UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MODERN AND HOLOCENE CHRYSOMONAD CYSTS FROM LOST TRAIL PASS BOG, MONTANA

by

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and

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OPEN-FILE REPORT
80-797

This report is preliminary and has not been reviewed for conformity with U. S. Geological Survey editorial standards or stratigraphic nomenclature

INTRODUCTION

This report is one of a series illustrating siliceous cysts from various localities. Although these cysts have been known for many years, they are so small that they cannot be observed in detail with optical microscopes. The recent development of the scanning electron microscope (SEM) has made possible much more detailed observations of the external features of these cysts, but as yet relatively few forms have been recorded in this way.

A major difficulty is taxonomic confusion. Many and perhaps all of these cysts are the resting stages of various algae of the phylum Chrysophyta; they will be referred to in the rest of this report as chrysomonad cysts, although other groups in addition to the Chrysomonadinae may be represented. Modern forms are found primarily in fresh water, and numerous authors have reported chrysomonad cysts from Holocene sediments (for example, see Nygaard, 1956). Older fossils have been recovered mostly from marine deposits, and are known as archaeomonads; whether the two groups are as distinct as this terminology suggests is not clear.

For an introduction to the literature on chrysomonad cysts and siliceous algal scales, the reader is referred to Adam and Mahood (1979b), a preliminary annotated bibliography on the subject.

The fossil archaeomonads have been described and named entirely on the basis of their cysts. This is not advisable with modern forms, because the cysts are identifiable as the remains of one stage of the life cycle of algae that presumably already have legitimate taxonomic names. Proper cyst nomenclature therefore depends on establishing which cysts are produced by which algae. At the moment, we have only a very limited knowledge of the forms that exist, and almost no knowledge of the phycological pedigrees of the various forms.

The present work is directed towards expanding our knowledge of the various cyst forms and their geographic and environmental distributions. Taxonomic problems are ignored, and the various cyst forms are simply given numbers, which have been assigned arbitrarily. These numbers are consistent throughout all reports in this series, and are being used to tabulate where the various forms occur. (A list of the previous reports in this series is given in Appendix A). The approach used has been that of "splitting", as opposed to "lumping"; it may well be desirable to lump together many of the forms described here when more is known about them.

The SEM photographs are the most important part of this paper, and no attempt has been made to reduce them

to words. Supporting data has been placed in the captions. Sample preparation techniques are generally the same as those used for preparing diatom samples; details may be found in Mahood and Adam (1979b).

The purpose of these initial reports is to provide primary documentation of the occurrence of particular cyst forms at particular localities, and to provide a means by which the SEM photographs of the cysts may be placed in a permanent depository. Counts of the relative abundance of the various forms and interpretations of their significance have not yet been attempted, but must await a more complete understanding of the range of cyst morphologies.

We have illustrated all of the distinctive cyst forms found in the samples, using the best available photographs. In some instances we have included more than one photograph of a given form; we have included all of the photographs we have taken.

Negatives of the plates for this report are on deposit at the USGS Photo Library, and prints can be obtained (at your expense) by writing to:

U. S. Geological Survey Library
Photo Library
Stop 914
Box 25406, Denver Federal Center
Denver, Colorado 80225

SITE DESCRIPTION

Lost Trail Pass Bog is located at an elevation of 2150 m on the Idaho-Montana border on the crest of the Bitterroot Range near its junction with the Continental Divide. A description of the site, together with a photograph and a floral list, may be found in Mehringer, Arno and Petersen (1977). Two samples were studied for this report. The first (sample 29) is from the top of the core, and represents modern conditions; the other (sample 35) came from just beneath a layer of Mazama Ash, and represents conditions that prevailed about 7000 years ago. The cysts shown in Plates A and B are from the modern sample, and the cysts in Plates C, D and E are from the pre-Mazama sample. The assemblages are completely different, with no cyst types found in both samples, but we have not yet done any quantitative work. The sediment was highly organic; dry weight loss after ignition at 600 C was over 90%.

REFERENCES CITED

Adam, David P., and Mahood, Albert M., 1979b, A preliminary working bibliography on siliceous algal cysts and scales. U. S. Geological Survey Open-File Report No. 79-1215, 34 p.

Mehringer, Peter J., Jr., Arno, Stephen F., and Petersen, Kenneth L., 1977, Postglacial history of Lost Trail Pass Bog, Bitterroot Mountains, Montana: Arctic and Alpine Research, v. 9, n. 4, p. 345-368.

