Front Matter
93rd Annual Meeting
The Ohio Academy of Science
April 27–29, 1984
Hosted by
Case Western Reserve University
and
The Cleveland Museum of Natural History
Theme: Industry/Academia Relations

Please bring this Program to the meeting.
Single issues for Academy members and
subscribers: $5; others: $7.
THE OHIO JOURNAL OF SCIENCE
ISSN 0030–0950

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THE OHIO JOURNAL OF SCIENCE considers original contributions from members and non-members of the Academy in all fields of science. Special consideration will be given to Ohioana. Submission of an article is understood to mean that the article is original and unpublished and is not being considered for publication elsewhere. All manuscripts will be critically reviewed. It should be understood that the opinions expressed by the reviewers are their own, and do not represent the views of the Ohio Academy of Science or THE OHIO JOURNAL OF SCIENCE. Manuscripts and illustrations should be prepared in triplicate in accord with instructions published in at least one issue each year and submitted to Dr. Tim M. Berra, Editor, THE OHIO JOURNAL OF SCIENCE, Department of Zoology, Ohio State University at Mansfield, 1680 University Drive, Mansfield, OH 44906.

Publication in THE OHIO JOURNAL OF SCIENCE requires consideration of editorial costs. These will be assessed at $40 per page for members and $60 per page for non-members. Papers in excess of 12 printed pages may be charged full production costs. A page charge bill will be sent by the Ohio Academy of Science at the time of publication.

Unsupported authors may request a waiver of page charges and will be asked to supply statements from their supervisor (department chairman, their adviser in the case of graduate students, and dean) that institutional and grant funds are not available. The Academy can only subsidize a few papers per year.

Failure to receive any number of the JOURNAL must be reported to the Ohio Academy of Science within six months of the date of issue for the claim to be recognized.

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Lynn Edward Elfner

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REGISTRATION FORM

93rd Annual Meeting
The Ohio Academy of Science
April 27, 28, 29, 1984

Hosted by
The Cleveland Museum of Natural History
and
Case Western Reserve University

Meal reservations and payments must be postmarked by Monday, April 23, 1984.

Make checks payable to The Ohio Academy of Science and mail to:

93rd OAS Annual Meeting Registration
CASE WESTERN RESERVE UNIVERSITY
ATTN: Ms. Karen Toil
Department of Geological Sciences
Cleveland, OH 44106

Phone (216) 368-3690

ALL attendees must register at registration desk on day of meeting.

NAME__________________________________________________________

ADDRESS_______________________________________________________

CITY/STATE/ZIP________________________________________________

EMPLOYER or SCHOOL____________________________________________

ACADEMY MEMBER? ___ yes ___ no

***Please use a separate form for each person***

REGISTRATION (One fee for all three days)

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<td>Banquet, Saturday, April 28, 1984</td>
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<td>Geology Field Trip Bus Trip and Lunch, Sunday, April 29, 1984</td>
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TOTAL ENCLOSED $________
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The Ohio Academy of Science

Hosted by
The Cleveland Museum of Natural History
and
Case Western Reserve University

April 27, 28, 29, 1984

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GENERAL SCHEDULE

NOTE: All meetings on Friday, April 27, 1984 will be held at the Cleveland Museum of Natural History.

All meetings on Saturday, April 28, 1984 will be held on the campus of Case Western Reserve University.

FRIDAY, April 27, 1984

8:00 a.m.  Registration - Museum Lobby
8:45 a.m.  Morning Sessions - Sections Q. and S.
10:30 a.m. Coffee Break
12:00 noon Lunch - Meeting Room
1:00 p.m.  Afternoon Sessions - Sections Q. and S.
2:15 p.m.  Coffee break
3:00 p.m.  O.B.S. Executive Committee - Classroom (Lower Level)
4:00 p.m.  O.A.S. Executive Committee - Rare Book Room
6:00 p.m.  Joint O.B.S. and O.A.S. Executive Committee Dinner - Rare Book Room
8:00 p.m.  O.A.S. Governing Council Meeting - Meeting Room

O.B.S. Advisory Council Meeting - Classroom (Lower Level)

Saturday, April 28, 1984

8:00 a.m. - Registration and Coffee - Tomlinson Hall
3:00 p.m.

8:15 a.m. - Technical Sessions - See Section listing for rooms and times
11:00 a.m.

