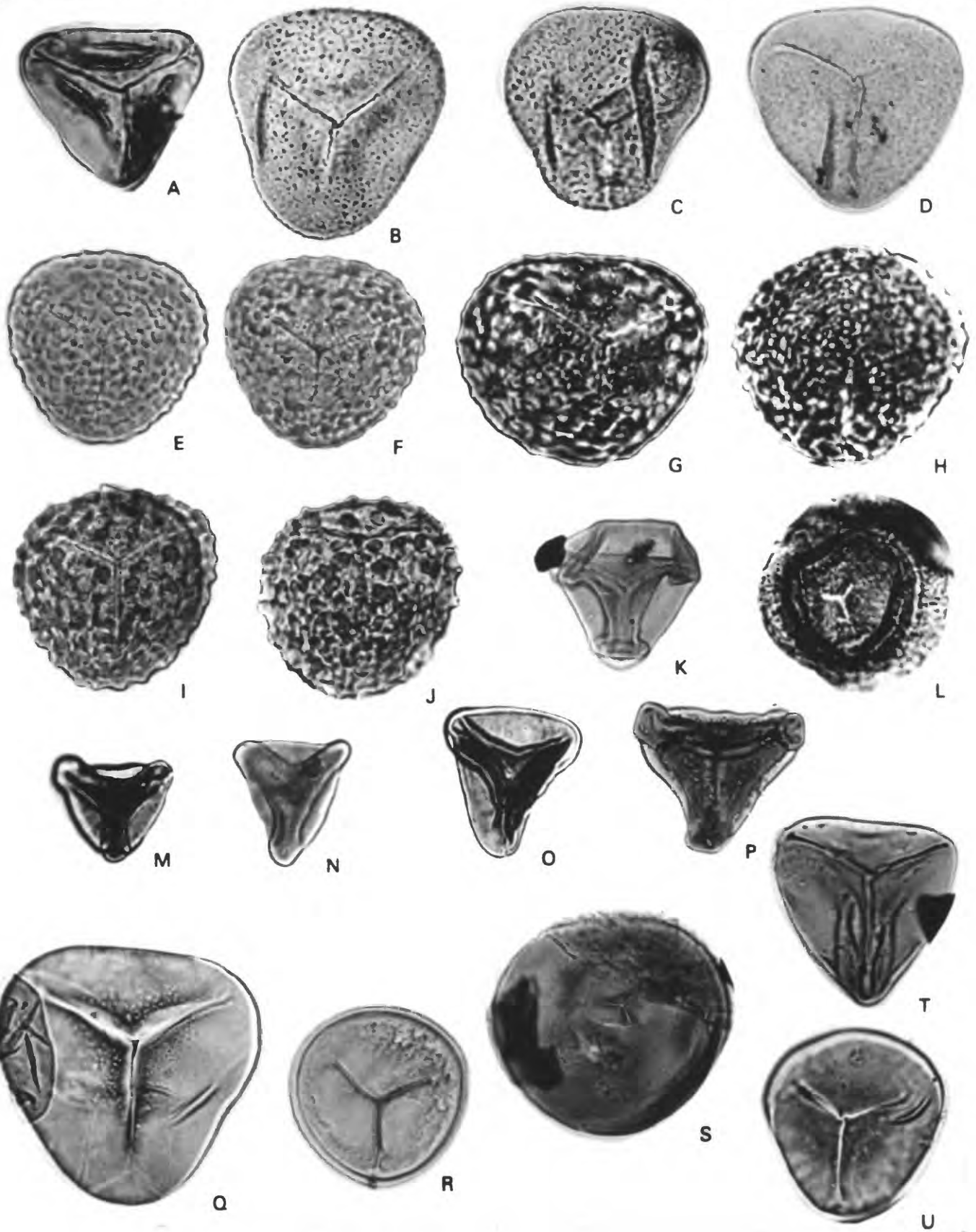

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U

Figure 4.--Magnification X 1000.

