UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MODERN CHRYSOMONAD CYSTS FROM FALLEN LEAF LAKE, ELDORADO COUNTY, CALIFORNIA

by

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OPEN-FILE REPORT
80-798

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 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 (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 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

Fallen Leaf Lake is located just south of Lake Tahoe at an elevation of 1944 m. The sample studied for this report was collected by R. H. Fuller at his station 2 on 24 July, 1974, in 70 m of water about 150 m from the south end of the lake (Fuller, 1975). Water samples were taken from the lake at several times during the year for Fuller's study, and he reports various chrysophyte algae from the lake, including Chrysochromulina parva, Chrysoikos sp., Dinobryon bavaricum (both cysts and active stages), Diceras (Britschia) sp., and Diceras chodati. He also presented chemical data for the lake; it is nearly neutral, with pH values usually ranging between 6.5 and 7.5. However, pH values tended to rise during the summer, and by 21 October, 1974, a pH of 8.88 was recorded at a depth of 9 m.

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.

Fuller, Richard H., 1975, Selected water-quality data from Fallen Leaf Lake, Eldorado County, California, June through October 1974: U. S. Geological Survey Open-File Report, 38 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.

Fallen Leaf Lake, Plate A

scale bar = 3 micrometers

1 - Type 331

2 - Type 138

(with adhering debris)

3 - Type 139

4 - Type 140

5 - Type 140

(with adhering debris)

6 - Type 141

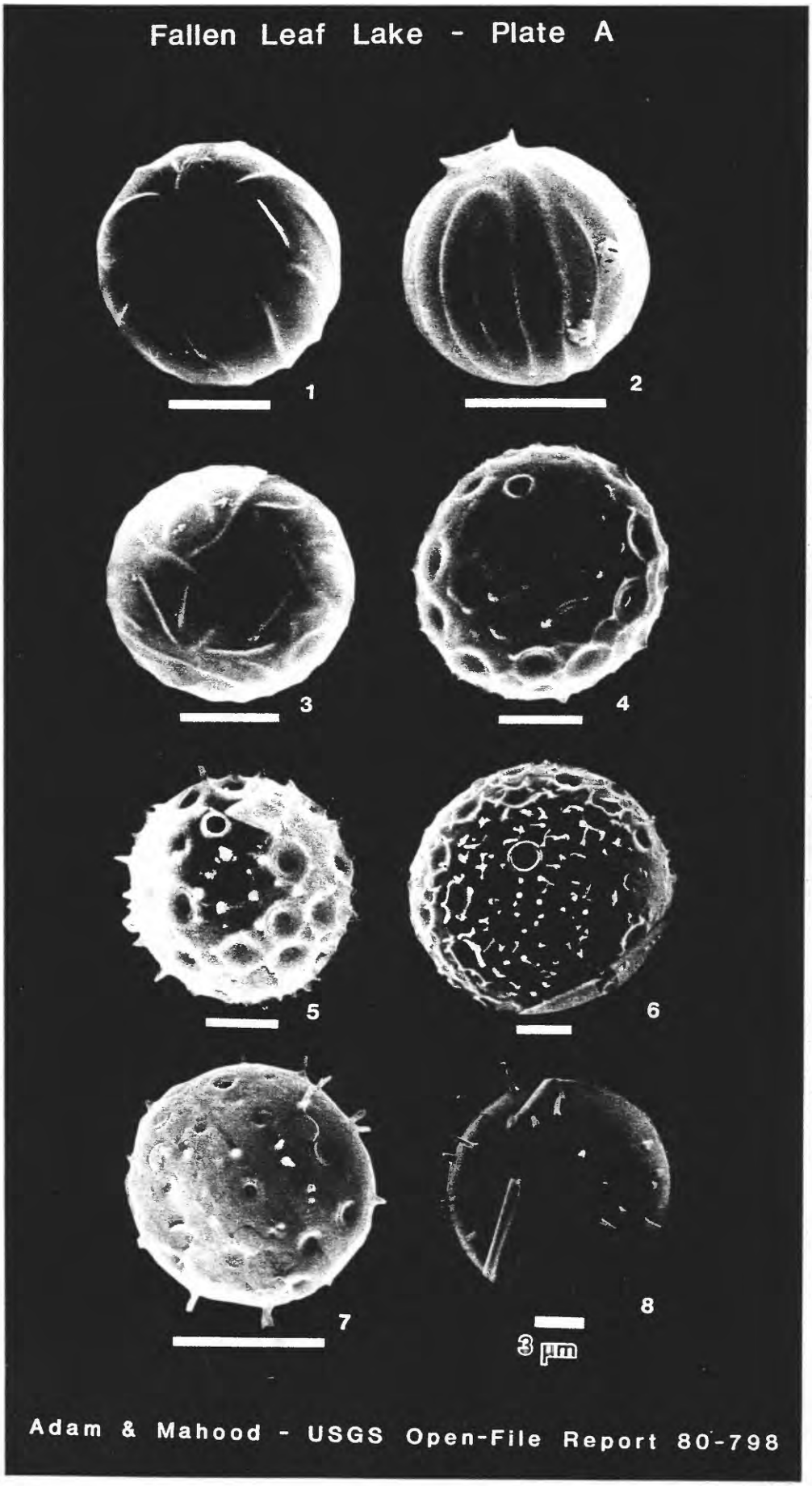
(with adhering debris)