11:00 a.m. All-Academy Lecture - Strosacker Lecture Hall

Welcome from Dr. Donald E. Schuele
Vice President
Case Western Reserve University

Welcome from Dr. Jane Decker, President
The Ohio Academy of Science
Professor of Botany
Ohio Wesleyan University

Speaker: Mr. Patrick S. Parker
Chairman of The Board and
Chief Executive Officer
Parker-Hannifin Corporation

"Industry/Academia Relations"

12:00 noon Lunch Fribley Commons
1:30 p.m. Section Business Meetings
1:45 p.m. Afternoon Sessions see specific program
5:00 p.m. Cash Bar - Fribley Commons
6:30 p.m. Academy Banquet - Fribley Commons

Greetings: Dr. Harold Mahan, Director
Cleveland Museum of Natural History

Response: Dr. Richard H. Mahard
Past President, The Ohio Academy of
Science, and Emeritus Professor of
Geology and Geography, Denison
University

Awards: Dr. Paul Daniel
Director, The Ohio Junior Academy
of Science and Professor of Zoology
Miami University

President's Address: "Chromosome Technology for the 80s!"
Dr. Jane Decker
Professor of Botany
Ohio Wesleyan University

9:00 p.m. Annual Business Meeting and Election of Officers

Sunday, April 29, 1984

8:30 a.m. Geology Field Trip - Adelbert Gymnasium
(bus trip registration required)

9:00 a.m. Plant Sciences Field Trip - Bedford Glens Parking Lot (Cleveland Metroparks)

PARKING

Friday, April 27, 1984

Park in the Museum lot or on the Oval.

Saturday, April 28, 1984

Parking for all Saturday sessions will be available in lots 53 and 11 (see map). A fee of $3.00/car for the day will be charged. Inform guard of your intention to attend the OAS Annual Meeting.

REGISTRATION

Registration is required for all meeting participants. See registration form inside front cover.

Advance registration deadline: postmarked by Monday, April 23, 1984.

Make checks payable to The Ohio Academy of Science and mail to:

93rd OAS Annual Meeting Registration
CASE WESTERN RESERVE UNIVERSITY
ATTN: Ms. Karen Toil
Department of Geological Sciences
Cleveland, OH 44106

Phone (216) 368-3690
MEALS

Meal reservations must be postmarked by April 23, 1984. Use registration form inside front cover.

Registrants without meal reservations may eat at local restaurants. A list and local map will be available at the registration desk.

The Friday, April 27, 1984 luncheon will be at the Cleveland Museum of Natural History. The cost is $6.00.

The Academy luncheon on Saturday, April 28, 1984 will be held in Fribley Commons from 12:00 - 1:00 p.m. The cost is $7.00.

The Academy banquet will be held in Fribley Commons on Saturday, April 28, 1984 at 6:30 p.m. The cost is $10.50.

The Sunday, April 29, 1984 Geology Field Trip includes a box lunch and bus transportation. The cost is $15.00.

HOUSING

Registrants wishing to remain in Cleveland over the weekend are expected to make their own reservations. Use the following choices or consult your travel agent:

The Clinic Inn
Carnegie and East 96th Street
(216) 791-1900

Holiday Inn
East 22nd & Euclid Avenue
(216) 696-5175

Howard Johnson's
East 55th Street & Cleveland Memorial Shoreway NE
(216) 432-2220

SYMPOSIA

Several symposia are planned for this meeting. Consult the table of contents or the specific technical section for details.

"HOW CAN UNIVERSITIES CONTRIBUTE TO OHIO'S ECONOMIC REVITALIZATION"

Section Q. Economics
Friday, April 27, 1984, 8:45 a.m.

"GROUND WATER IN OHIO: PRESENT PROBLEMS, FUTURE PROSPECTS"

Section R. Ecology
Saturday, April 28, 1984, 1:45 p.m.

"CENTERS OF EXCELLENCE"
Saturday, April 28, 1984, 2:00 p.m.
See page 95

"PRODUCTIVITY, TRAINING, AND RETRAINING"
Saturday, April 28, 1984, 2:00 p.m.
See page 97
FIELD TRIPS

Both field trips are on Sunday, April 29, 1984.

PLANT SCIENCES SECTION FIELD TRIP

TINKERS CREEK GORGE; BEDFORD RESERVATION
OF THE CLEVELAND METROPARK SYSTEM

9:00 a.m. - 12:00 noon

The Bedford Reservation has more Allegheny-Appalachian mountain type plants than any other Metropolitan Park in Cuyahoga County. Portions of north facing slopes of the gorge are covered with Canadian yew, mountain maple, yellow birch, and hemlock. Early spring wildflowers are abundant. Assemble at Bedford Glens Parking Area. Maps directing field trip participants to the area will be available at the registration desk on Saturday, April 28, 1984. From I-271, take I-480 west to the Warrensville Center Road exit. Go south on Warrensville Center Road to Broadway (Ohio Route 14). As you cross Broadway, Warrensville Center Road changes to Willis Road. Proceed on Willis Road. The turn off for Bedford Glens will be the first road on your right. Field trip leader: James K. Bissell, Cleveland Museum of Natural History.