A. Callialasporites triassicus (Sukh Dev) Dunay and Fisher, 1979. Locality D1341, slide 7, coordinates 123.8 x 6.6 K.

B. Callialasporites triassicus (Sukh Dev) Dunay and Fisher, 1979. Locality D1341, slide 1, coordinates 109.9 x 23.0.

C. cf. Duplicisporites granulatus Leschik, 1956. Locality D1341, slide 1, coordinates 111.5 x 6.9 K.

D. ?Tulesporites briscoensis Dunay and Fisher, 1979. Locality D1341, slide 8, coordinates 101.7 x 19.0.

E. Patinasporites cf. P. densus (Leschik) Scheuring, 1970. Locality D1341, slide 9, coordinates 122.5 x 16.8 K.

F. Patinasporites cf. P. densus (Leschik) Scheuring, 1970. Locality D1341, slide 6, coordinates 109.0 x 22.4.

G. Patinasporites cf. P. densus (Leschik) Scheuring, 1970. Locality D1341, slide 1, coordinates 101.9 x 11.0.

H. Same as G. Interference contrast.

I. ?Patinasporites sp. Locality D1341, slide 9, coordinates 126.1 x 16.3 K.

J. Monosaccate spore, undetermined. Locality D1341, slide 6, coordinates 95.3 x 19.1.

K. Enzonalasporites sp. Locality D1341, slide 7, coordinates 106.2 x 16.3 K.

L. Enzonalasporites cf. E. vigens (Leschik) Scheuring, 1970. Locality D1341, slide 9, coordinates 133.7 x 16.8 K.

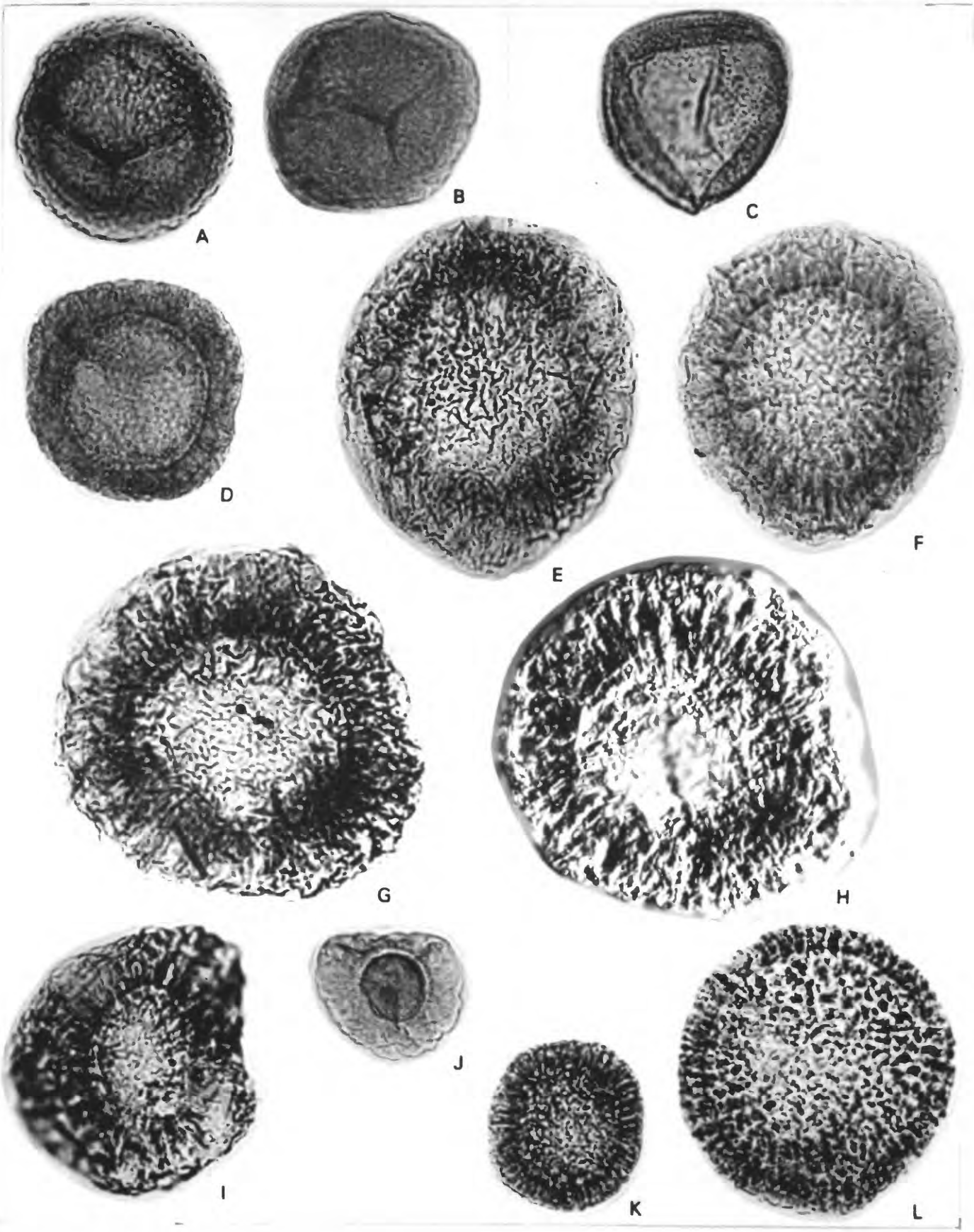

A
B
C
D
E
F
G
H
I
J
K
L

Figure 5.--Magnification X 1000.

