



*"Research in Science Education:  
Agent for Change"*

## **59th ANNUAL MEETING**

**Meridien Hotel  
San Francisco**

**March 28-31, 1986**

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## **PROGRAM COMMITTEE**

### **Chairman:**

James P. Barufaldi  
The University of Texas at Austin  
Science Education Center, EDB 340  
Austin, Texas 78712

### **Members:**

F. Gerald Dillashaw  
Bradley University  
College of Education  
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Rodney L. Doran  
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Robert D. Sherwood  
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Emmett L. Wright  
Kansas State University  
Education  
Manhattan, KS 66502

William G. Holliday  
The University of Maryland  
Science Teaching Center  
College Park, MD 20742

# NARST OFFICERS

1985-1986

## PRESIDENT

Davis P. Butts  
Department of Science Education  
University of Georgia  
Athens, GA 30602

## PRESIDENT-ELECT

James P. Barufaldi  
Science Education Center, EDB 340  
The University of Texas at Austin  
Austin, TX 78712

## IMMEDIATE PAST PRESIDENT

Ertle Thompson  
Ruffner Hall  
University of Virginia  
Charlottesville, VA 22903

## BOARD MEMBERS

Glen Aikenhead  
Faculty of Education  
University of Saskatchewan  
Sackatoon, Saskatchewan  
Canada S7N 0W0

Patricia E. Blosser  
Science & Mathematics  
Education  
The Ohio State University  
Columbus, OH 43210-1172

Jane Bowyer  
Mills College  
School of Education  
Oakland, CA 94613

Marcia C. Linn  
Lawrence Hall of Science  
University of California  
Berkeley, CA 94720

Michael J. Padilla  
Department of Science Education  
University of Georgia  
Athens, GA 30602

Gerald Skoog  
National Science Teachers Assoc.  
1742 Connecticut Avenue, N.W.  
Washington, D.C. 20009

John Staver  
University of Illinois at Chicago  
School of Education  
Chicago, IL 60655

## PRESIDENTS OF NARST

1928 W.L. Eikenberry	1958 Nathan S. Washton
1929 W.L. Eikenberry	1959 Thomas P. Fraser
1930 W.L. Eikenberry	1960 Vaden W. Miles
1931 Elliot R. Downing	1961 Clarence H. Boeck
1932 Elliot R. Downing	1962 Herbert A. Smith
1933 Francis D. Curtis	1963 Ellsworth S. Obourn
1934 Ralph K. Watkins	1964 Cyrus W. Barnes
1935 Archer W. Hurd	1965 Frederic B. Dutton
1936 Gerald S. Craig	1966 Milton P. Pella
1937 Walter G. Whitman	1967 H. Craig Sipe
1938 Hanor A. Webb	1968 John M. Mason
1939 John M. Mason	1969 Joseph D. Novak
1940 Otis W. Caldwell	1970 Willard D. Jacobson
1941 Harry A. Carpenter	1971 Paul D. Hurd
1942 G.P. Cahoon	1972 Frank X. Sutman
1943 Florence G. Billig	1973 J. David Lockard
1944 Florence G. Billig	1974 Wayne W. Welch
1945 Florence G. Billig	1975 Robert E. Yager
1946 C.L. Thield	1976 Ronald D. Anderson
1947 Earl R. Glenn	1977 O. Roger Anderson
1948 Ira C. Davis	1978 Roger G. Olstad
1949 Joe Young West	1979 James R. Okey
1950 N. Eldred Bingham	1980 John W. Renner
1951 Betty Lockwood	1981 Stanley L. Helgeson
1952 Betty Lockwood	1982 Stanley L. Helgeson
1953 J. Darrell Barnard	1983 Carl F. Berger
1954 George C. Mallinson	1984 Ann C. Howe
1955 Kenneth E. Anderson	1985 Ertle Thompson
1956 W.C. VanDeventer	1986 David P. Butts
1957 Waldo W. Blanchet	

## **EDITOR, JOURNAL OF RESEARCH IN SCIENCE TEACHING**

Russell H. Yeany  
Department of Science Education  
University of Georgia  
Athens, GA 30602

## **RESEARCH COORDINATOR**

Rodney L. Doran  
553 Blady Hall  
SUNY at Buffalo  
Amherst, NY 14260

## **EXECUTIVE SECRETARY**

William G. Holliday (through December 31, 1985)

Glenn Markle (effective January 1, 1986)  
401 Teacher's College  
University of Cincinnati  
Cincinnati, Ohio 45221