GEOLOGY SECTION FIELD TRIP

8:30 a.m. to 1:30 p.m.

NOTE: Preregistration is requested. The $15 fee will cover your bus transportation and a box lunch.

The annual geology field trip will visit various bedrock localities in the Cleveland area, providing a look at some of the intriguing features of these units and reviewing modern theories about their environments of deposition. The trip will depart at 8:30 a.m. on Sunday, April 29, 1984 from the parking lot on the south side of Adelbert Gymnasium on the Case campus. The trip will last about five hours. Lunch will be provided. Field trip leader: Dr. Philip Banks, Department of Geological Sciences, Case Western Reserve University.

LOCAL ARRANGEMENTS

Cochairmen of Local Arrangements

Dr. Samuel Savin
Professor of Geology
Case Western Reserve University

Dr. Harold Mahan
Director
Cleveland Museum of Natural History

Director of Campus Coordination

Ms. Karen Toil
Case Western Reserve University
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<td>Dr. Richard W. Hoffman</td>
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<td>Dr. Billy M. Horton</td>
<td>Mech. &amp; Aerospace Engineering Management</td>
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<td>Dr. Vasu Ramanujam</td>
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<tr>
<td>Q. Economics</td>
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<tr>
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<td>Dr. Joseph F. Koonce</td>
<td>Biology</td>
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<tr>
<td>S. Info. and Libr. Sciences</td>
<td>Mrs. Jennie Levey</td>
<td>University Libraries</td>
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**OUR HOSTS**

**Case Western Reserve University**

Case Western Reserve University is nationally recognized for the excellence of its programs in the arts, engineering, health sciences, humanities, social and behavioral sciences, management, and natural sciences.

Case is not the typical urban university. It is located in the heart of a 500 acre park-like cultural center, known as University Circle, which includes internationally renowned museums, the Cleveland Institutes of Music and Art, and Severance Hall, home of the world famous Cleveland Orchestra. University Circle is bordered by attractive suburbs and quaint ethnic communities, and yet it is only four miles from Cleveland's bustling downtown business and entertainment center.

The University's two undergraduate colleges, Case Institute of Technology and Western Reserve College, enroll slightly more than 3,400 students from 48 states and 86 foreign countries. A nine to one student/faculty ratio makes learning a highly personalized experience.

Case Institute of Technology is ranked among America's top technological institutes. Founded in 1880, Case is noted for producing outstanding graduates in engineering, natural sciences, and mathematics. Distinguished faculty, challenging curricula, and outstanding teaching and research facilities are its hallmarks.
Western Reserve College, founded in 1826, is recognized for its excellence in preparing students for professional careers in health care, law, management, natural sciences, and mathematics.

The University's libraries, containing more than 1.5 million volumes and operating almost entirely on the open-shelf system, are a valuable resource for students and professors. Sears Library and Freiberger Library contain the bulk of the University's collections in humanities, social sciences, natural sciences, and engineering. Members of the university community also have access to the libraries of other University Circle institutions and the extensive resources of the Cleveland Public Library.

The financial aid policy at Case is based on the principle that the opportunity to attend the University should be made available to all qualified applicants for admission regardless of financial status. Most financial aid awards combine gift assistance, a loan, and an opportunity for employment. At CWRU in 1982-83, four out of five students who requested financial aid qualified for assistance.

Beyond its fine academic programs and facilities, CWRU offers extensive extracurricular opportunities. More than 150 student organizations reflect the wide range of interests of the university community. Students also have the opportunity to participate in variety of intercollegiate and intramural sports from traditional football, basketball, soccer, and swimming, to more unusual sports such as fencing, archery, and water polo.

More than 85 percent of CWRU students live on campus in residences offering a choice of living arrangements: single rooms in suites, double rooms, and, for upperclassmen, fraternities and sororities as well.

The academic and social atmosphere of Case Western Reserve University can best be described by quoting one of its sophomores: "Case Western Reserve has definitely met my expectations. . .I expected a fine education, the cultural extras of University Circle, and a good sports program. . .I've gotten it all."
Tracing its origin to a group of Clevelanders who met in a one room building called the "Ark" in 1835, the official incorporation of the Cleveland Museum of Natural History came on December 6, 1920. Associated with the original "Arkites", as they called themselves in 1835, was the eminent scientist, naturalist and physician Dr. Jared Potter Kirtland. To honor this leading force in their organization, the title was changed to "The Kirtland Society of the Natural Sciences" -- succeeded in this century by the Cleveland Museum of Natural History.

