

Journal of the Minnesota Academy of Science

Volume 64 | Number 2

Article 1

2000

Front Matter

Follow this and additional works at: <https://digitalcommons.morris.umn.edu/jmas>



Part of the [Life Sciences Commons](#), [Physical Sciences and Mathematics Commons](#), and the [Social and Behavioral Sciences Commons](#)

Recommended Citation

(2000). Front Matter. *Journal of the Minnesota Academy of Science*, Vol. 64 No.2, i-iii.
Retrieved from <https://digitalcommons.morris.umn.edu/jmas/vol64/iss2/1>

This Article is brought to you for free and open access by the Journals at University of Minnesota Morris Digital Well. It has been accepted for inclusion in Journal of the Minnesota Academy of Science by an authorized editor of University of Minnesota Morris Digital Well. For more information, please contact skulann@morris.umn.edu.

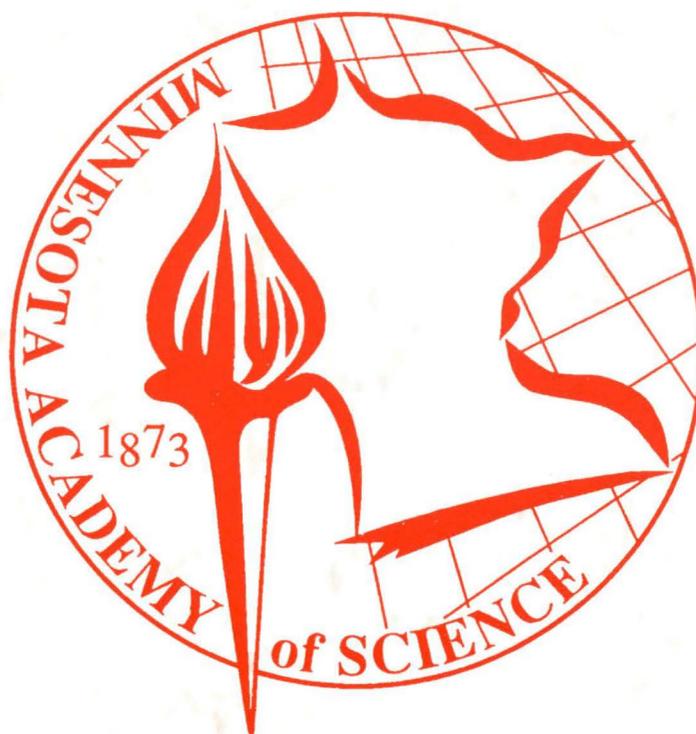
Journal of the Minnesota Academy of Science

68th Annual Meeting

hosted by

Moorhead State University

1st Tri-State Meeting of the Minnesota, North Dakota, and
South Dakota Academies of Science



Spring 2000

Vol. 64, No. 2

MISSION STATEMENT

The Minnesota Academy of Science is committed to promoting interest in and appreciation of science among the citizens of Minnesota, encouraging and facilitating excellence in science and science education at all levels, and fostering active and integrated participation in scientific inquiry.

ACTIVITIES PROMOTING SCIENCE ...

ANNUAL MEETING

The annual meeting of the Academy provides the opportunity for individuals involved in science in Minnesota to meet their colleagues and to hear or present the results of research with a regional emphasis. The meeting location is rotated throughout the state.

AWARDS PROGRAMS FOR OUTSTANDING MINNESOTA SCIENCE TEACHERS

The Minnesota Academy of Science sponsors awards to recognize the achievements of outstanding Minnesota science educators.

BREAKFAST WITH THE SCIENTISTS

Students have the chance for an informal talk with scientists from industry, government, and universities about career opportunities in science and technology.

JOURNAL OF THE MINNESOTA ACADEMY OF SCIENCE

Members receive this publication featuring research in all scientific disciplines and reports on statewide and regional academic and industry activities.

JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM

At this event, high school students from Minnesota and the Dakotas present the results of their original research projects to more than 200 students, teachers, and judges. Students may meet and exchange ideas, interact with practicing researchers, and explore future academic and career possibilities. Five students are selected to receive an expense-paid trip to the National Symposium.

MAS/INTEL SCIENCE TALENT SEARCH

The papers of students who submit to the national Science Talent Search are reviewed by the Minnesota Academy of Science.

REGIONAL AND STATE SCIENCE FAIRS

The Minnesota Academy of Science coordinates the nine Regional Science Fairs of Minnesota. From approximately 2,500 students, judges select about 400 to present their projects and papers at the annual Minnesota Academy of Science State Fair. At

this fair, over thirty organizations present over 100 awards to students with outstanding research. About 30 students receive expense-paid trips to compete at the Intel International Science and Engineering Fair.