Nygaard, Gunnar, 1956, Ancient and Recent flora of diatoms and Chrysophyceae in Lake Gribsø, in Berg, Kaj, and Petersen, I. C., eds., Studies on the humic acid Lake Gribsø: Folia Limnologia Scandinavica, No. 8, p. 32-94, 12 plates.

Lost Trail Pass Bog, Plate A
Sample 29, taken from top of core
scale bar = 3 micrometers

1 - Type 229

2 - Type 229
(aperture at top right)

3 - Type 229
(aperture not visible)

4 - Type 229

5 - Type 230

6 - Type 230

7 - Type 231

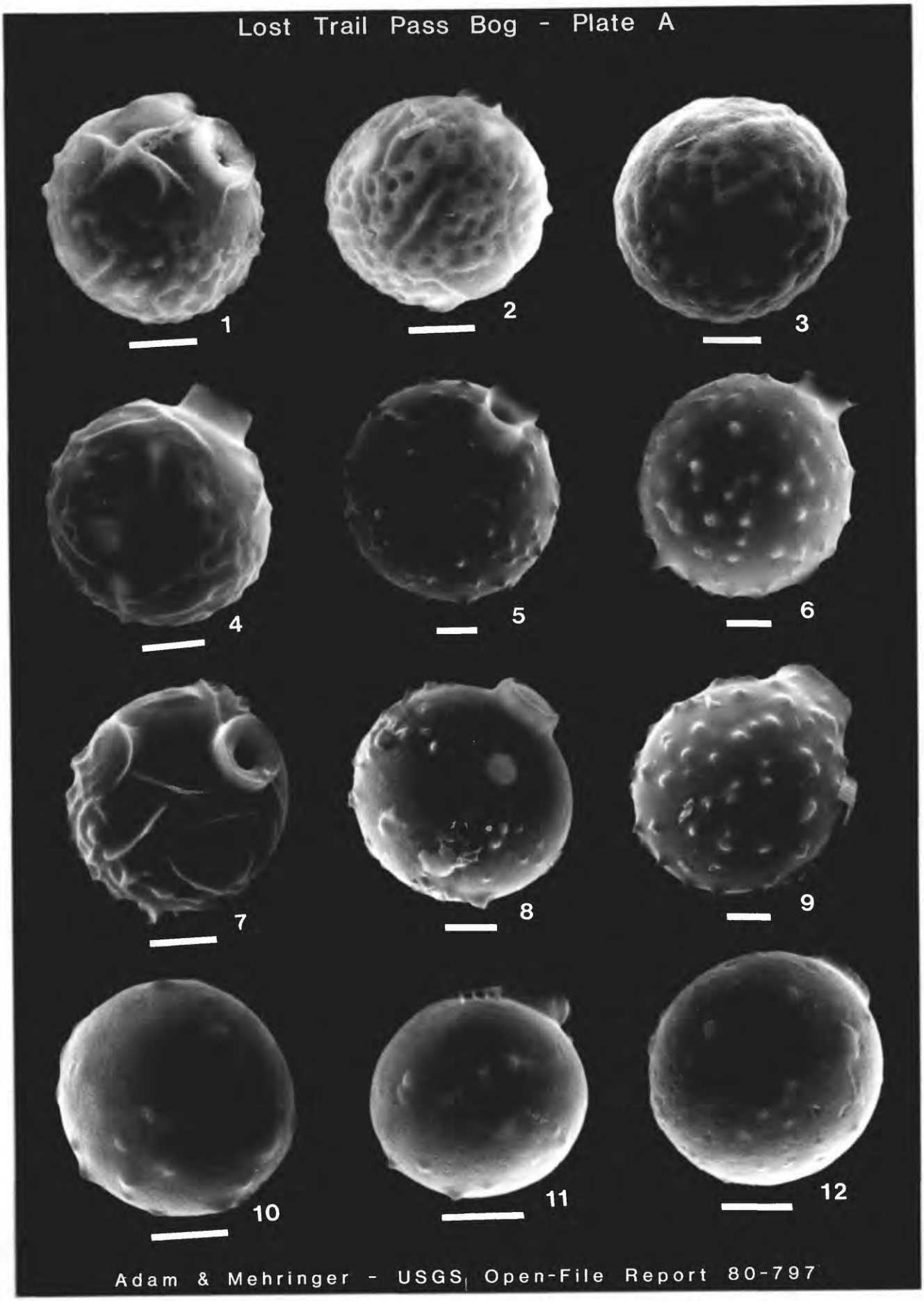
8 - Type 232
(with adhering debris)