## **EMERITUS MEMBERS**

Kenneth A. Anderson  
N. Eldred Bingham  
Paul Blackwood  
George T. Davis  
T. Handley Diehi  
Frederic B. Dutton  
H. Seymour Fowler  
Thomas P. Fraser  
Ralph P. Frasier  
Harvey J. Goehring  
Paul D. Hurd  
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Ralph W. Lefler  
Bob Lepischak  
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Lester Mills

Clarence H. Nelson  
Jerry J. Nisbet  
Milton Pella  
Ruth L. Roche  
Sidney Rosen  
Herman J. Ruoff  
Herman Schneider  
Robert Stollberg  
Edward Victor  
Nathan S. Washton  
Feltcher G. Watson  
Allen D. Weaver  
William G. Walsh

## **LIFE MEMBERS**

Lois M. Shoemaker  
H. Craig Sipe

## GENERAL INFORMATION

THE NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING (NARST) was founded in 1928 for the purpose of promoting research in science education at all educational levels, and of disseminating the findings of this research in such ways as to improve science teaching. The Association was incorporated as a nonprofit corporation in the State of Minnesota.

The official publication of the Association is the **Journal of Research in Science Teaching**.

NARST encourages the presentation of a wide variety of scholarly papers reporting investigations in all aspects of science education, including "action", historical, philosophical, ethnographic, experimental and evaluative studies. Thus, reports of empirical research, critical reviews and theoretical works are encouraged.

Some of the research areas of interest to NARST include curriculum development and organization, evaluation, learning theory, teacher education, programs for the talented and the handicapped, and methods of instruction in science. The Association cooperates with the ERIC Clearinghouse for Science, Mathematics, and Environmental Education (SMEAC) located at The Ohio State University to conduct and publish reviews of research in science education at the elementary, secondary and college levels and to compile and publish the abstracts of paper presented at the annual meeting.

The constitution of the Association specifies that membership shall be drawn from people interested in research in science education and from people outstanding in science education leadership, including teachers, supervisors, and curriculum developers. Patron membership is available to individuals and organizations who wish to contribute more than the basic dues to support the work of our organization.

The Association's headquarters is located the the University of Cincinnati, Teacher's College (513-475-2335). Inquiries regarding Association matters should be directed to its Executive Secretary, Dr. Glenn Markle, 401 Teacher's College, University of Cincinnati, Cincinnati, OH 45221.

## **HOW NARST KEEPS ITS MEMBERS INFORMED**

Nine issues of the **Journal of Research in Science Teaching** — the best research in journal in science education.

JRST has been ranked as one of the highest quality educational journals according to studies published by Ward, Holland and Schramm (**American Educational Research Journal**) and Guba and Clark (**Educational Researcher**) for the American Educational Research Association - AERA. These authors identified JRST as clearly the top research journal in science education.

Over 150 abstracts of research papers presented at our annual meeting.

Quarterly newsletter describing recent developments in research and in the profession.

Detailed Register-Directories (over 40 pages) describing the accomplishments and current research interests of NARST members.

Opportunities to work with prominent people throughout the world on research projects and with such affiliated organizations as the National Science Teachers Association (NSTA) and the American Association for the Advancement of Science (AAAS).

**FRIDAY, MARCH 28, 1986**

7:30 a.m. - 12:30 p.m.	Executive Board Meeting	Board Room
9:00 - 11:00 a.m.	Training Session A <i>Statistical Methods of Meta-Analysis: Theory and Applications</i> <i>Larry V. Hedges, University of Chicago</i> <i>George Woodsworth, University of Iowa</i> <i>James A. Shymansky, University of Iowa</i>	Room 1
9:00 - 11:00 a.m.	Training Session B <i>Use of Microcomputers for Laboratory Interaction and Research</i> <i>John Layman, visiting scholar</i> <i>Lawrence Hall of Science</i>	Room 2