A. Zonalasporites cinctus Leschik, 1956. Locality D1341, slide 8, coordinates 84.6 x 15.6.

B. Zonalasporites sp. Locality D1341, slide 7, coordinates 109.3 x 16.2 K.

C. Zonalasporites sp. Locality D1341, slide 7, coordinates 123.2 x 5.3 K.

D. Zonalasporites sp. Locality D1341, slide 8, coordinates 106.5 x 16.4.

E. Daughertyspora chinleanus (Daugherty) Dunay and Fisher, 1979. Locality D1341, slide 7, coordinates 105.4 x 5.9 K.

F. Daughertyspora chinleanus (Daugherty) Dunay and Fisher, 1979. Locality D1341, slide 2, coordinates 94.8 x 14.3.

G. Daughertyspora chinleanus (Daugherty) Dunay and Fisher, 1979. Locality D1341, slide 133, coordinates 104.5 x 14.5.

H. Trilete, monosaccate spore, undetermined. Locality D1341, slide 8, coordinates 96.2 x 15.6.

I. Camerosporites spissus Dunay and Fisher, 1979. Locality D1341, slide 8, coordinates 112.0 x 17.0.

J. Camerosporites secatus (Leschik) Scheuring, 1970. Locality D1341, slide 107, coordinates 105.7 x 6.0.

K. Aratrisporites sp. Locality D1341, slide 5, coordinates 102.4 x 7.3 K.

L. Aratrisporites sp. Locality D1341, slide 8, coordinates 98.0 x 12.5.

M. Aratrisporties sp. Locality D1341, slide 5, coordinates 127.6 x 5.0 K.

N. Aratrisporites sp. Locality D1341, slide 8, coordinates 95.8 x 15.9.

O. Aratrisporites sp. Locality D1341, slide 2, coordinates 95.1 x 21.9.

P. Aratrisporites sp. Locality D1341, slide 1, coordinates 85.2 x 17.2.

Q. Undetermined. Locality D1341, slide 5, coordinates 107.5 x 10.3 K.

R. Undetermined. Locality D1341, slide 8, coordinates 88.0 x 15.1.

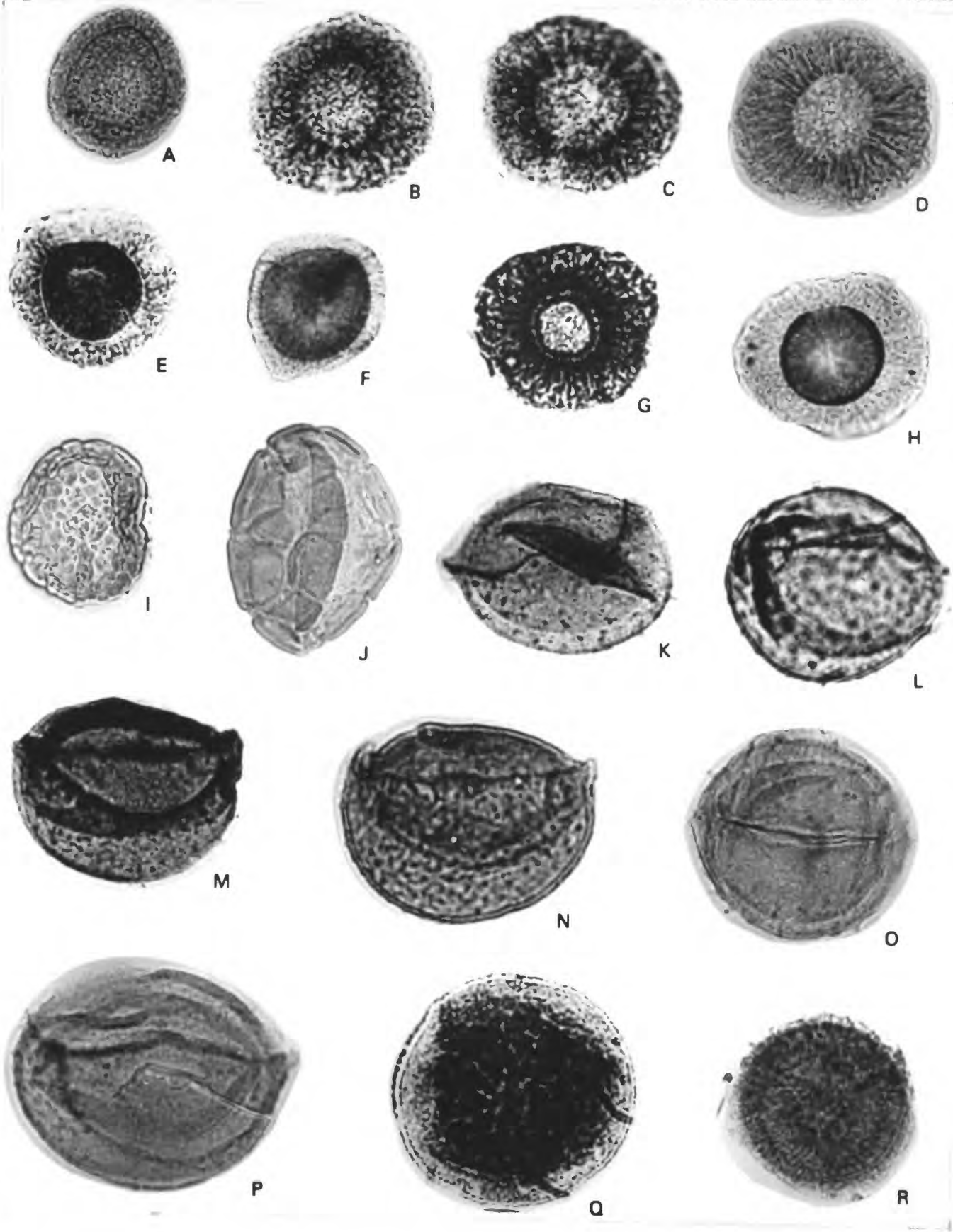

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R

Figure 6.--Magnification X 1000.

A. Equisetosporites chinleana (Daugherty) Scott, 1960. Locality D1341, slide 1, coordinates 108.4 x 1.1.

B. Equisetosporites chinleana (Daugherty) Scott, 1960. Locality D1341, slide 8, coordinates 111.8 x 16.5.

C. Equisetosporites chinleana (Daugherty) Scott, 1960. Locality D1341, slide 9, coordinates 119.8 x 8.3 K.

D. Equisetosporites chinleana (Daugherty) Scott, 1960. Locality D1341, slide 5, coordinates 105.8 x 19.0.

E. Equisetosporites steevsi (Jansonius) De Jersey, 1968. Locality D1341, slide 5, coordinates 106.8 x 10.7 K.

F. Equisetosporites sp. Locality D1341, slide 107, coordinates 88.8 x 8.7.

G. Equisetosporites sp. Locality D1341, slide 110, coordinates 96.3 x 9.8.

H. Brodispora striata Clarke, 1965. Locality D1341, slide 9, coordinates 93.4 x 21.9.

I. Brodispora striata Clarke, 1965. Locality D1341, slide 2, coordinates 83.9 x 9.8.

J. Brodispora striata Clarke, 1965. Locality D1341, slide 8, coordinates 90.0 x 16.2.

K. ?Brodispora striata Clarke, 1965. Locality D1341, slide 1, coordinates 120.8 x 4.2 K.

L. Striate spore, undetermined. Locality D1341, slide 1, coordinates 90.3 x 18.6.

M. Striate spore, undetermined. Locality D1341, slide 2, coordinates 85.1 x 19.9.

N. Striate spore, undetermined. Locality D1341, slide 87, coordinates 89.6 x 17.9.

O. Striate spore, undetermined. Locality D1341, slide 108, coordinates 96.7 x 11.9.


A
B
C
D
E
F
G
H
I
J
K
L
M
N
O

Figure 7.--Magnification X 1000.

A. Bisaccate pollen, undetermined. Locality D1341, slide 9, coordinates 111.1 x 16.1 K.

B. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 85.3 x 22.8.

C. ?Umbrosaccus sp. Locality D1341, slide 8, coordinates 84.6 x 19.9.

D. ?Umbrosaccus sp. Locality D1341, slide 1, coordinates 102.1 x 15.0.

E. Wapellites sp. Locality D1341, slide 5, coordinates 127.2 x 10.0 K.

F. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 109.1 x 2.1 K.

G. Umbrosaccus sp. Locality D1341, slide 1, coordinates 90.0 x 23.3.

H. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 84.2 x 23.0.

I. Bisaccate pollen, undetermined. Locality D1341, slide 108, coordinates 115.6 x 7.1.

J. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 93.6 x 21.6.

K. ?Klausipollenites sp. Locality D1341, slide 7, coordinates 121.9 x 8.4 K.

L. ?Klausipollenites sp. Locality D1341, slide 7, coordinates 118.5 x 2.8 K.

M. ?Klausipollenites sp. Locality D1341, slide 5, coordinates 126.0 x 7.2 K.

N. ?Klausipollenites sp. Locality D1341, slide 9, coordinates 113.6 x 18.0 K.

O. ?Parcisporites sp. Locality D1341, slide 5, coordinates 125.5 x 7.0 K.

P. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 93.4 x 23.2.

Q. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 104.2 x 20.9.

R. Bisaccate pollen, undetermined. Locality D1341, slide 9, coordinates 120.0 x 9.5 K.

S. Bisaccate pollen, undetermined. Locality D1341, slide 9, coordinates 123.8 x 17.3 K.

T. Bisaccate pollen, undetermined. Locality D1341, slide 7, coordinates 120.6 x 9.4 K.

U. Bisaccate pollen, undetermined. Locality D1341, slide 8, coordinates 89.1 x 15.4.


A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U

Figure 8.--Magnification X 1000 unless otherwise indicated.