9 - Type 233
(with adhering debris)

10 - Type 234
(aperture at top right)

11 - Type 234
(with adhering debris)

12 - Type 234
(aperture at top right)


Lost Trail Pass Bog - Plate A
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Lost Trail Pass Bog, Plate B
Sample 29, taken from top of core
scale bar = 3 micrometers

1 - Type 160
(with adhering debris)

2 - Type 160

3 - Type 1
(light-colored spot is an artifact)

4 - Type 235

5 - Type 236

6 - Type 237
(with adhering debris)

7 - Type 298

8 - Type 238
(with adhering debris; aperture not visible)

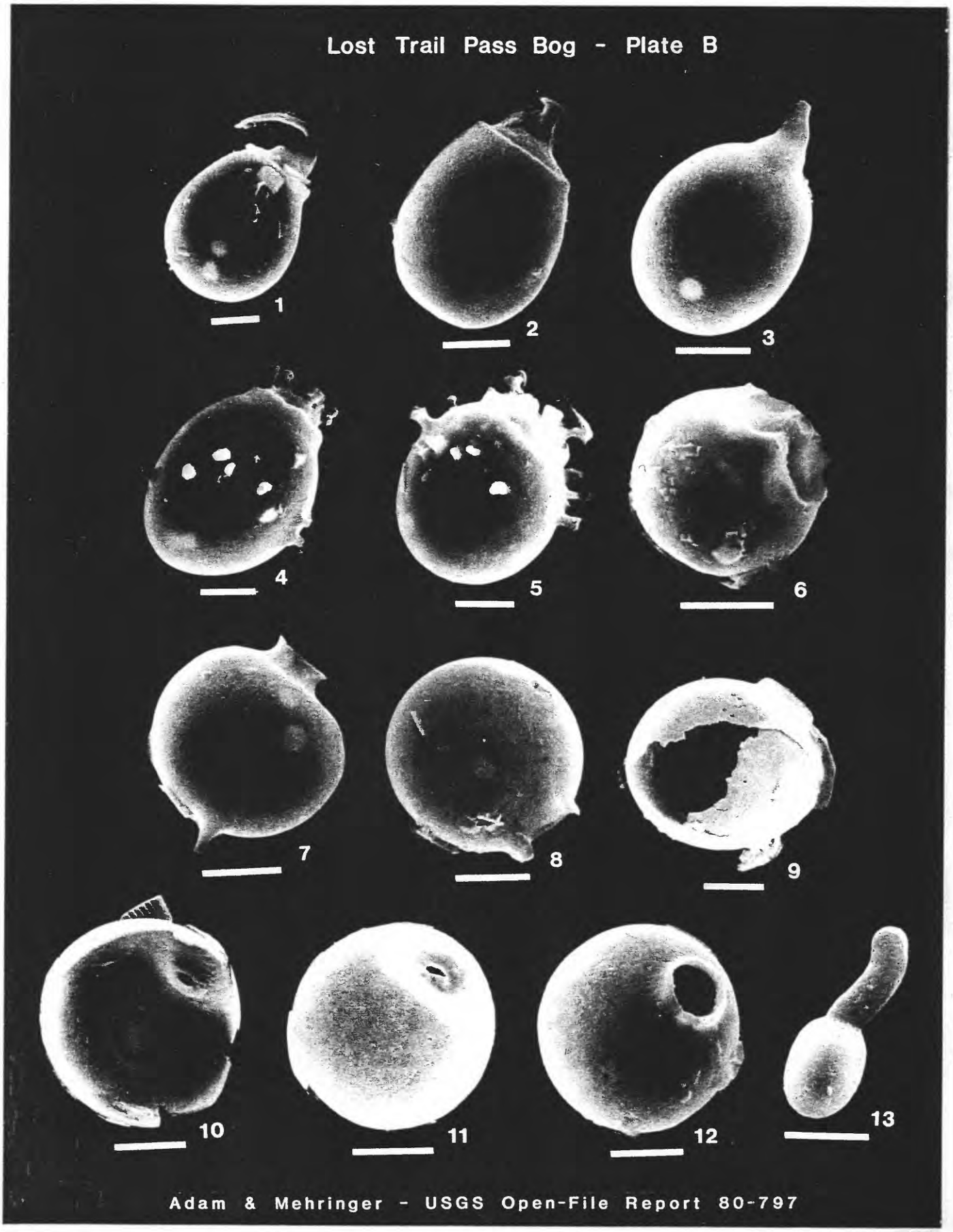
9 - Type 238
(with adhering debris; broken cyst, showing very thin wall)

