UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SCANNING ELECTRON MICROGRAPHS OF CHRYSOMONAD CYSTS FROM LAKE ALOHA, EL DORADO COUNTY, CALIFORNIA

by

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and

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OPEN-FILE REPORT
81-45

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 (1979a), 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 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 have 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 (1979).

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 sample, using the best available photographs. In some instances we have included more than one photograph of a given form, but we have not 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

Lake Aloha is an artificial lake that occupies much of the floor of Desolation Valley. The valley was heavily glaciated during the Pleistocene by an ice cap that drained to the east into Lake Tahoe by way of Fallen Leaf Lake, to the south into the American River by way of Horsetail Falls, and to the North into Rockbound Valley and the upper Rubicon River. Many small rock-basin lakes occupied the valley; these have been united into Lake Aloha by a rock dam about 10 m high.

The sample we studied was collected as a periphyton sample by D. Marelli for A. Mahood in July, 1972. We do not have exact locality data, but other samples were collected that suggest that our sample probably came from near the northeast part of the lake, where the trail from Fallen Leaf Lake reaches Lake Aloha (Fig. 1).

The water level of Lake Aloha fluctuates widely during the year, as water is let out of the lake to support power generation downstream after the runoff from spring snowmelt diminishes.

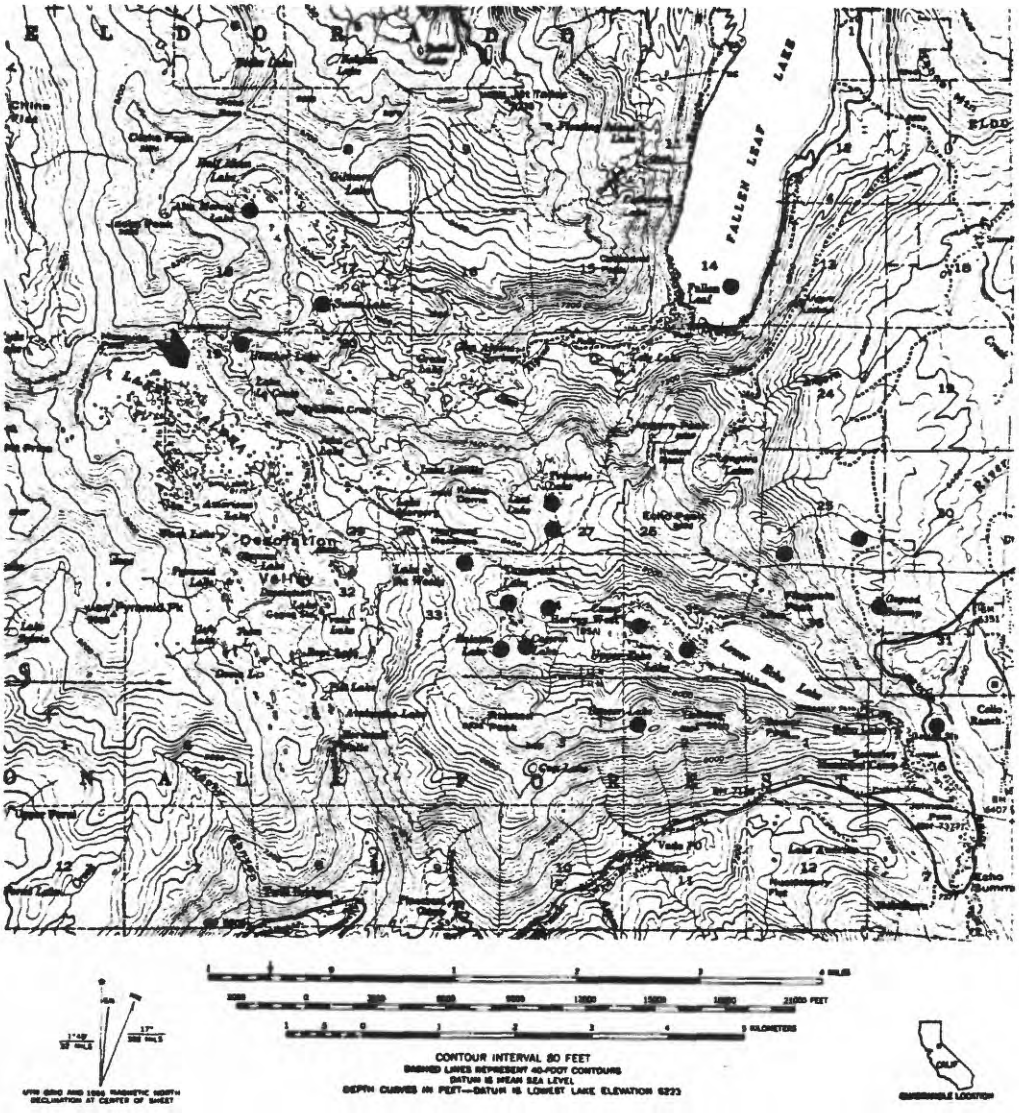


Figure 1.--Map showing the location of Lake Aloha (arrow). Dots mark other sites where we have recovered cysts. Map is reduced from part of the USGS Fallen Leaf Lake 15-minute quadrangle.

REFERENCES CITED

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

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

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.

Lake Aloha, Plate A
scale bar = 3 micrometers

1 - Type 161

2 - Type 161
(with adhering debris)

3 - Type 166
(with adhering debris)

4 - Type 84
(with adhering debris)

5 - Type 79
(with adhering debris)

6 - Type 372
(with adhering debris)

7 - Type 285

8 - Type 287
(with adhering debris)

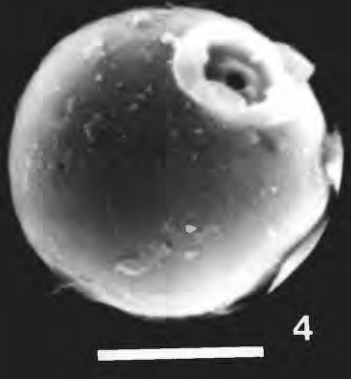
9 - Type 56
(with adhering debris)

Lake Aloha - Plate A


1


2


3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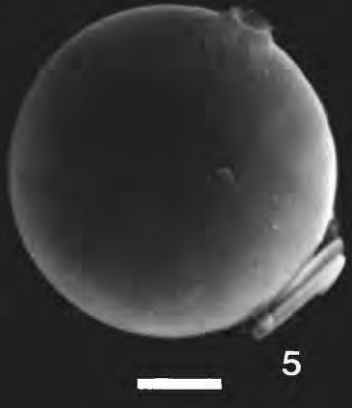
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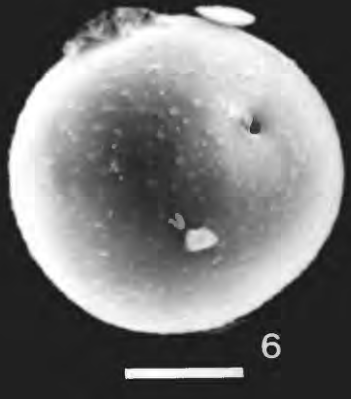
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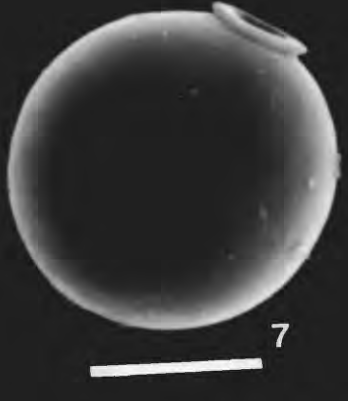
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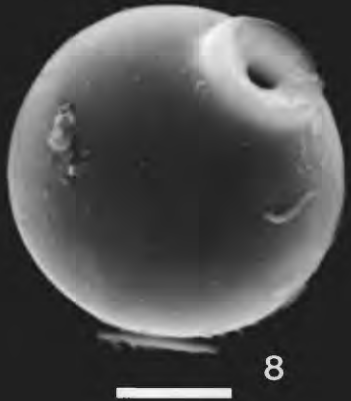
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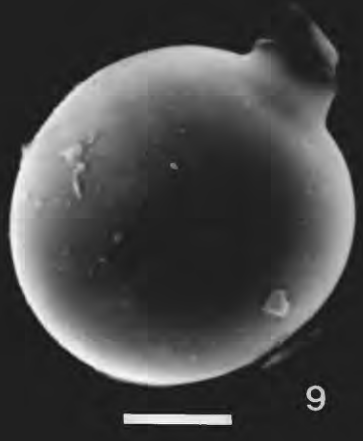
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Lake Aloha, Plate B
scale bar = 3 micrometers