A. *Platysaccus* sp. Locality D1341, slide 8, coordinates 94.1 x 6.4.

B. *Platysaccus nitidus* Pautsch, 1971. Locality D1341, slide 5, coordinates 127.9 x 11.8 K.

C. *Platysaccus* cf. *P. nitidus* Pautsch, 1971. Locality D1341, slide 9, coordinates 132.3 x 16.3 K.

D. *Platysaccus* cf. *P. nitidus* Pautsch, 1971. Locality D1341, slide 6, coordinates 109.0 x 20.9 K.

E. *Platysaccus* sp. Locality D1341, slide 6, coordinates 99.3 x 16.1.

F. *Platysaccus* sp. Locality D1341, slide 9, coordinates 109.8 x 18.0 K.

G. *Platysaccus* sp. Locality D1341, slide 10, coordinates 81.3 x 10.9, X 500.

H. *Platysaccus* sp. Locality D1341, slide 1, coordinates 106.5 x 19.2.

I. *Platysaccus* sp. Locality D1341, slide 5, coordinates 122.8 x 7.2 K.

J. *Platysaccus* sp. Locality D1341, slide 8, coordinates 85.7 x 10.8.

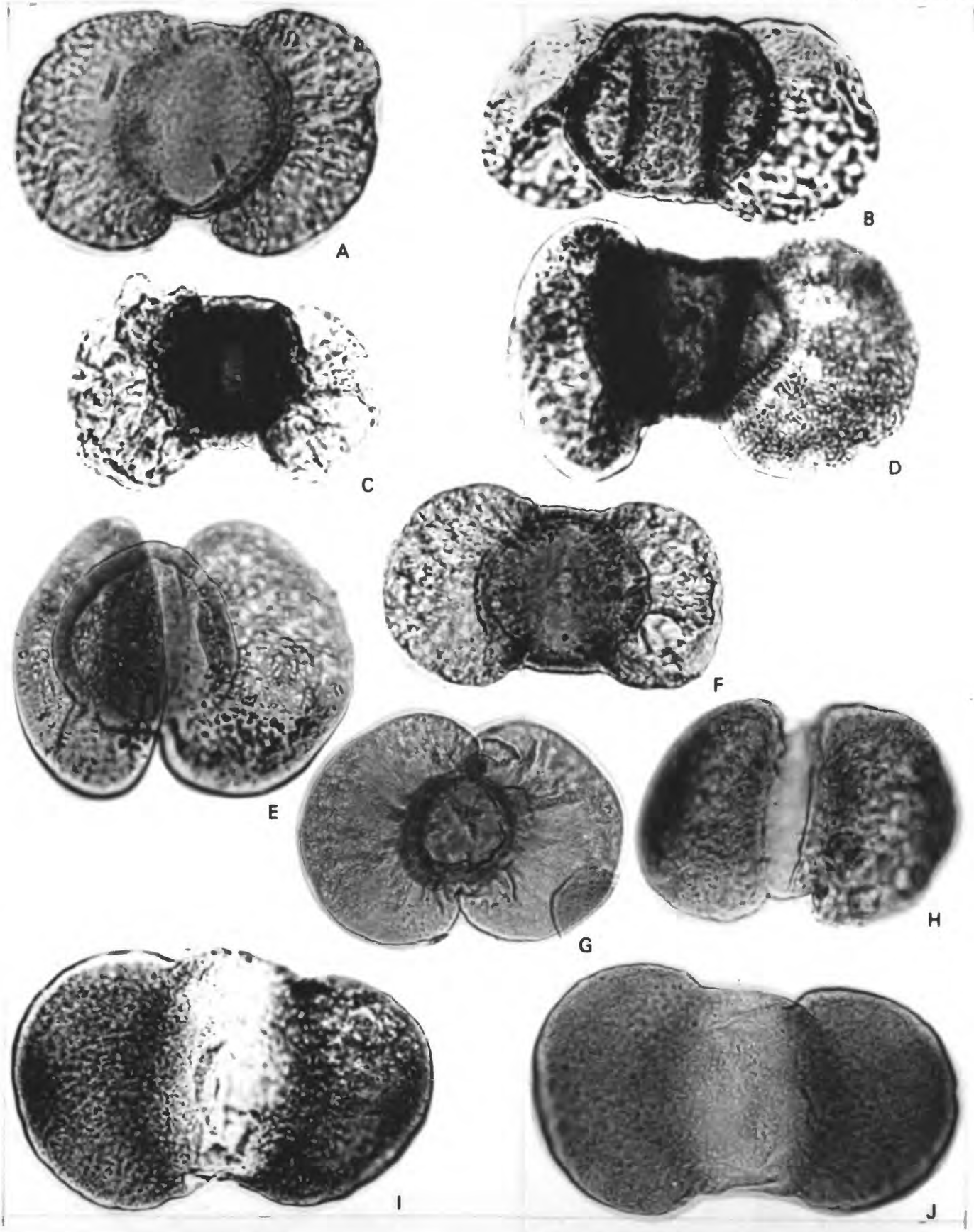

A
B
C
D
E
F
G
H
I
J

Figure 9.--Magnification as indicated.

A. Platysaccus triassicus (Maljavkina) Dunay and Fisher, 1979. Locality D1341, slide 107, coordinates 95.9 x 21.3, X 1000.

B. Platysaccus triassicus (Maljavkina) Dunay and Fisher, 1979. Locality D1341, slide 108, coordinates 111.6 x 10.0, X 600.