## FRIDAY, MARCH 28, 1986

	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
1:00 - 2:30 p.m.	A-1 Symposium: <i>Secondary School Science Instructional Practices</i>	A-2 Symposium: <i>Research on Computers in Science Learning Beyond French Lick Springs</i>	A-3 Paper Set: <i>Teacher's Professional Knowledge and Conceptual Change in Students</i>	A-4 Papers: <i>Factors Influencing Student Science Achievement</i>	A-5 Papers: <i>Contexts for Science Learning</i>	A-6 Papers: <i>Surveys</i>
2:45 - 4:15 p.m.	A-7 Symposium: <i>Research on Classroom and School Environment</i>	A-8 Paper Set: <i>A Cooperative Study</i>	A-9 Papers: <i>Students' Attitudes</i>	A-10 Papers: <i>Secondary Science Teacher Education</i>	A-11 Papers: <i>Computer Applications</i>	A-12 Papers: <i>Assessments</i>
4:30 - 6:00 p.m.	A-13 Symposium: <i>Second International Science Study — A Multinational Report</i>	A-14 Symposium: <i>Focusing Pre-College Curriculum: A Discussion of Five Orientations</i>	A-15 Paper Set: <i>Process Product Studies in Middle School Science Classes</i>	A-16 Papers: <i>Logical Thinking in Science</i>	A-17 Papers: <i>Alternatives in Science Education</i>	A-18 Posters:
6:00 - 7:00 p.m.	SPECIAL SESSION: <i>"Setting A Research Agenda For Science Education: Report of a National Committee;</i> <i>Marcia C. Linn, Lawrence Hall of Science</i> <i>Marjorie Gardner, Lawrence Hall of Science</i> <i>James Greeno, University of California, Berkeley</i> <i>Alan Shoenfeld, University of California, Berkeley</i>					
7:00 - 8:30 p.m.	Program Committee	Financial Committee	Publications Committee	Policy Committee	Research Committee	Election Committee
8:30 - 10:00 p.m.	Awards Committee	JRST Editorial Board	International Committee	Committee A	Committee B	Committee C
10:00 - 10:30 p.m.	NARST Social Hour					

## **FRIDAY, MARCH 28**

7:30 a.m.

Executive Board Meeting

Board Room

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### **Chairman:**

President

David P. Butts, University of Georgia

### **Executive Board:**

President-Elect

James P. Barufaldi, The University of Texas at Austin

Immediate Past President

Ertle Thompson, University of Virginia

Board Members

Glen Aikenhead, University of Saskatchewan

Patricia E. Blosser, The Ohio State University

Jane Bowyer, Mills College

Marcia C. Linn, University of California

Michael J. Padilla, University of Georgia

Gerald Skoog, National Science Teachers Association

John Staver, University of Illinois at Chicago

Editor, Journal of Research in Science Teaching

Russell H. Yeany, University of Georgia

Research Coordinator

Rodney L. Doran, SUNY at Buffalo

Executive Secretary

Glenn Markle, University of Cincinnati

## **FRIDAY, MARCH 28**

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1:00 p.m. - 2:30 p.m.

Session A-1

Room 1

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### **SYMPOSIUM TOPIC: SECONDARY SCHOOL SCIENCE INSTRUCTIONAL PRACTICES**

#### **Moderator**

Edmund Marek  
Univ. of Oklahoma

#### **Papers**

**A Study of Secondary School Science Teaching Practices**

James J. Gallagher, Michigan State University

**Target Students in a Science Classroom: A Case Study**

David A. Cline, Michigan State University

**The Decontextualization of Middle School Science: An Ethnographic Study of Three Teachers**

Armando Contreras, Michigan State University

**Middle School Science Teachers' Perceptions of Their Instructional Roles**

Okhee Lee, Michigan State University

**High School Science Teachers' Role Conceptions as Reflected in Their Daily Classroom Practices and Discussions**

Ribhi Abu Isneineh, Michigan State University

## FRIDAY, MARCH 28

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1:00 p.m. - 2:30 p.m.

Session A-2

Room 2

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SYMPOSIUM TOPIC: RESEARCH ON COMPUTERS IN SCIENCE LEARNING BEYOND FRENCH LICK SPRINGS

### **Moderator**

Robert D. Sherwood  
Vanderbilt University

### **Presentors**

Patricia E. Simmons, University of Iowa  
Joseph S. Krajcik, University of Iowa  
Vincent N. Lunetta, University of Iowa  
Eugene Gennaro, University of Minnesota  
F. Gerald Dillashaw, Bradley University  
Robert D. Sherwood, Peabody College, Vanderbilt University  
Camille Wainwright, University of Minnesota  
Carl Berger, University of Michigan

## FRIDAY, MARCH 28

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1:00 p.m. - 2:30 p.m.

Session A-3

Room 3

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### PAPER SET: TEACHER'S PROFESSIONAL KNOWLEDGE AND CONCEPTUAL CHANGE IN STUDENTS

#### **Moderator**

Willis J. Horak  
Univ. of Arizona

#### **Discussant**

Rodney L. Doran  
SUNY at Buffalo

#### **Papers**

##### **Defining and Observing Instructional Strategies for Conceptual Change Teaching**

Theron D. Blakeslee, Michigan State University  
Charles W. Anderson, Michigan State University

##### **Teachers' Understanding of Students' Scientific Thinking: Its Influence on Planning and Teaching**

Robert E. Hollon, Michigan State University  
Charles W. Anderson, Michigan State University

##### **Alternative Student Conceptions of Matter Cycling in Ecosystems**

Edward L. Smith, Michigan State University  
Charles W. Anderson, Michigan State University

##### **Improving College Science Teaching: Problems of Conceptual Change and Instructors' Knowledge**

Charles W. Anderson, Michigan State University

## FRIDAY, MARCH 28

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1:00 p.m. - 2:30 p.m.