1 - Type 223

2 - Type 283
(with adhering debris)

3 - Type 286
(with adhering debris)

4 - Type 289
(with adhering debris)

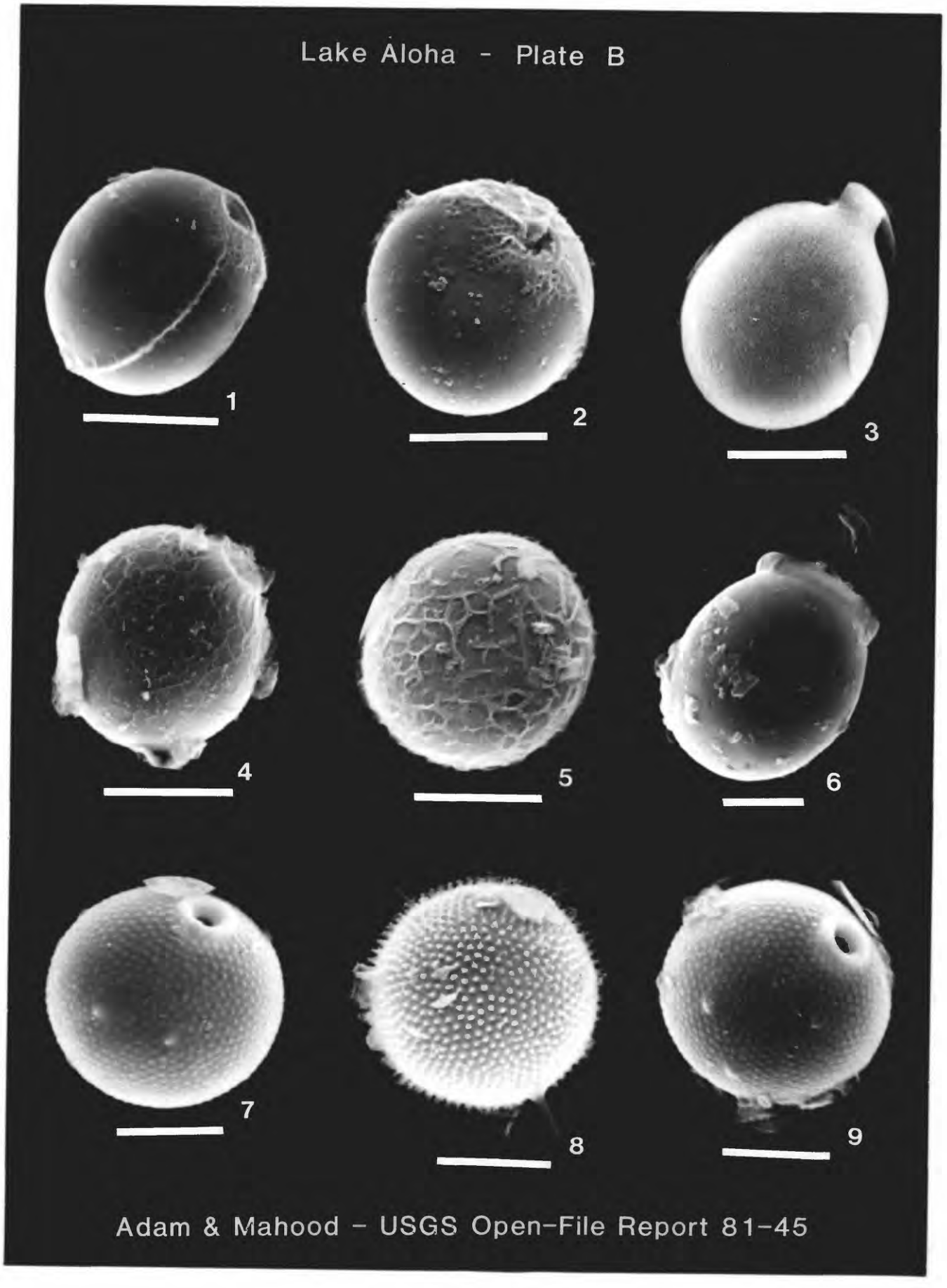
5 - Type 289(?)
(with adhering debris; aperture not visible)