C. Platysaccus triassicus (Maljavkina) Dunay and Fisher, 1979. Locality D1341, slide 71, coordinates, 94.8 x 9.5, X 600.

D. Platysaccus sp. Locality D1341, slide 130, coordinates 108.8 x 17.5, X 700.

E. Falcisporites oviformis Dunay and Fisher, 1979. Locality D1341, slide 1, coordinates 87.3 x 17.3, X 500.

F. Falcisporites oviformis Dunay and Fisher, 1979. Locality D1341, slide 5, coordinates 106.9 x 10.8, X 500.

G. Falcisporites oviformis Dunay and Fisher, 1979. Locality D1341, slide 1, coordinates 128.3 x 4.9 K, X 500.

H. Falcisporites tecovasensis Dunay and Fisher, 1979. Locality D1341, slide 110, coordinates 107.3 x 20.6, X 600.

I. Falcisporites cf. F. tecovasensis Dunay and Fisher, 1979. Locality D1341, slide 108, coordinates 98.5 x 8.1, X 600.

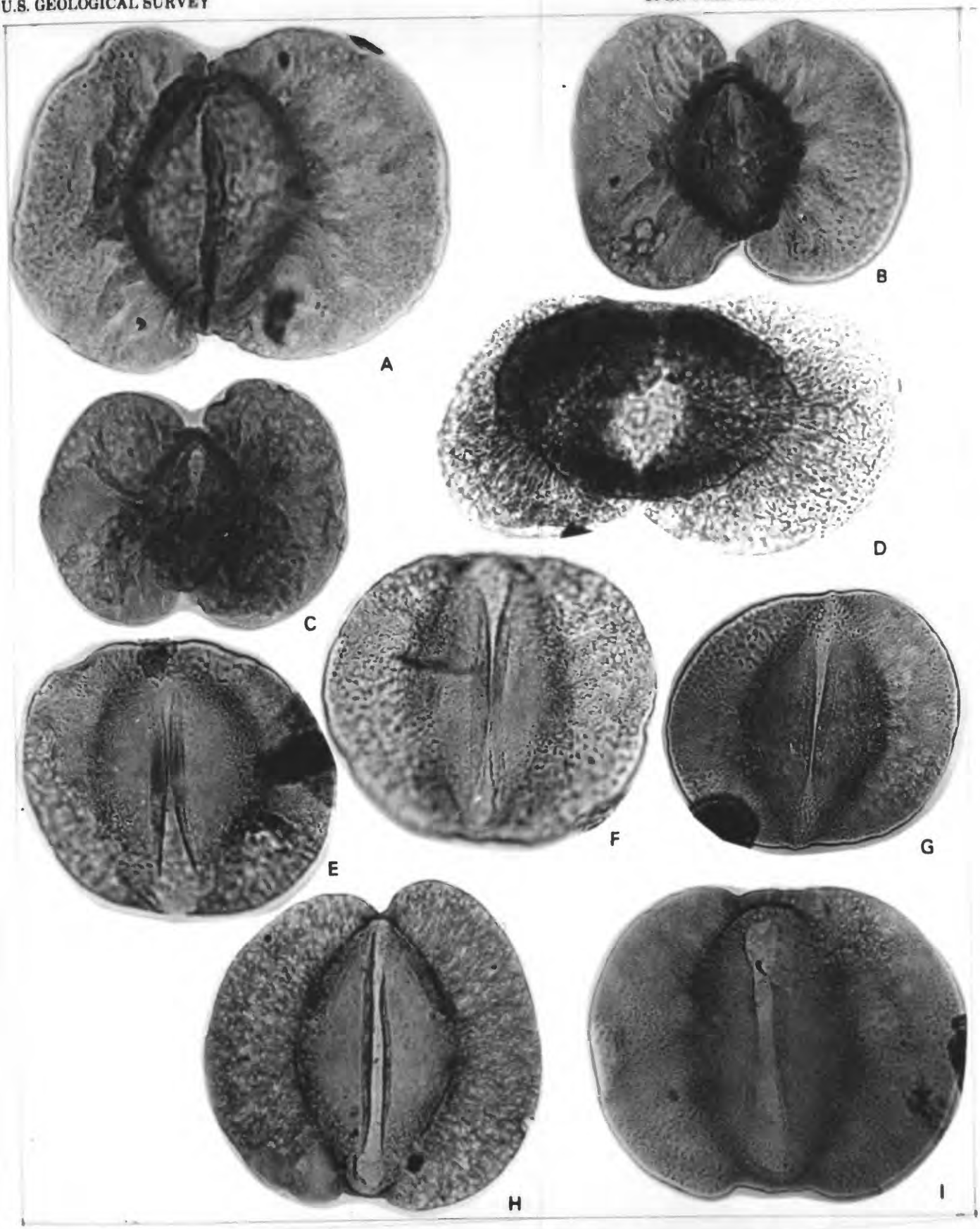

A
B
C
D
E
F
G
H
I

Figure 10.--Magnification X 1000.

A. ?Falcisporites sp. Locality D1341, slide 5, coordinates 127.7 x 3.6 K.

B. Vitreisporites pallidus (Reissinger) Nilsson, 1958. Locality D1341, slide 8, coordinates 93.5 x 11.7.

C. Vitreisporites pallidus (Reissinger) Nilsson, 1958. Locality D1341, slide 110, coordinates 103.9 x 13.6.

D. Vitreisporites sp. Locality D1341, slide 8, coordinates 97.3 x 12.2.

E. Bisaccate pollen, undetermined. Locality D1341, slide 9, coordinates 107.6 x 17.5 K.

F. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 125.2 x 1.7 K.

G. Bisaccate pollen, undetermined. Locality D1341, slide 8, coordinates 93.9 x 16.0.

H. Bisaccate pollen, undetermined. Locality D1341, slide 7, coordinates 116.5 x 16.0 K.

I. Bisaccate pollen, undetermined. Locality D1341, slide 108, coordinates 114.2 x 21.4.

J. Bisaccate pollen, undetermined. Locality D1341, slide 2, coordinates 93.8 x 23.4.

K. Bisaccate pollen, undetermined. Locality D1341, slide 108, coordinates 93.8 x 14.0.

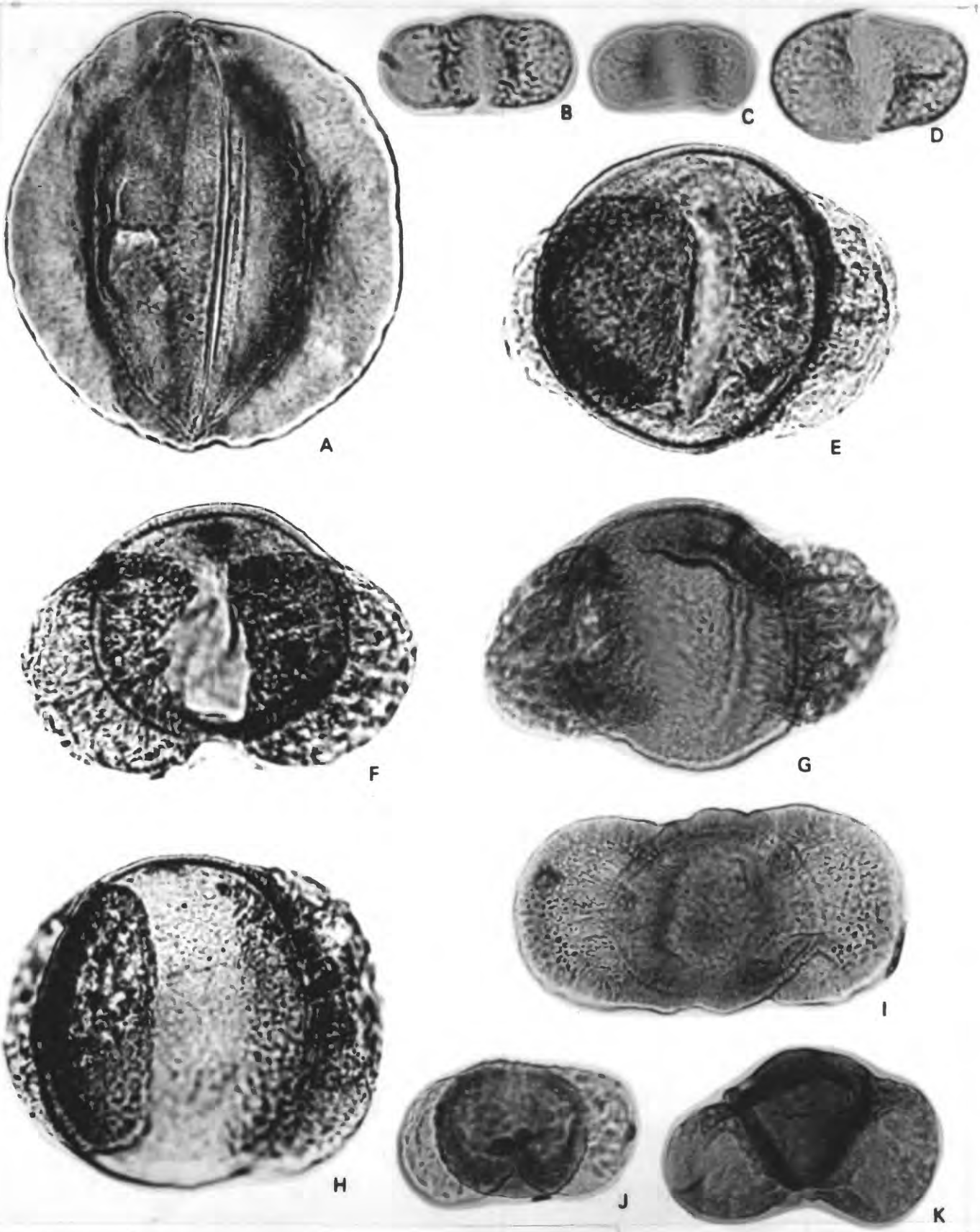

A
B
C
D
E
F
G
H
I
J
K

Figure 11.--Magnification X 1000 unless otherwise indicated.