Session A-4

Room 4

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### TOPIC: FACTORS INFLUENCING STUDENT SCIENCE ACHIEVEMENT

#### **Moderator**

Richard Tolman  
Brigham Young Univ.

#### **Discussant**

Eugene L. Chiappetta  
Univ. of Houston

#### **Papers**

The Effect of Textual-Aid, In-Class Homework on Achievement in Advanced Biology

Nancy R. Oakley, Winston Salem/Forsyth County Schools  
Robert H. Evans, Wake Forest University

A Comparison of the Effects of Two Instructional Sequences Involving Science Laboratory Activities

Glenn C. Markle, University of Cincinnati  
Jerry E. Ivans, Northwest School District, Cincinnati, OH

## FRIDAY, MARCH 28

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1:00 p.m. - 2:30 p.m.

Session A-5

Room 5

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### TOPIC: CONTEXTS FOR SCIENCE LEARNING

#### **Moderator**

Mary Atwater  
Atlanta University

#### **Discussant**

Donald W. McCurdy  
Univ. of Nebraska

#### **Papers**

The Acculturation of Science Students: A Prerequisite for Scientific Literacy in any Decade?

Cathleen Loving, The University of Texas at Austin

An Analysis of the Research on Learning in Science Education

Donna F. Berlin, The Ohio State University at Newark  
Arthur L. White, The Ohio State University at Columbus

Problem-Solving and Knowledge-Based Learning in Science

George L. Pallrand, Rutgers University  
Daulat Husain, Rutgers University  
Neil Moyer, Rutgers University

## FRIDAY, MARCH 28

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1:00 p.m. - 2:30 p.m.

Session A-6

Room 6

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### TOPIC: SURVEYS

#### **Moderator**

Nasrine Adibe  
C.W. Post College

#### **Discussant**

Piyush Swami  
University of Cincinnati

### **Papers**

Science and Technology Related Global Problems: A Survey of Science Educators in Developing Countries

Rodger W. Bybee, Biological Sciences Curriculum Study

A Survey of Biology Teachers' Opinions About the Teaching of Evolutionary Theory and/or the Creation Model in the United States

Frank Affannato, Buena Vista College

Daniel Sheldon, The University of Iowa

Were the 1950s like the 1980s? A Study of Science Laboratory Equipment in North Dakota High Schools

Patsy Ann Giese, University of Wisconsin-Madison

## **FRIDAY, MARCH 28**

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2:45 p.m. - 4:15 p.m.

Session A-7

Room 1

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### **SYMPOSIUM TOPIC: RESEARCH ON CLASSROOM AND SCHOOL ENVIRONMENT**

#### **Moderator**

Thaddeus W. Fowler  
University of Cincinnati

#### **Presentors**

#### **Validity and Use of a Classroom Environment Instrument for Higher Education**

David F. Treagust, Western Australian Institute of Technology  
Barry J. Fraser, Western Australian Institute of Technology

#### **Assessment of Teachers' Perceptions of School-Level Environment**

Darrell L. Fisher, Tasmanian State Institute of Technology  
Barry J. Fraser, Western Australian Institute of Technology

#### **Effect of Classroom Equipment on Science Attitudes: A Crosscultural Replication in Indonesia**

Renato A. Schibeci, Murdoch University  
I. Made Rideng, Murdoch University  
Barry J. Fraser, Western Australian Institute of Technology

#### **Research on Classroom and School Environment**

Barry J. Fraser, Western Australian Institute of Technology

## **FRIDAY, MARCH 28**

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2:45 p.m. - 4:15 p.m.

Session A-8

Room 2

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### **PAPER SET: A COOPERATIVE STUDY**

#### **Moderator**

Sylvia Leith

University of Manitoba

#### **Discussant**

Frank E. Crawley

University of Texas at Austin

#### **Papers**

A Cooperative Study of Science Attitudes and Involvement in Science Activities of U.S. and Japanese Middle Grades Students

Charles R. Coble, East Carolina University

An Assessment of Integrated Process Skills of Junior High School Students

William E. Spooner, North Carolina Department of Public Instruction

A Study of the Logical Thinking Skills of Junior High School Students in North Carolina and Japan

Floyd E. Mattheis, East Carolina University

## FRIDAY, MARCH 28

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2:45 p.m. - 4:15 p.m.