10 - Type 280
(inside view of broken cyst)

11 - Type 280
(with adhering debris)

12 - Type 238

13 - ?? (affinity unknown)


Lost Trail Pass Bog - Plate B
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Lost Trail Pass Bog, Plate C
Sample 35, taken from beneath Mazama Ash
scale bar = 3 micrometers

1 - Type 242
(aperture not visible)

2 - Type 242
(with adhering debris; aperture at top right)

3 - Type 242
(with adhering debris; aperture not visible)

4 - Type 241
(with adhering debris)

5 - Type 243
(with adhering debris)

6 - Type 243
(enlarged view of aperture of (5))

7 - Type 241
(with adhering debris; aperture not visible)

8 - Type 241
(with adhering debris)

9 - Type 241
(with adhering debris; surface sculpturing is poorly developed)

Lost Trail Pass Bog - Plate C


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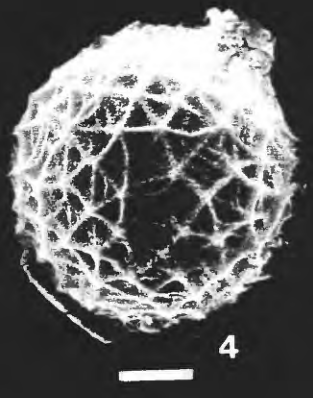
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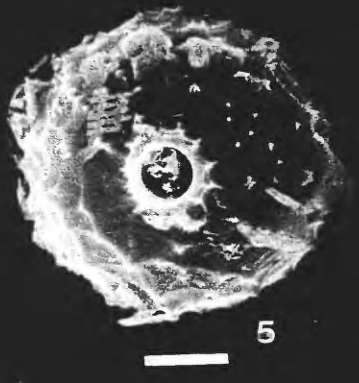
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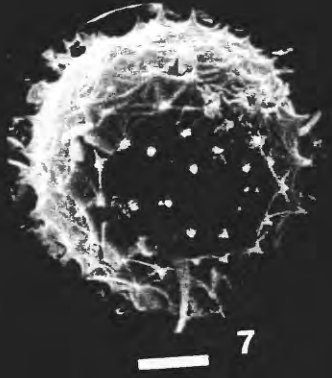
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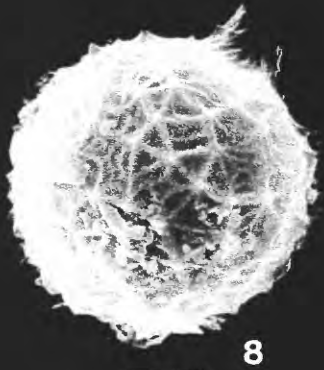
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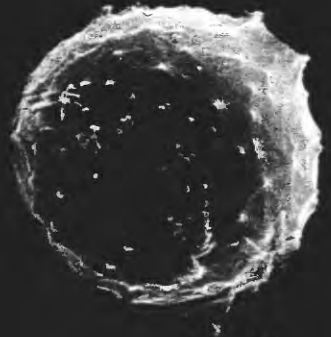
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Lost Trail Pass Bog, Plate D
Sample 35, taken from beneath Mazama Ash
scale bar = 3 micrometers

1 - Type 245
(with adhering debris)

2 - Type 287
(with adhering debris)

3 - Type 56
(with adhering debris)

4 - Type 247
(with adhering debris; circular collar at top right appears to be a part of the aperture structure)