SCHOOL SCIENCE CLUBS

Secondary school students in science clubs which affiliate with the Minnesota Academy of Science may take part in a statewide "Science Get-Together," apply for Research Engineering and Apprenticeship Program scholarships (paid summer research internships in an area of the student's choice at a college or university), and serve as an elected delegate who helps plan statewide science events.

SCIENCE QUIZ BOWL

Teams of high school students compete in a college quiz bowl format, answering questions from all fields of science and math. Winning teams represent Minnesota at the National Science Quiz Bowl.

SCIENCE OLYMPIAD

These tournaments are interscholastic competitions for middle and high school students emphasizing cooperative learning in the areas of concepts and knowledge, processes and thinking skills, and scientific applications and technology. Winners from the State tournament represent Minnesota in the National Science Olympiad.

SHARE SCIENCE

Secondary students work in a team of 2 to 3 students and a youth leader/skill trainer to bring a Share Science lesson to an elementary school classroom. This student-to-student program provides a link between teens who have shown an interest in science and the younger community members who will follow.

WINCHELL UNDERGRADUATE RESEARCH SYMPOSIUM

Awards are given to the best undergraduate research papers presented at the Minnesota Academy of Science Annual meeting.

LETTER FROM THE EDITOR

Dear Academy Member:

Spring is upon us once again. At this time of year, the Academy traditionally celebrates science with a meeting consisting of several symposia and the Winchell competition. This annual event provides an opportunity for colleagues whose paths cross infrequently to renew acquaintances and exchange ideas. In addition, this meeting provides an opportunity to share the experiences and reward the efforts of numerous budding young scientists.

This year's meeting, however, represents a milestone. This is the first time that the Minnesota, North Dakota, and South Dakota Academies of Science have jointly participated in a single scientific program. This program contains scientific symposia and sessions organized by members of each of the participating Academies. In addition, the Minnesota and North Dakota Academies each provide a forum highlighting student investigators. These sessions afford an opportunity to preview tomorrow's talent.

This issue of *The Journal of the Minnesota Academy of Science* contains abstracts for those symposia organized by Lorman Lundsten (University of St. Thomas) and Ellis Bell (Gustavus Adolphus College) as well as for the Winchell Program, coordinated by Mark Davis (Macalester College). Abstracts for the professional symposia appear in the order of their presentation in relevant portions of the annual meeting program. Abstracts for the Winchell Symposium and Poster Session, respectively, appear in alphabetical order of the first author. Abstracts and proceedings of symposia and sessions sponsored by the North and South Dakota Academies of Science will appear in their publications.

Considerable effort goes into preparing a scientific program. The meeting planned for Moorhead is no exception. This Tri-State meeting has a diverse and rich blend to topics that encompass science education as well as scientific research thanks to the efforts of numerous individuals associated with all three Academies. We express our appreciation especially to Lorman Lundsten, Ellis Bell, and Mark Davis for organizing the Business and Economics Symposium, Symposium on Structural Biology, and Winchell Symposium, respectively. We also are indebted to Vijendra Agarwal and Joseph Provost (Moorhead State University), Susan Kafka and Sue Zenk (MAS office), and Sue Moro (University of St. Thomas) for the behind-the-scenes efforts that have made this year's annual meeting and the abstract issue possible. Joe Provost also deserves special thanks for modernizing our publicity about this meeting by constructing a web-site that facilitated both information flow and aspects of the registration process. Lest we be remiss, we also thank the participants of this program for sharing the results of their investigations with us (at least in abstract form within the pages of this issue).

Sincerely,
Raymond E. Sicard, Ph.D.
Editor

April 2000

EDITOR

*Raymond Sicard
Pikeville College*

MANAGING EDITOR

*Susan Moro
University of St. Thomas*

WINCHELL PAPER CHAIR

*Mark Davis
Macalester College*

ON-SITE ANNUAL MEETING DIRECTORS

*Vijendra Agarwal
Joseph Provost
Moorhead State University*

SYMPOSIA CHAIRS

STRUCTURAL BIOLOGY

*Ellis Bell
Gustavus Adolphus College*

BUSINESS/ECONOMICS

*Lorman Lundsten
University of St. Thomas*

Journal of the **MINNESOTA ACADEMY OF SCIENCE**

Vol. 64, No. 2

Spring 2000

68th Annual Meeting
Minnesota Academy of Science
and

1st Tri-State Meeting of the Minnesota,
North Dakota and South Dakota Academies of Science

Hosted by
Moorhead State University
Moorhead, Minnesota

April 28-29, 2000

TABLE OF CONTENTS

Abstracts

Symposia Papers

Structural Biology..... 24

Business and Economics 25

Winchell Papers 29

Winchell Posters 33

Address Editorial Correspondence to: Editor,
Minnesota Academy of Science, Suite 410,
408 St. Peter St., St. Paul, MN 55102.

*The Minnesota Academy of Science does not take a stand on issues
that may be discussed in articles published in the journal. Readers
should bear in mind that views expressed in these articles are strictly
those of the authors.*