Session A-9

Room 3

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### TOPIC: STUDENTS' ATTITUDES

#### **Moderator**

Paul Joslin  
Drake University

#### **Discussant**

Lowell J. Bethel  
The University of Texas  
at Austin

#### **Papers**

Students' Perceptions as Predictors of Attitudes and Achievement in Intermediate Life Science Classes

John Mergendoller, Far West Laboratory  
Martin Packer, Far West Laboratory

Project LEO Studies of Attitudes, Perceptions, and Preferences of High School Chemistry Students Who Have Experienced Three Quantitatively-Defined Science Learning Environments

Charles C. Matthews, Maharishi International University  
Dorothy M. Schlitt  
Mohammad AbuNejmeh, Annajah University

An Analysis of Native American Student Attitude Toward Science

Gerry D. Haukoos, Memphis State University

## FRIDAY, MARCH 28

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2:45 p.m. - 4:15 p.m.

Session A-10

Room 4

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### TOPIC: SECONDARY SCIENCE TEACHER EDUCATION

#### **Moderator**

Marvin Druger  
Syracuse University

#### **Discussant**

Ronald D. Anderson  
Univ. of Colorado

#### **Papers**

Evaluation of a Teacher Inservice Training Program in Physical Science  
Frances P. Lawrenz, Arizona State University

Secondary Science Education Library Resources at New England's Teacher Education Programs  
Lloyd H. Barrow, University of Missouri-Columbia

The Effectiveness of a Narrow Field Academic Science Major in Preparing Students for a Broader Context Teaching Assignment  
Roger G. Olstad, University of Washington  
Andrea V. Marrett, University of Washington

## FRIDAY, MARCH 28

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2:45 p.m. - 4:15 p.m.

Session A-11

Room 5

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### TOPIC: COMPUTER APPLICATIONS

#### **Moderator**

David A. Cline  
Michigan State Univ.

#### **Discussant**

Don Daugs  
Utah State Univ.

#### **Papers**

The Development and Concurrent Validation of Computer-Based Piagetian Instruments  
Charles R. Barman, Indiana University at Kokomo

The Instructional Effectiveness of Graphically-Realistic Computer-Generated Material on Students of Different Prior-Knowledge Levels  
D. Daryl Adams, University of Georgia  
John W. Shrum, University of Georgia  
Russell H. Yeany, University of Georgia

Validity and Reliability Study of a Computer Simulation Designed to Test for Control of Variables  
Richard A. Borst, Georgia State University

## FRIDAY, MARCH 28

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2:45 p.m. - 4:15 p.m.

Session A-12

Room 6

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### TOPIC: ASSESSMENTS

#### **Moderator**

Pat Obenauf  
University of West Va.

#### **Discussant**

Lynn Talton  
State Dept. of Education, South Carolina

#### **Papers**

##### Readability of Multiple-Choice Science Items

Steven J. Rakow, University of Houston-Clear Lake  
Thomas C. Gee, University of Houston-Clear Lake

##### Content Validity of the 1985 Michigan Department of Education Pilot Science Examination

W.L. Yarroch, Michigan Technological University

##### The Development of a Test of Computer Literacy for Science Teachers

James D. Ellis, Biological Sciences Curriculum Study  
Paul J. Kuerbis, The Colorado College

## FRIDAY, MARCH 28

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4:30 p.m. - 6:00 p.m.

Session A-13

Room 1

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### SYMPOSIUM TOPIC: SECOND INTERNATIONAL SCIENCE STUDY—A MULTI-NATIONAL REPORT

#### **Moderator**

Willard J. Jacobson  
Columbia University

#### **Presentors**

Willard J. Jacobson, Columbia University  
John Keeves, Australia  
Pisarn Soydhurum, Thailand  
Dolores Hernandez and Josefina Fonacier, Philippines  
Pinchas Tamir, Israel  
Rodney Doran, U.S.A.  
Michael Connelly, Robert Crocker, Heidi Kass, and Mehaheem Finegold, Canada

## **FRIDAY, MARCH 28**

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4:30 p.m. - 6:00 p.m.

Session A-14

Room 2

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**SYMPOSIUM TOPIC: FOCUSING PRECOLLEGE SCIENCE CURRICULA: A DISCUSSION OF FIVE ORIENTATIONS**

**Moderator**

Joel E. Bass

Sam Houston State University

**Presentors**

**Curriculum as Technology**

Ron Good, Florida State University

**Personal Relevance**

Rober Yager, University of Iowa

**Development of Cognitive Processes**

Anton Lawson, Arizona State University

**Social Adaptation & Social Reconstruction**

Rodger Bybee, BSCS — Colorado College

**Academic Rationalism**

Richard Duschl, University of Houston

## **FRIDAY, MARCH 28**

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4:30 p.m. - 6:00 p.m.