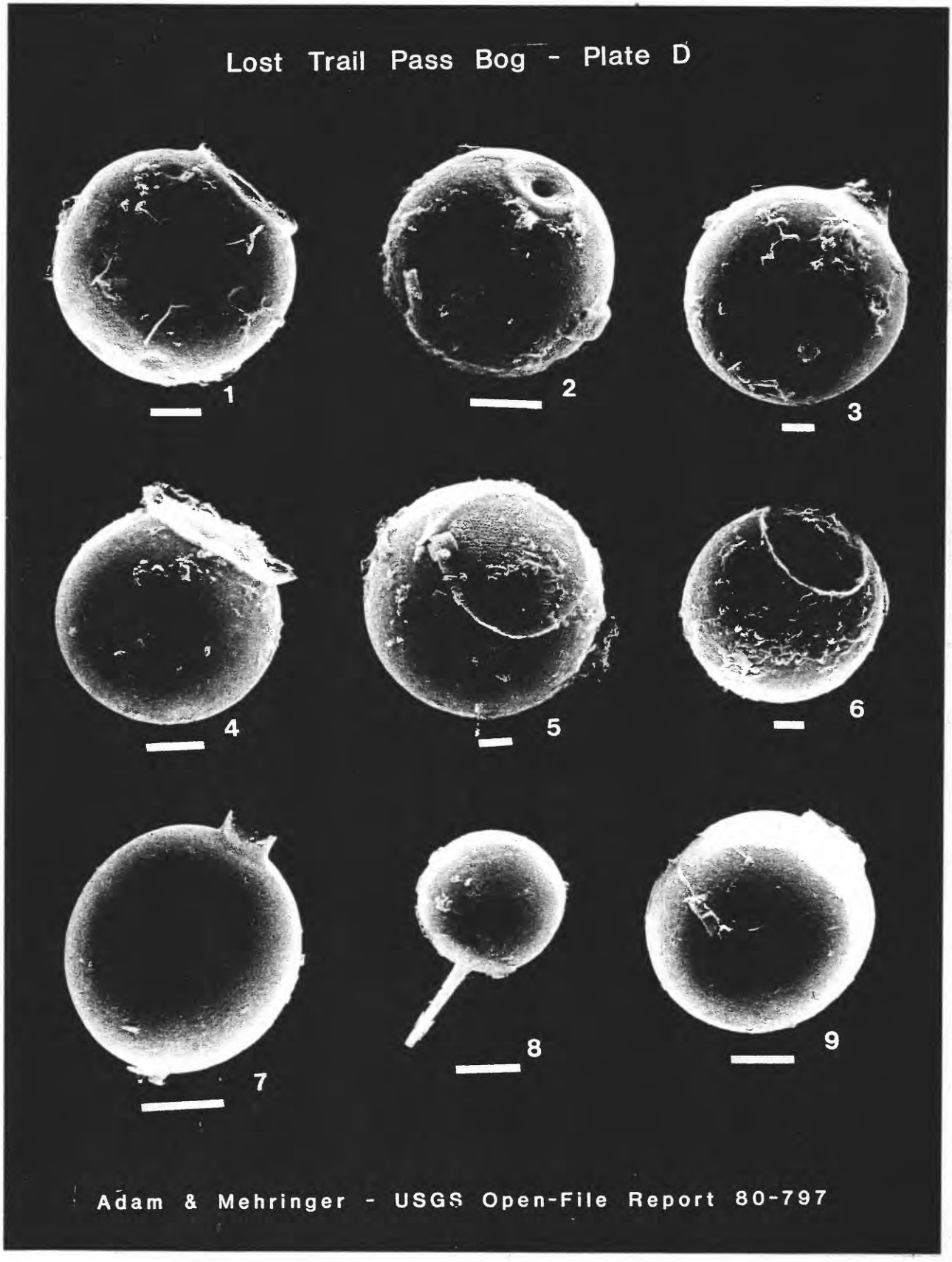
5 - Type 247
(with adhering debris; aperture not visible; note finely reticulate algal scale adhering to cyst)

6 - Type 247
(with adhering debris; aperture not visible; note algal scale)

7 - Type 248
(with adhering debris)

8 - Type 249
(with adhering debris; aperture barely visible at right)

9 - Type 250
(with adhering debris)


Lost Trail Pass Bog - Plate D
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Lost Trail Pass Bog, Plate E
Sample 35, taken from beneath Mazama Ash
scale bar = 3 micrometers

1 - Type 255
(with adhering debris; aperture not visible)

2 - Type 255
(with adhering debris)

3 - Type 113?
(with adhering debris; aperture not visible)

4 - Type 253
(with adhering debris; aperture not visible)