A. Scopulisporites cf. S. toralis Leschik, 1956. Locality D1341, slide 5, coordinates 111.0 x 5.0 K.

B. Bisaccate pollen, undetermined. Locality D1341, slide 9, coordinates 116.7 x 18.0 K.

C. Bisaccate pollen, undetermined. Locality D1341, slide 2, coordinates 114.8 x 19.7 K, X 750.

D. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 91.6 x 23.0.

E. Protodiploxypinus cf. P. americus Dunay and Fisher, 1979. Locality D1341, slide 130, coordinates 93.7 x 16.2.

F. ?Chordasporites chinleanus (Daugherty) Dunay and Fisher, 1979. Locality D1341, slide 2, coordinates 99.1 x 9.3.

G. Bisaccate pollen, undetermined. Locality D1341, slide 131, coordinates 111.8 x 4.8.

H. Bisaccate pollen, undetermined. Locality D1341, slide 2, coordinates 105.4 x 15.4.

I. ?Plicatisaccus sp. Locality D1341, slide 5, coordinates 108.7 x 8.7.

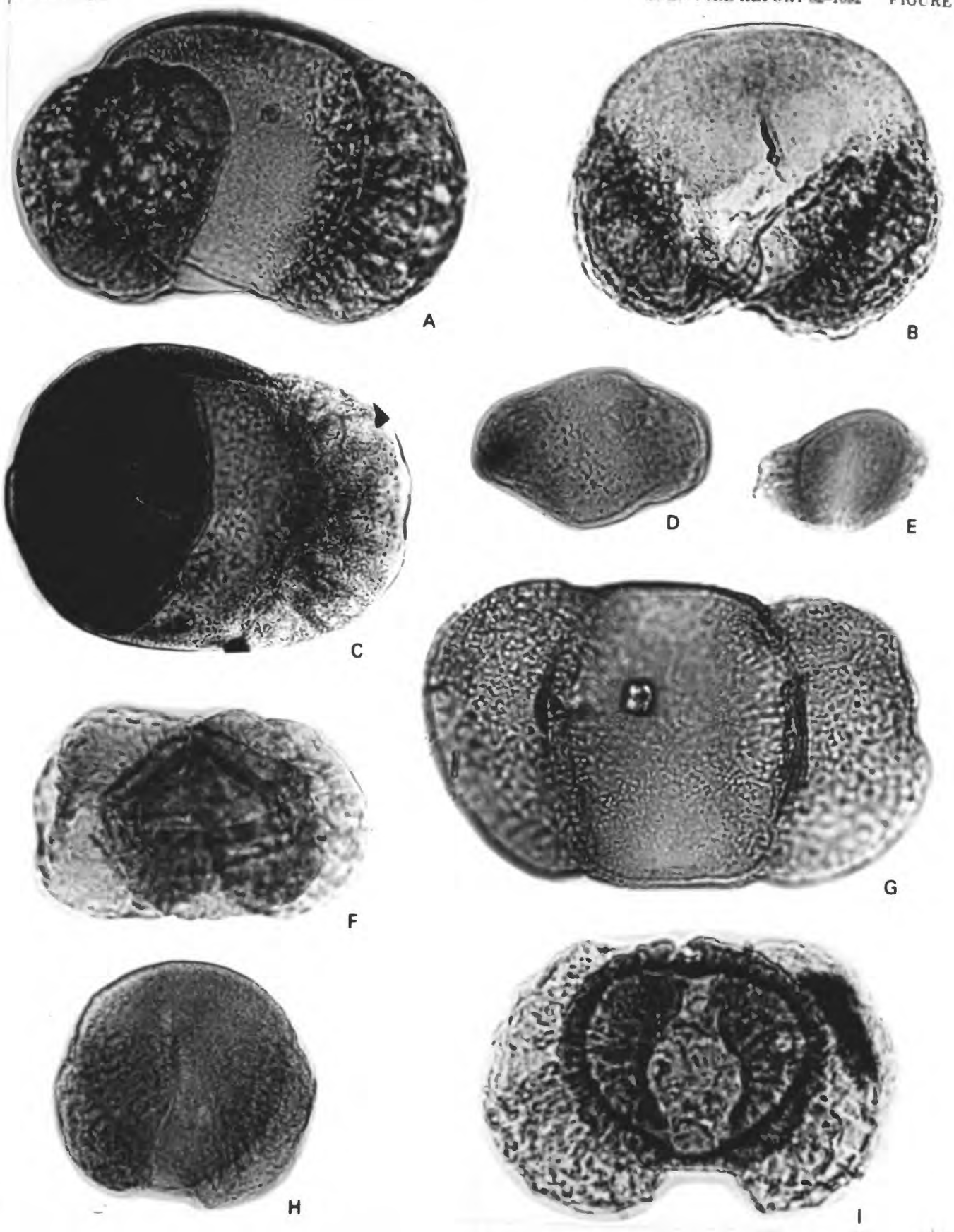

A
B
C
D
E
F
G
H
I

Figure 12.--Magnification X 1000 unless otherwise indicated.