Session A-15

Room 3

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### **PAPER SET: PROCESS PRODUCT STUDIES IN MIDDLE SCHOOL SCIENCE CLASSES**

#### **Moderator**

Glenn Markle  
Univ. of Cincinnati

#### **Discussant**

Roger G. Olstad  
Univ. of Washington

#### **Papers**

##### **Introduction to Process Product Studies**

William Capie, University of Georgia

##### **Relationships between Teacher Performance, Student Perceptions of the Learning Environment and Process Skill Achievement**

Antonio Bettencourt, University of Georgia

Steve Byrd, University of Georgia

Kenneth Tobin, Western Australian Institute of Technology

##### **The Relationship of Teacher Performance to Science Process Skills Achievement of Students**

Michael Padilla, University of Georgia

Linda Cronin, University of Georgia

William Capie, University of Georgia

##### **Development of a Middle Georgia Integrated Science Process Skills Test**

Linda Cronin, University of Georgia

Michael Padilla, University of Georgia

## FRIDAY, MARCH 28

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4:30 p.m. - 6:00 p.m.

Session A-16

Room 4

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### TOPIC: LOGICAL THINKING IN SCIENCE

#### **Moderator**

Jane Bowyer  
Mills College

#### **Discussant**

Marianne B. Betkouski  
Univ. of North Florida

#### **Papers**

**The GALT: A Measure of Logical Thinking Ability of Grade 8 Students and a Predictor of Science and Mathematics Achievement**

Betty L. Bitner, Arkansas Tech University

**Relationships Among Superstitious Beliefs, Science Process Skill and Logical Thinking Abilities of Philippine Students**

Joseph P. Riley, II, University of Georgia

Laurena G. Chuapoco, Marikina Institute of Science and Technology, Philippines

**Factors Which Influence Students' Performance on a Formal Reasoning Group Test**

Reuven Lazarowitz, Technion-Israel Institute of Technology

Michal Shemesh, Technion-Israel Institute of Technology

## FRIDAY, MARCH 28

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4:30 p.m. - 6:00 p.m.

Session A-17

Room 5

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### TOPIC: ALTERNATIVES IN SCIENCE EDUCATION

#### **Moderator**

Terry J. Shaw  
Norman Public Schools

#### **Discussant**

Linda W. Crow  
Houston Community College

#### **Papers**

Family Involvement in Secondary Science Homework Activities  
Richard Rezba, Virginia Commonwealth University

Parent-Child Interaction in a Free-Choice Learning Setting  
Lynn D. Dierking, Smithsonian Institution  
John J. Koran, University of Florida  
Mary Lou Koran, University of Florida  
John H. Falk, Smithsonian Institution

Philosophical Assessment of Andragogy as an Alternative to Pedagogy for  
Adult Science Education  
J. Preston Prather, University of Georgia  
John W. Shrum, University of Georgia

## **FRIDAY, MARCH 28**

4:30 p.m. - 6:00 p.m.

Session A-18

Room 6

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### **POSTER SESSION**

#### **Moderator**

Larry E. Schaffer  
Syracuse University

#### **Papers**

Attitude Changes of Teachers Involved in a Project for the Improvement of Physical Science Instruction in Rural Elementary Schools

Karen L. Ostlund, Southwest Texas State University

Dick E. Hammond, Southwest Texas State University

An Instructional Immunology Laboratory Simulation

Antoinette Hodapp, University of California, Davis

Joseph Faletti, University of California, Davis

The Relationship of the Science Process Skill of Prediction to Factors Involved with the Use of Biological Computer Simulations

Derrick R. Lavoie, Florida State University

Ron Good, Florida State University

Teachers' Experiences in Implementing the EQUALS Program: A Qualitative Study

Catherine R. Conwell, University of North Carolina at Charlotte

Richard B. White, University of North Carolina at Charlotte

The Imagistic Processing System: A Component of a Model for Competency in Mathematical Problem Solving

Sandra Judith Costello, Somerset County College

An Evaluation of the Simulation: The Factory

E.L. Shaw, Jr., Southeastern Louisiana University

James P. Okey, University of Georgia

California Science Teachers Learn to Serve as Colleague/Mentors

Rita W. Peterson, University of California, Irvine

The Genetics Tutorial Project: Combining Educational Research, Expert Systems and Instructional Software

James Stewart, University of Wisconsin-Madison

Michael Streibel, University of Wisconsin-Madison

Angelo Collins, University of Wisconsin-Madison

Ken Koedinger, University of Wisconsin-Madison

## FRIDAY, MARCH 28

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7:00 p.m.