6 - Type 160
(with adhering deoris)

7 - Type 54
(with adhering debris)

8 - Type 98
(with adhering debris)

9 - Type 54
(with adhering debris)


Lake Aloha - Plate B
1
2
3
4
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Lake Alona, Plate C
scale bar = 3 micrometers

1 - Type 214
(with adhering debris)

2 - Type 214

3 - Type 157

4 - Type 214
(with adhering debris; aperture not visible)

5 - Type 290
(with adhering debris)

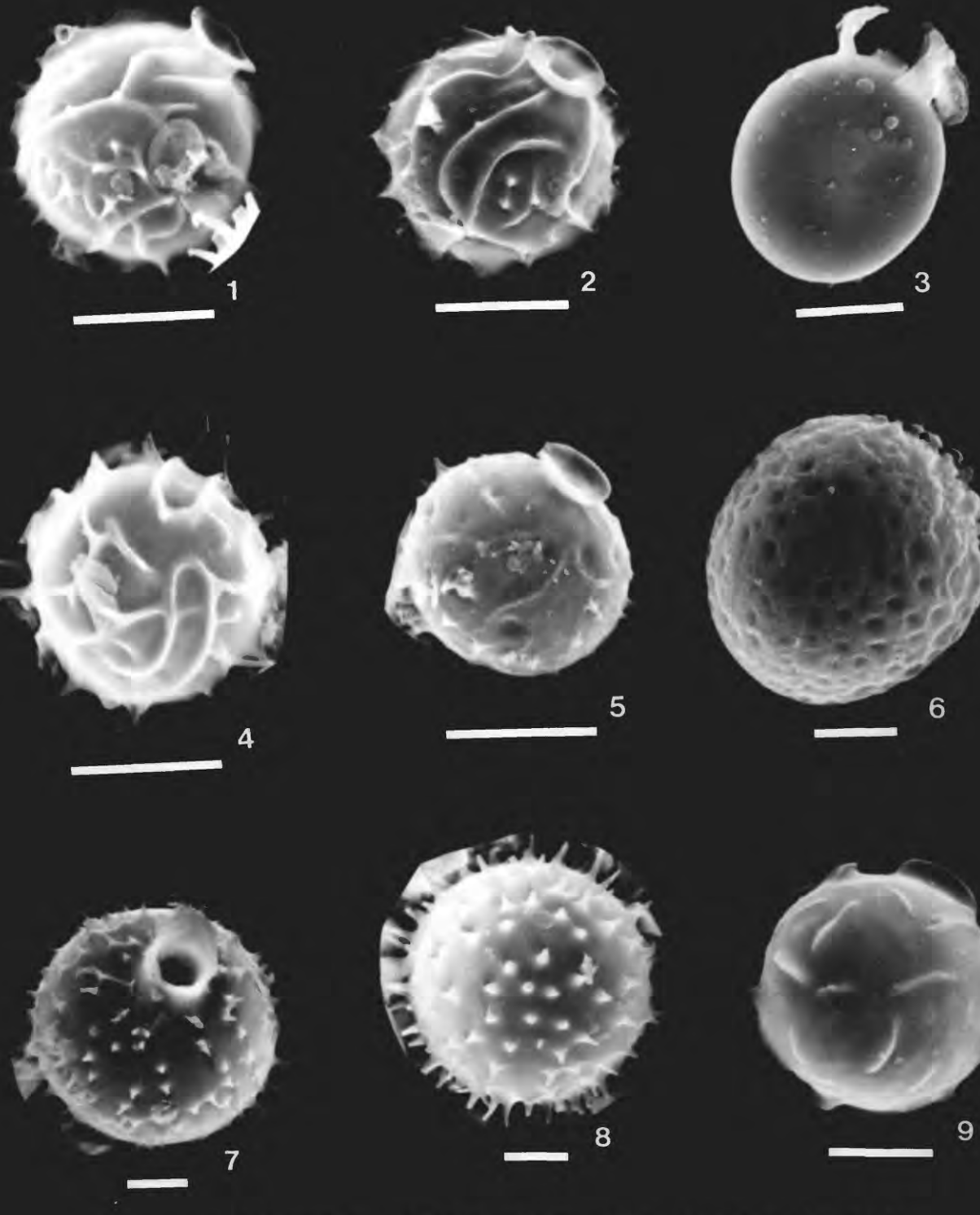
6 - Type 371

7 - Type 291
(with adhering debris)

8 - Type 291
(aperture not visible; background is showing behind cyst)

9 - Type 116(?)

Lake Aloha - Plate C



Adam & Mahood - USGS Open-File Report 81-45

APPENDIX A

PREVIOUS REPORTS IN THIS SERIES

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

Adam, David P., and Mehringer, Peter J., Jr., 1980, Modern and Holocene chrysomonad cysts from Lost Trail Pass Bog, Montana: U. S. Geological Survey Open-file Report Number 80-797, 13 p. + 5 plates.

Adam, David P., and Mahood, Albert D., 1980, Modern chrysomonad cysts from Fallen Leaf Lake, El Dorado County, California: U. S. Geological Survey Open-file Report Number 80-798, 9 p. + 2 plates.