A. Ovalipollis ovalis (Krutzsch) Scheuring, 1970.
Locality D1341, slide 7, coordinates 121.3 x 6.1 K.

B. Ovalipollis ovalis (Krutzsch) Scheuring, 1970.
Locality D1341, slide 9, coordinates 109.2 x 17.0 K.

C. Ovalipollis ovalis (Krutzsch) Scheuring, 1970.
Locality D1341, slide 5, coordinates 100.2 x 15.3.

D. Ovalipollis ovalis (Krutzsch) Scheuring, 1970.
Locality D1341, slide 2, coordinates 108.0 x 13.8.

E. Pityosporites sp. Locality D1341, slide 6, coordinates 106.3 x 13.0.

F. Pityosporites sp. Locality D1341, slide 1, coordinates 92.9 x 23.0.

G. Pityosporites sp. Locality D1341, slide 7, coordinates 110.4 x 3.2.

H. Pityosporites sp. Locality D1341, slide 5, coordinates 106.8 x 8.0 K.

I. Protodiploxypinus sp. Locality D1341, slide 130,
coordinates 91.8 x 15.9.

J. Bisaccate pollen, undetermined. Locality D1341, slide 6,
coordinates 95.3 x 9.6.

K. Bisaccate pollen, undetermined. Locality D1341, slide 106,
coordinates 111.2 x 2.7.

L. Bisaccate pollen, undetermined. Locality D1341, slide 8,
coordinates 111.7 x 13.2.

M. Bisaccate pollen, undetermined. Locality D1341, slide 5,
coordinates 128.9 x 12.7, X 500.

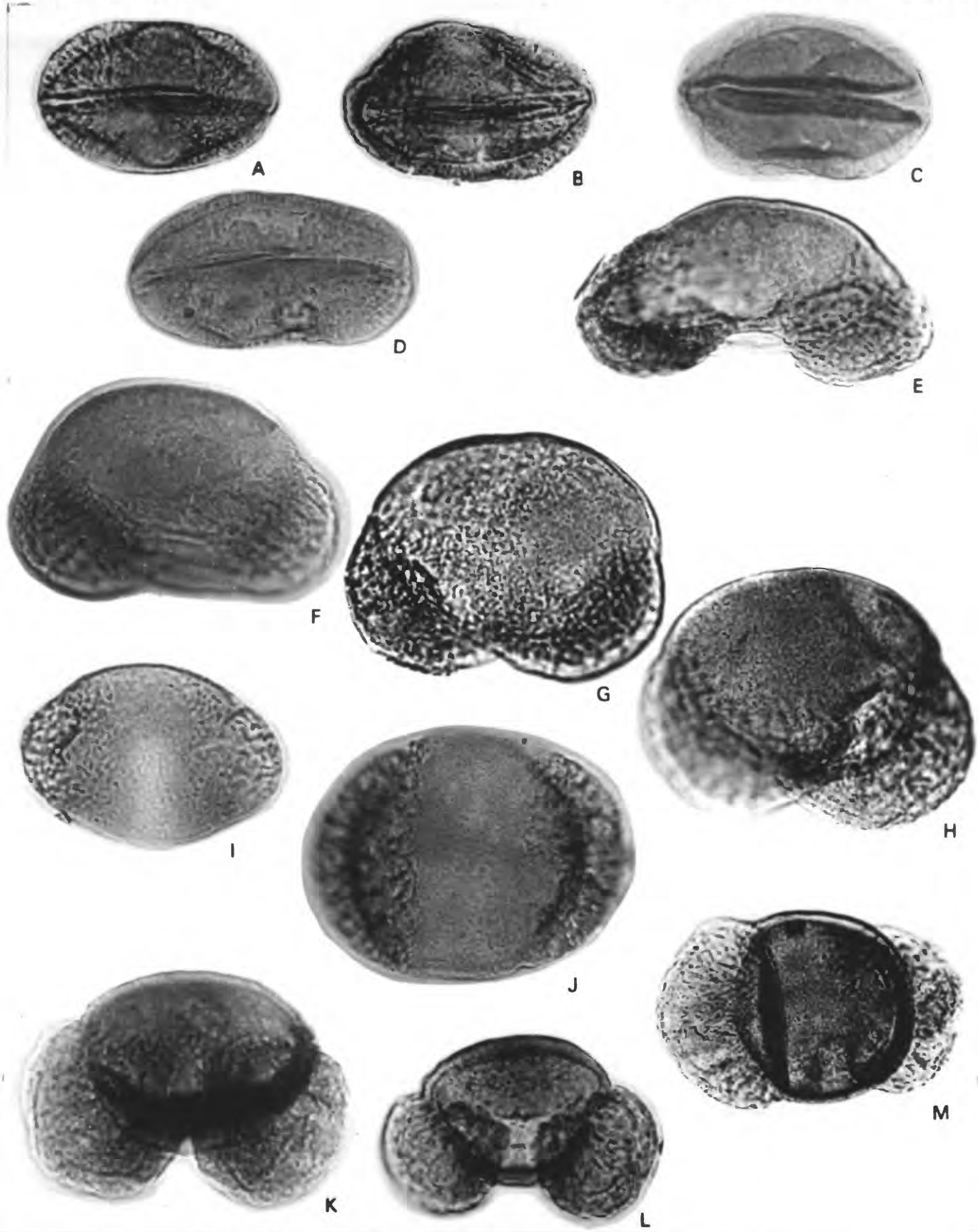

A
B
C
D
E
F
G
H
I
J
K
L
M

Figure 13.--Magnification X 1000.