Program Committee

Room 1

---

### Chairman:

James P. Barufaldi, The University of Texas at Austin

### Members:

F. Gerald Dillashaw, Bradley University  
Rodney L. Doran, SUNY at Buffalo  
Thomas R. Koballa, Jr., The University of Texas at Austin  
Edmund A. Marek, University of Oklahoma  
Joseph P. Riley, University of Georgia  
Robert D. Sherwood, Vanderbilt University  
Emmett L. Wright, Kansas State University  
William G. Holliday, The University of Maryland

## FRIDAY, MARCH 28

---

7:00 p.m.

Financial Committee

Room 2

---

### Chairman:

Marcia C. Linn, University of California

### Members:

Dorothy Gabel, Indiana University  
H. Seymour Fowler, University of Pennsylvania  
Jerry G. Horn, Kansas State University  
William G. Holliday (ex officio), University of Maryland  
Carl Berger, University of Michigan

## FRIDAY, MARCH 28

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7:00 p.m.

Publications Committee

Room 3

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**Chairman:**

Glen Aikenhead, University of Saskatchewan

**Members:**

William H. Leonard, Louisiana State University  
Donald W. McCurdy, University of Nebraska  
Dan L. McKenzie, University of South Carolina  
Russell Yeany (ex officio), The University of Georgia  
William G. Holliday (ex officio), University of Maryland

## FRIDAY, MARCH 28

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7:00 p.m.

Policy Committee

Room 4

---

**Chairman:**

Ertle Thompson, University of Virginia

**Members:**

James P. Barufaldi, The University of Texas at Austin  
Ronald G. Good, Florida State University  
Ann C. Howe, North Carolina State University  
William G. Holliday, University of Maryland

## FRIDAY, MARCH 28

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7:00 p.m.

Research Committee

Room 5

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**Chairman:**

Rodney L. Doran, SUNY at Buffalo

**Members:**

Jane Bowyer, Mills College  
Roger T. Johnson, University of Minnesota  
Joseph D. Novak, Cornell University  
William G. Holliday, University of Maryland

## FRIDAY, MARCH 28

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7:00 p.m.

Election Committee

Room 6

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**Chairman:**

Ertle Thompson, University of Virginia

**Members:**

Robert W. Howe, The Ohio State University  
J. David Lockard, University of Maryland

## FRIDAY, MARCH 28

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8:30 p.m.

Awards Committee

Room 1

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**Chairman: (Steering)**

Michael J. Padilla, University of Georgia

**Chairman: (JRST Award)**

John R. Staver, University of Illinois at Chicago

**Chairman: (NARST Awards)**

Patricia E. Blosser, The Ohio State University

**Members:**

John W. Butzow, Indiana, PA  
James D. Ellis, Colorado College  
Joy S. Lindbeck, Akron, OH  
Peter A. Rubba, Jr., Pennsylvania State University  
William G. Holliday, University of Maryland  
J. Hugh Baird, Brigham Young University  
Eugene L. Chiappetta, University of Houston  
Claudia B. Douglass, Central Michigan University  
Willis J. Horak, University of Arizona  
Larry E. Schafer, Syracuse University  
Barbara M. Strawitz, Louisiana State University  
Lynn Talton, South Carolina Department of Education  
Dale R. Baker, University of Utah  
Joel E. Bass, Sam Houston State University  
Lowell Bethel, The University of Texas at Austin  
Linda Crow, Houston Community College System  
William B. McIlwaine, Millersville State College  
J. Nathan Swift, SUNY-Oswego  
Richard L. Williams, University of Victoria

**Chairman:**

Russell H. Yeany, Jr., University of Georgia

**Members:**

Ed van den Berg, Sat-ya Waccha Christian University  
Pinchas Tamir, Hebrew University  
Marianne Betkouski, University of North Florida  
Doris Simonis, University of Montana  
George DeBoer, Colgate University  
Victor L. Willson, Texas A&M University  
Rosalind Driver, University of Leeds  
Robert Sherwood, Vanderbilt University  
Barry J. Fraser, Western Australia Institute of Technology  
Richard Duschl, University of Houston  
Douglas A. Roberts, University of Calgary  
William C. Kyle, Jr., University of Connecticut  
Thomas Koballa, The University of Texas at Austin  
Ronald G. Good, Florida State University  
William Capie, University of Georgia  
Kenneth Tobin, Western Australia Institute of Technology  
Willis Horak, University of Arizona  
Linda Crow, Houston Community College System  
Antonio Mendez, University of Puerto Rico  
Dana L. Zeidler, Delaware State College  
Barbara Spector, University of South Florida  
Emmett L. Wright, Kansas State University  
Barbara Strawitz, Louisiana State University  
Peter Rubba, Pennsylvania State University  
Victor Mayer, Ohio State University

## FRIDAY, MARCH 28

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8:30 p.m.

