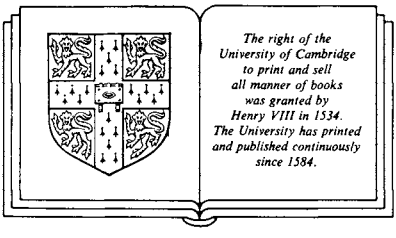
Chrysophytes: aspects and problems

Chrysophytes: aspects and problems

Edited by
JØRGEN KRISTIANSEN
University of Copenhagen
and
ROBERT A. ANDERSEN
DePaul University
Chicago, Illinois



CAMBRIDGE UNIVERSITY PRESS

Cambridge
London New York New Rochelle
Melbourne Sydney

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore,
São Paulo, Delhi, Dubai, Tokyo, Mexico City

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9780521180078

First published 1986
First paperback edition 2010

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data
Main entry under title:
Chrysophytes: aspects and problems.
Papers from the first International Chrysophyte
Symposium, held at the University of North Dakota,
Aug. 11–16, 1983.
Includes index.
1. Chrysophyceae–Congresses. I. Kristiansen,
Jørgen. II. Andersen, Robert A. (Robert Arthur),
1948– . III. International Chrysophyte Symposium
(1st: 1983: University of North Dakota)
QK569.C62C48 1986 589.4′8 85-25548

ISBN 978-0-521-32090-0 Hardback
ISBN 978-0-521-18007-8 Paperback

Contents

Preface

The growing interest in the study of chrysophytes resulted in the First International Chrysophyte Symposium, which was held in Grand Forks (United States of America), at the University of North Dakota, August 11–16, 1983, in continuation of the Annual Meeting of the Phycological Society of America. At this symposium, 41 contributions on all aspects of the study of chrysophytes were presented. Of these, 21 papers have been collected in the present volume, and these contributions reflect important trends in today's investigations on chrysophytes.

One main complex of problems addressed in Part I is the content and delimitation of "chrysophytes." How should this group be structured? On closer study it appears more and more heterogeneous, and perhaps some of its members do not belong here at all. What are the relations to other algae, such as diatoms and brown algae, and to zooflagellates?

Electron microscopy has penetrated into almost every field of chrysophyte study, and taxonomy (Part II) is no exception. Ultrastructural evidence sometimes makes it necessary to split established families. For example, the once united silica-scaled species are now classified as two only distantly related families. Light microscopic characters are still used for arranging species in evolutionary lines, but in many cases electron microscopy is necessary in order to describe new species and to redefine established ones.

The chrysophytes have also been favorite organisms for cell biologists (Part III). Electron microscopy in combination with biochemical methods has made it possible to study the intricate problem of how silica scales are deposited in the scale case surrounding the *Synura* cell. As investigators probe at an ever-smaller scale, biochemical and molecular methods become increasingly more important, such as in the study of organelles and their function or the study of DNA in chloroplasts.

Equally important, but in a direction of increasingly larger scale, are

studies to help explain how organisms interact with their environment (Parts IV and V). The occurrence of the chrysophytes in nature is regulated at least in part by changes in water chemistry, light, and temperature. Especially important are studies of life histories as correlated with environmental factors. However, occurrence is also governed by interspecific relations, sometimes even as symbiotic partnerships. Ecology and distribution of chrysophytes have been the object of many investigations, but severe species identification problems have hitherto hindered such studies. In the silica-scale-bearing groups these problems to a great extent are now being solved, and the methods of defining and recognizing chrysophyte assemblages have also improved.

The paleobiology (Part VI) of chrysophytes provides, just as it does for all groups of organisms, information that leads to a better understanding of today's living forms. An increasing number of Recent fossil scales and cysts can now be referred to present-day living species with known ecology, and these serve as environmental indicators for understanding aquatic ecosystems of the past. However, many problems remain, such as the identity of Cambrian scales – do they belong to ancient chrysophytes? The growing interest in fossil cysts makes it advantageous to introduce a standardized procedure for describing new forms.

Even if the contributions in this book reflect many viewpoints in the study of chrysophytes today, several additional themes might as well have been treated. In order to give an impression of the complete range of the Symposium, the Symposium papers not published here are listed by author and title.

The Chrysophyte Symposium was a success, and the editors hope that the publication of this treatise will be equally well received. We thank the Phycological Society of America which sponsored the Symposium and supported the publication of this volume. We also thank our editorial committee and the many anonymous reviewers who have striven for excellence in this publication. The First International Chrysophyte Symposium and this publication were supported in part by a United States National Science Foundation Grant BSR 82-16920 to R.A.A.

JK & RAA

Titles of other papers from the symposium

David H. Adam: Chrysophyte cysts: a geologist's approach.

R.A. Andersen: Ultrastructure of the flagellar apparatus of *Synura uvella* Ehr.

G. Cronberg: Scaled chrysophytes from the tropics.

D.A. Egloff, T.J. Cowles, and D. Stoecker: Effects of *Olisthodiscus luteus* Carter (Chrysophyceae) on feeding and swimming of the marine rotifer *Synchaeta cecilia* Rousselot.

L.R. Hoffman and M. Vesk: Ultrastructure of zoospores in *Hydrurus foetidus*.

B.A. Jacobsen: Scale-bearing Chrysophyceae from West Greenland.

H.J. Kling: Chrysophyceae in Central Arctic lakes.

Aa. Kristiansen: Locality types and occurrence in Denmark of marine benthic Chrysophyceae and Prymnesiophyceae.

K.H. Nicholls: *Mallomonas labrinthina* sp. nov. and *Paraphysomonas sediculosa* sp. nov., two new silica-scaled chrysophytes.