A. Vesicaspora cf. V. cacheutensis Jain, 1968. Locality D1341, slide 110, coordinates 101.9 x 8.7.

B. Sulcatisporites sp. Locality D1341, slide 108, coordinates 114.0 x 20.9.

C. Sulcatisporites sp. Locality D1341, slide 2, coordinates 106.1 x 15.2.

D. Sulcatisporites sp. Locality D1341, slide 110, coordinates 94.7 x 5.2.

E. Sulcatisporites sp. Locality D1341, slide 5, coordinates 111.1 X 9.7.

F. Podocarpidites sp. Locality D1341, slide 106, coordinates 101.6 x 22.9.

G. Podocarpidites sp. Locality D1341, slide 2, coordinates 102.0 x 10.8.

H. Podocarpidites sp. Locality D1341, slide 5, coordinates 128.2 x 10.2 K.

I. Podocarpidites sp. Locality D1341, slide 130, coordinates 100.8 x 14.2.

J. Bisaccate pollen, undetermined. Locality D1341, slide 110, coordinates 106.7 x 2.8.

K. Bisaccate pollen, undetermined. Locality D1341, slide 5, coordinates 86.6 x 11.7.

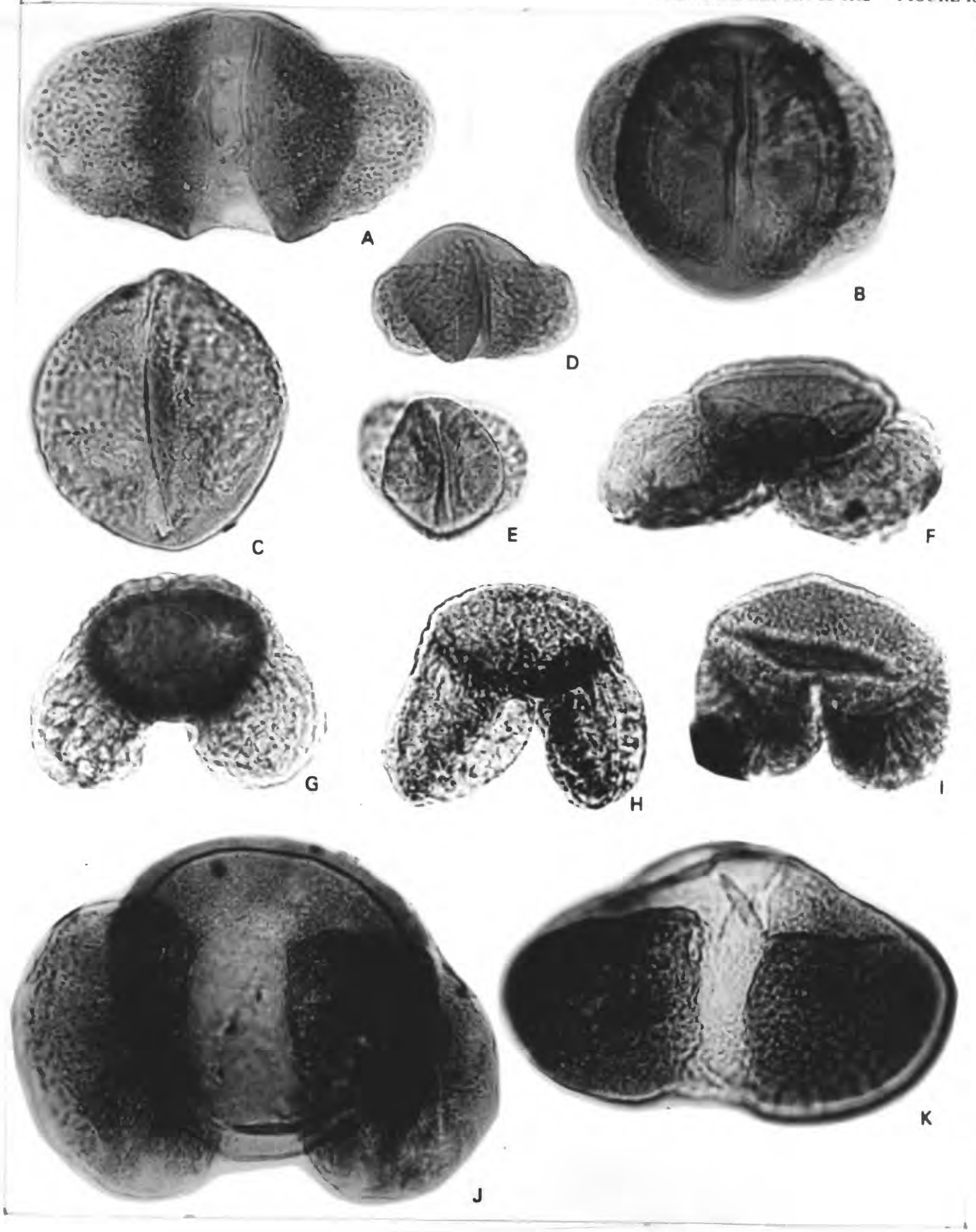

A
B
C
D
E
F
G
H
I
J
K

Figure 14.--Magnification X 1000 unless otherwise indicated.

A. Parcisporites cf. P. cirratus Leschik, 1956. Locality D1341, slide 9, coordinates 112.3 x 17.5 K.

B. Parcisporites sp. Locality D1341, slide 7, coordinates 108.8 x 10.6 K.

C. Parcisporites sp. Locality D1341, slide 7, coordinates 117.7 x 3.1 K.

D. Parcisporites sp. Locality D1341, slide 5, coordinates 126.0 x 4.5 K.

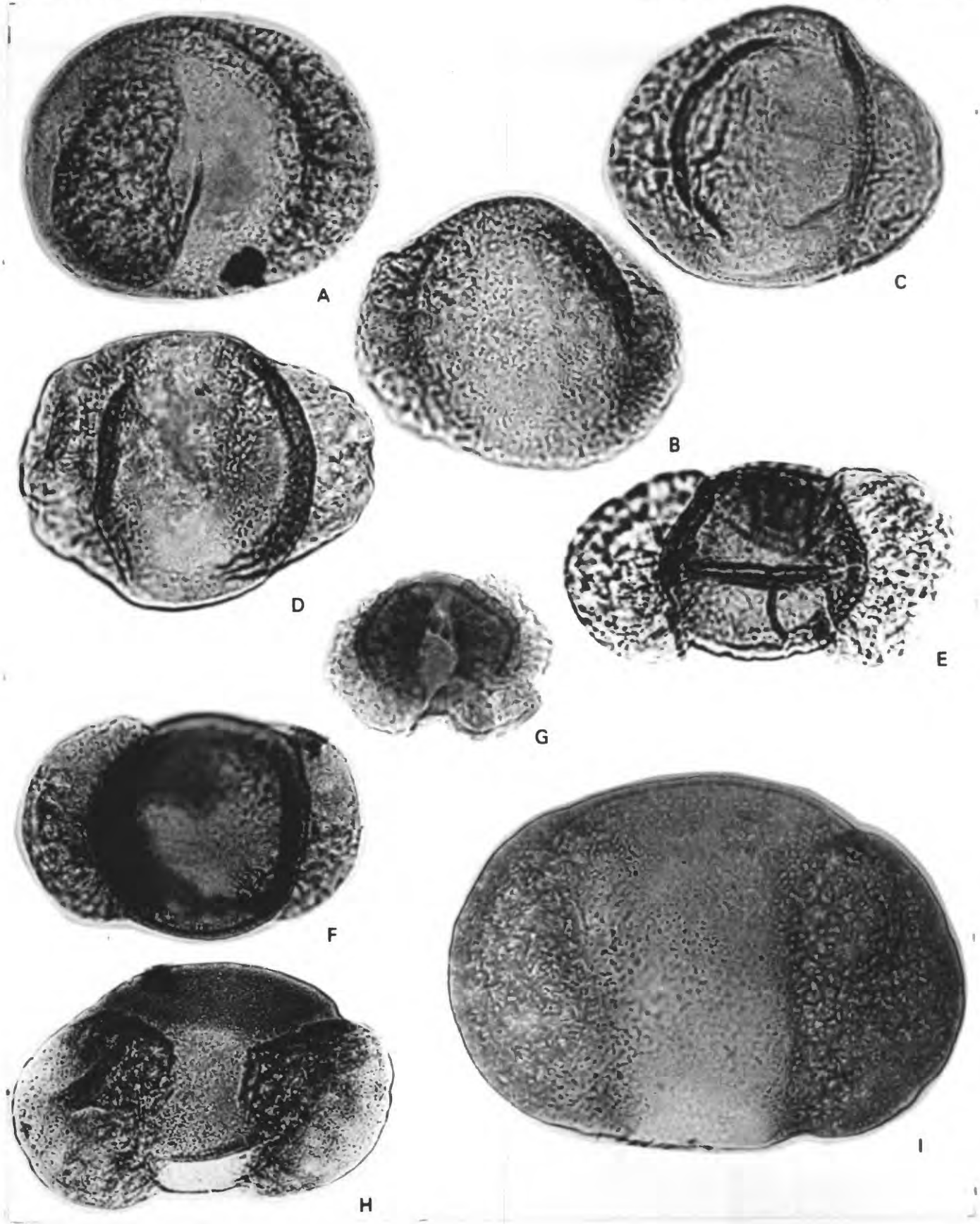
E. Chordasporites sp. Locality D1341, slide 5, coordinates 87.3 x 12.0.

F. Trilete bisaccate, undetermined. Locality D1341, slide 6, coordinates 108.6 x 15.2 K, X 500.

G. ?Cristatisaccus sp. Locality D1341, slide 1, coordinates 96.8 x 23.2.

H. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 117.2 x 7.2 K, X 500.

I. Bisaccate pollen, undetermined. Locality D1341, slide 1, coordinates 98.0 x 16.3.


A
B
C
D
E
F
G
H
I