Adam, David P., and Mahood, Albert D., 1980, Modern chrysomonad cysts from Alta Morris Lake, El Dorado County, California: U. S. Geological Survey Open-file Report Number 80-822, 11 p. + 4 plates.

Adam, David P., and Mehringer, Peter J., Jr., 1980, Scanning electron micrographs of modern chrysomonad cysts from Castor Pond, Jemez Mountains, New Mexico: U. S. Geological Survey Open-File Report Number 80-1231, 15 p., including 5 plates.

Adam, David P., 1980, Scanning electron micrographs of modern chrysomonad cysts from Haypress Meadows, El Dorado County, California: U. S. Geological Survey Open-File Report Number 80-1235, 15 p., including 3 plates.

Adam, David P., 1980, Scanning electron micrographs of Upper Pleistocene chrysomonad cysts from Flagpole Peak, El Dorado County, California: U. S. Geological Survey Open-File Report Number 80-1239, 13 p., including 2 plates.

Adam, David P., and Mehringer, Peter J., Jr., 1980, Scanning electron micrographs of modern and Holocene chrysomonad cysts from Fish Lake, Steens Mountains, Oregon: U. S. Geological Survey Open-File Report Number 80-1249, 26 p., including 6 plates.

Adam, David P., and Mahood, Albert D., 1980, Scanning electron micrographs of chrysomonad cysts from Suzie Lake, El Dorado County, California: U. S. Geological Survey Open-File Report Number 80-1250, 11 p., including 2 plates.