J.D. Pickett-Heaps: A comparison of scale formation in chrysophytes with valve formation in diatoms.

J.S. Prince: Comparative ultrastructure of coccolith, naked and scaly cells of *Coccolithus neohelis*.

C.D. Sandgren and H.J. Carney: A flora of fossil chrysophycean cysts from the recent sediments of Frains Lake, Michigan, U.S.A.

J.P. Smol: Chrysophycean microfossils in lacustrine deposits.

H.A. Thomsen: Fine structural studies on the flagellate genus *Bicosoeca* – a review.

S.D. van Valkenburg: The synchronization of silicoflagellate cultures.

M. Vesk and L.R. Hoffman: Mitosis and cell division in *Hydrurus foetidus*.

M. Vesk, S.W. Jeffrey, and J.L. Stauber: *Pelagococcus subviridis* from the East Australian current.

J.L. Wee and M. Gabel: The distributional relationship between pH, tem-

perature, and assemblages of silica-scaled chrysophytes in the Tall-Grass Prairie of the USA.

D.E. Wujek: Ultrastructure of the flagellated chrysophyte *Chrysosphaerella*.

Contributors

Jane Aldrich, The Standard Oil Co., 3092 Broaday Avenue, Cleveland, Ohio 44115, U.S.A. (Chapter 11)

Carol Wagner Allison, University of Alaska Museum, Fairbanks, Alaska 99701, U.S.A. (Chapter 19)

Robert A. Andersen, Department of Biological Sciences, DePaul University, 1036 Belden Avenue, Chicago, Illinois 60614, U.S.A. (Chapter 8)

Chantal Billard, Laboratoire d'Algologie fondamentale et appliquée, Université de Caen, 39 rue Desmoueux, 14000-Caen, France (Chapter 3)

Steven Bressler, Department of Botany KB-15, University of Washington, Seattle, Washington 98195, U.S.A. (Chapter 11)

Rose Ann Cattolico, Department of Botany KB-15, University of Washington, Seattle, Washington 98195, U.S.A. (Chapter 11)

Jan S. Chock, East Woods School, 31 Yellow Cote Road, Oyster Bay, New York 11771, U.S.A. (Chapter 12)

Annette W. Coleman, Division of Biology and Medicine, Brown University, Providence, Rhode Island 02912, U.S.A. (Chapter 10)

Gertrud Cronberg, Institute of Limnology, University of Lund, Box 3060, S-220 03 Lund, Sweden (Chapters 20 and 21)

R.L. Cubel, Department of Biology and Living Resources, University of Miami, Miami, Florida 33149, U.S.A. (Chapter 14)

Monika Dürrschmidt, Institut für Pflanzenökologie, Justus-Liebig Universität, Heinrich-Buff-Ring 38, D-6300 Giessen, Federal Republic of Germany (Chapter 7)

Duncan Ersland-Talbot, Agrigenetics Research Park, 5649 East Buckeye Road, Madison, Wisconsin 53716, U.S.A. (Chapter 11)

Paulette Gayral, Laboratoire d'Algologie fondamentale et appliquée, Université de Caen, 39 rue Desmoueux, 14000-Caen, France (Chapter 3)

David J. Hibberd, Axle Tree Cottage, Starvecrow Lane, Peasmarsh, Rye, East Sussex TN31 6XL, England (Chapters 2 and 5)

Jerry W. Hilgert, Institute of Northern Forestry, U.S.D.A., U.S. Forest Service, 308 Tanana Drive, Fairbanks, Alaska 99701, U.S.A. (Chapter 19)

Jørgen Kristiansen, Institut for Sporeplanter, University of Copenhagen, Øster Farimagsgade 2D, 1353 Copenhagen K, Denmark (Chapter 16)

Akira Kurata, Lake Biwa Research Institute, 1-10, Uchide-hama, Otsu, Shiga Prefecture, 520 Japan (Chapter 13)

Barry S.C. Leadbeater, Department of Plant Biology, University of Birmingham, Edgbaston, Birmingham, B15 2TT, England (Chapter 9)

Richard L., Meyer, Department of Botany and Microbiology, University of Arkansas, Fayetteville, Arkansas 72701, U.S.A. (Chapter 6)

Scott Newman, Department of Botany KB-15, University of Washington, Seattle, Washington 98195, U.S.A. (Chapter 11)

David J. Patterson, Department of Zoology, University of Bristol, Bristol, B58 1UG, England (Chapter 4)

Frances R. Pick, Department of Biology, York University, 4700 Keele Street, Toronto, Ontario, M3J 1P3, Canada (Chapter 14)

Hans R. Preisig, Institute of Systematic Botany, University of Zurich, Zollikerstr. 107, CH-8008, Zurich, Switzerland (Chapter 5)

Michael Reith, Department of Botany, University of Toronto, Toronto, Ontario M5S 1A1, Canada (Chapter 11)

R.M.M. Roijackers, Laboratory of Hydrobiology, Agricultural University, De Dreijen 12, 6703 BC Wageningen, The Netherlands (Chapter 17)

Frank E. Round, Department of Botany, University of Bristol, Bristol, B58 1UG, England (Chapter 1)

Craig D. Sandgren, Department of Biological Science, University of Wisconsin at Milwaukee, P.O. Box 413, Milwaukee, Wisconsin 53201, U.S.A. (Chapters 15 and 21)

Peter A. Siver, Department of Biology, Western Connecticut State University, Danbury, Connecticut 06810, U.S.A. (Chapter 12)

Absjørn Skogstad, Department of Biology, Division of Limnology, University of Oslo, P.O. Box 1027, Blindern, N-Oslo 3, Norway (Chapter 18)