7 - Type 141

8 - Type 142

(with adhering debris)

Fallen Leaf Lake - Plate A



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Fallen Leaf Lake, Plate B

scale bar = 3 micrometers

1 - Type 143

2 - Type 144

3 - Type 145

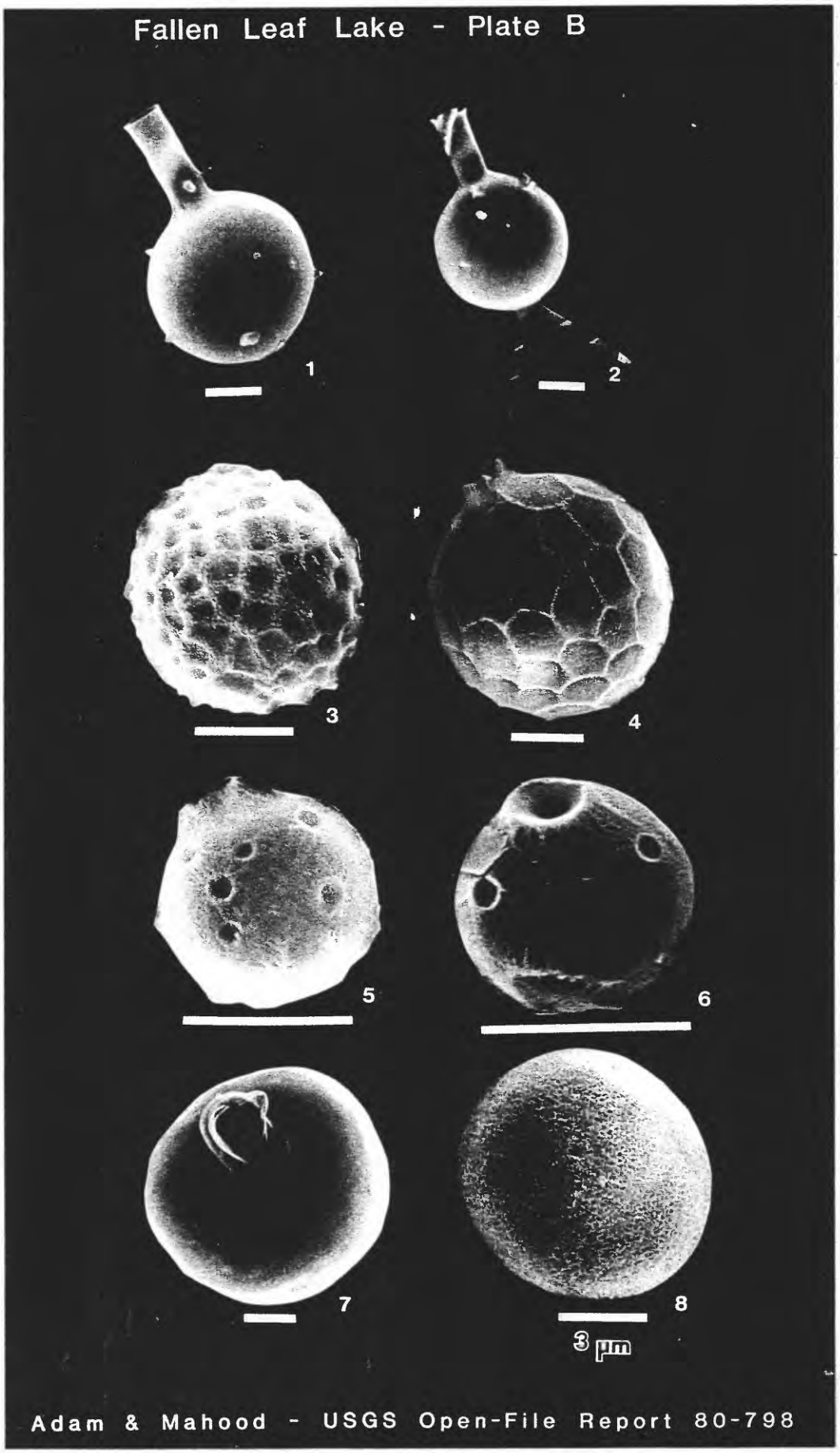
4 - Type 146

5 - Type 46

6 - Type 46
(with adhering debris)

7 - Type 147

8 - Type 148


Fallen Leaf Lake - Plate B
1
2
3
4
5
6
7
8
3 µm
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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.

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.