Why do museums exist and what is their purpose? According to Director Dr. Harold Mahan and the board of trustees, the overall purpose and objectives of the Museum are to collect and preserve materials of the natural world, instill an understanding of and appreciation for nature and add to our knowledge of natural history.

To attain these goals the Museum serves as the repository for scientifically valuable natural history material, interprets these materials for the general public and scientific community, provides educational opportunities and serves as a public service resource to the community.

The Museum's layout parallels the planet's history. The Museum has evolved into an institution where one learns of the life that went on before, examines his own world at close hand, and gets a glimpse of what lies beyond the earth.

The Museum has been a forerunner in educating the public in the natural sciences: the first organized class work was offered to teachers in 1921 and was the first program of its kind in the United States. School classes began to visit the Museum soon after and have shown growing enthusiasm over the years.

Museologists are exhibitionists. Because knowledge from all scientific disciplines is escalating, a vital and vigorous exhibits program is necessary to interpret the Museum's collections and objectives for educational programs and public viewing. The collections on display remain as the major source of direct communication with the community.

The Publications Department, headed by William C. Baughman, is responsible for communicating to members and others interested in natural history. The largest endeavor is publishing *The Explorer*, a quarterly magazine for members of this Museum and more than 20 other museums and science centers nationwide.

The heart of any museum is its collections. The Cleveland Museum of Natural History's collections consist of over one million specimens. In its early years the Museum purchased most of its collections, but major collecting trips in the 1920s', such as the White Expedition to Africa and the Blossom Expedition to the South Seas, contributed thousands of additional specimens. Now acquisitions are made largely through donations or staff collecting. Significant collections include: archaeology, botany, cultural anthropology, fine arts, invertebrate paleontology, invertebrate zoology, library including rare books, living animals, mineralogy, physical anthropology, vertebrate paleontology, and vertebrate zoology.

In addition to on site activities, the Museum maintains four natural areas -- Mentor Marsh, the Medina Sanctuary, Kellys Island, and Fern Lake -- and the Cleveland Aquarium, now nearly 40 years old.

The Museum is governed by a 36 member board of trustees. One of the founding tenets of the Board's philosophy is that the Museum remain a private institution, not dependent on tax dollars for its daily operations.
"INDUSTRY/ACADEMIA RELATIONS"

by

Mr. Patrick S. Parker
Chairman of the Board and
Chief Executive Officer
Parker-Hannifin Corporation

Saturday, April 28, 1984, 11:00 a.m.

Strosacker Lecture Hall
Case Western Reserve University

A native Clevelander, Patrick Parker was born on October 16, 1929, the son of A. L. Parker, founder of the Parker Appliance Company -- the name by which Parker-Hannifin was then known.

On August 14, 1980, Parker was elected to the office of president of Parker-Hannifin Corporation. On July 1, 1977, he was elected chairman of the Board for the Company.
Parker was elected chief executive officer of Parker-Hannifin on May 19, 1971 after having been elected president of the Company on December 18, 1968. He was elected a vice president on January 18, 1967.

In 1965, Parker was named president of the Parker Seal Company. In 1963, he was named manager of the Aerospace Products Division after having served as division manager of the Standard Components Division, sales manager of the Fittings Division and production planner of the Parker Aircraft Company's Los Angeles plant. He had been made a director of Parker-Hannifin Corporation in October, 1960.

From 1954 to 1957, he served in the United States Navy as a Stock Control Programs officer.

Parker assumed a full-time job with the company as a sales correspondent in 1953, after having worked in various departments of the Parker Cleveland plant during summer vacations while attending college.

He received an A.B. degree from Williams College and an M.B.A. degree from the Harvard School of Business.

Parker is on the Board of Trustees of Woodruff Hospital, The College of Wooster, Case Western Reserve University; and the Board of Directors of the Greater Cleveland Growth Association. He is also a director of The Sherwin-Williams Company, Reliance Electric Company, Acme-Cleveland, Society National Bank and Society Corporation. In 1982 Patrick Parker was awarded a "Certificate of Distinction" as one of the runners-up in a search for the Chief Executive of the Year sponsored by Financial World Magazine.

Parker is married and is the father of six children.

FUTURE ANNUAL MEETINGS

April 19-21, 1985
The University of Cincinnati
and
The Cincinnati Museum of Natural History

April 25-27, 1986
The University of Toledo

Editor's Note
The Ohio Journal of Science
2nd Annual Paper of the Year Award for 1983 will be presented at the 93rd Annual Meeting of The Ohio Academy of Science on 28 April 1984.