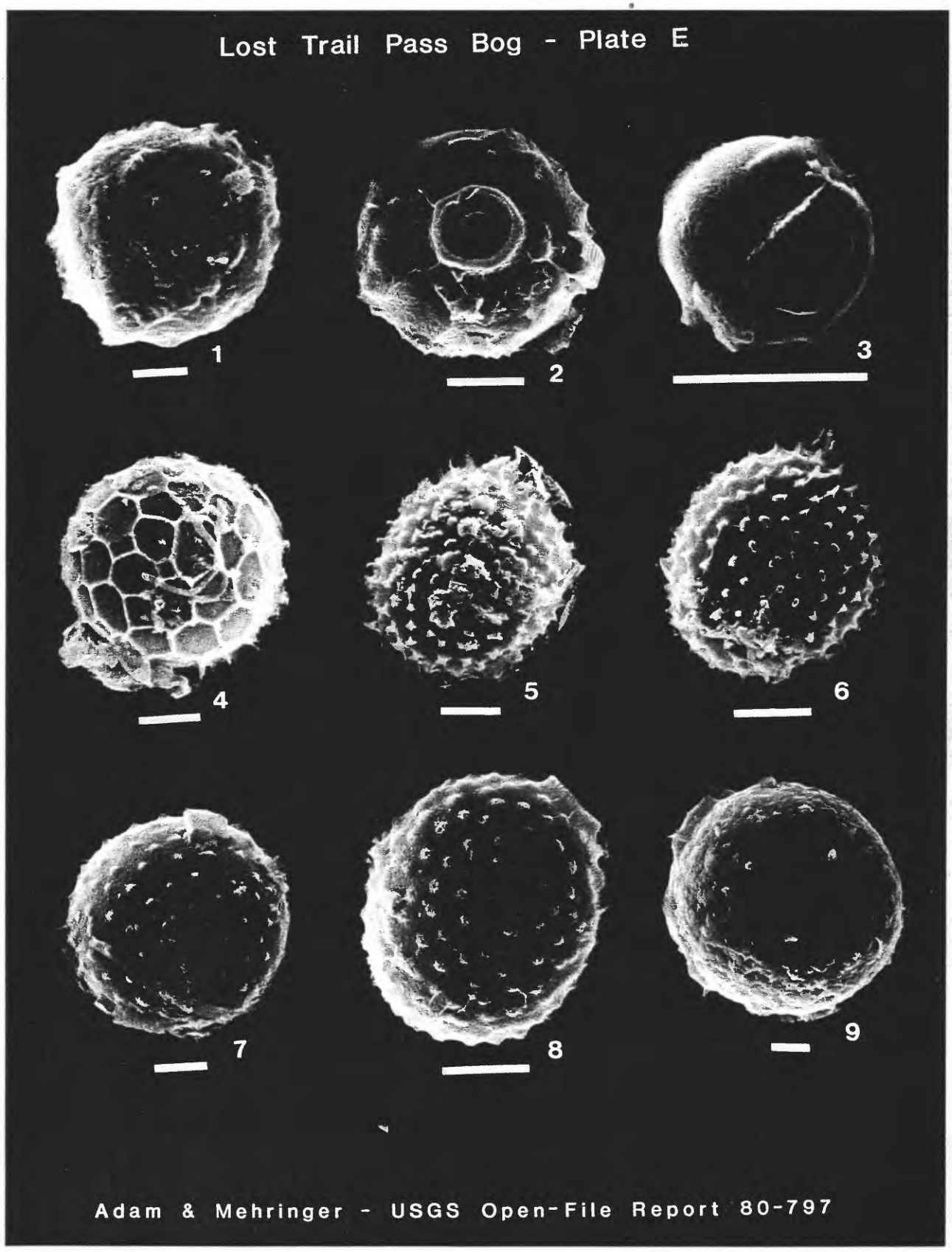
5 - Type 252?
(with adhering debris; aperture not visible)

6 - Type 252
(with adhering debris; aperture not visible)

7 - Type 251
(with adhering debris; aperture not visible)

8 - Type 251
(with adhering debris; aperture at top right;
note fine reticulation between spines)

9 - Type 315
(with adhering debris)


Lost Trail Pass Bog - Plate E
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APPENDIX A

PREVIOUS REPORTS IN THIS SERIES

Mahood, Albert D., and Adam, David P., 1979a, Late Pleistocene chrysomonad cysts from core 7, Clear Lake, Lake County, California: U. S. Geological Survey Open-file Report Number 79-971, 11 p., 4 plates. Defines types 1 through 44.

Adam, David P., and Mahood, Albert D., 1979a, A preliminary annotated bibliography on siliceous algal cysts and scales: U. S. Geological Survey Open-file Report Number 79-1215, 34 p.

Mahood, Albert D., and Adam, David P., 1979b, Techniques used for the cleaning, concentration, and observation of chrysomonad cysts from sediments: U. S. Geological Survey Open-file Report Number 79-1431, 5 p.

Adam, David P., and Mahood, Albert D., 1979b, Chrysomonad cysts from Upper Echo Lake, Eldorado County, California: U. S. Geological Survey Open-file Report Number 79-1461, 21 p. + 12 plates.