International Committee

Room 3

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### **Chairman:**

Patricia E. Blosser, The Ohio State University

### **Members:**

Glen Aikenhead, University of Saskatchewan

Barry Fraser, Western Australia Institute of Technology

Karl Frey, Institute for Science Education

Arthur L. White, The Ohio State University

William G. Holliday (ex officio), The University of Maryland

## SATURDAY, MARCH 29, 1986

	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
8:00 - 9:30 a.m.	B-1 Symposium: <i>Developments in Style and Purpose of Research on The Learning of Science</i>	B-2 Posters:	B-3 Papers: <i>Factors Influencing Student Science Achievement</i>	B-4 Papers: <i>Computer Applications-Concept and Skill Development</i>	B-5 Papers: <i>Science Process Skills</i>	B-6 Papers: <i>Undergraduate Science Education</i>

9:30 - 10:00 a.m.

Informal Discussion - Coffee Break

10:15 - 11:45 p.m.

General Session I: *Computer as Agents of Educational Change*  
*New Directions for Computers in Education*  
*Sueann Ambron, Apple Computer Corporation*

NARST is grateful to Delta Education, Inc. for its financial support of General Session Speakers.

	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
1:00 - 2:30 p.m.	B-7 Symposium: <i>Administration of Science Programs: A Policy Perspective</i>	B-8 Symposium: <i>The Attitude Concept: Can It Be Defined</i>	A-9 Paper Set: <i>A Study of Uncertainties in the Meta-Analysis of Research on the Effectiveness of "New" Science Curricula</i>	B-10 Papers: <i>Cognitive Development</i>	B-11 Papers: <i>Students' Concepts in Science</i>	B-12 Papers: <i>Teachers' Perceptions and Interests</i>
2:45 - 4:15 p.m.	B-13 Symposium: <i>Science and Writing — Linking Research with Classroom Models</i>	B-14 Paper-Set: <i>What Research Says About Using Science Textbooks</i>	B-15 Papers: <i>Gender Related Issues in Science Education</i>	B-16 Papers: <i>Pre-Service Science Teacher Education</i>	B-17 Papers: <i>Factors Related to Computer Effectiveness</i>	B-18 Papers: <i>Science Education in Non-Traditional Settings</i>

4:30 - 6:00 p.m.

General Session II: *Demolishing the Myth of Scientific Objectivity*  
*Ian I. Mitroff, University of Southern California*

7:15 p.m.

Reception for New Members

## **SATURDAY, MARCH 29**

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8:00 a.m. - 9:30 a.m.

Session B-1

Room 1

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**SYMPOSIUM TOPIC: DEVELOPMENTS IN STYLE AND PURPOSE OF RESEARCH ON THE LEARNING OF SCIENCE**

**Moderator**

Russell H. Yeany  
University of Georgia

**Presentors**

Richard F. Gunstone, Monash University  
Richard T. White, Monash University  
Peter J. Fensham, Monash University  
Russell H. Yeany, Jr., University of Georgia

## SATURDAY, MARCH 29

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8:00 a.m. - 9:30 a.m.

Session B-2

Room 2

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### POSTER SESSION

#### **Moderator**

Karen L. Ostlund  
Southwest Texas State University

#### **Presentors**

Decision Making, Logical Reasoning and Other Factors Related to Student Success on the Nursing State Board Examination

Carol Biermann, Kingsbrough Community College

The Monthly Fluctuation in Perceptual/Reading Accuracy in Female College Students

Thomas R. Lord, Burlington County College

Kathleen Taylor, Burlington County College

Hardware and Software Development of High Technology Science Instruction: A Case History of the Interactive Videodisc System

William H. Leonard, Louisiana State University

Scientific Literacy and Informal Science Teaching

Johàn Strauss, Rand Afrikaans University

J. Maarschalk, Rand Afrikaans University

Categorization of Genetic Problems by Successful Problems on Chemical Equilibrium

Moises Camacho, Interamerican University of Puerto Rico

Ron Good, Florida State University

Identifying Students' Difficulties in Understanding Concepts Pertaining to Cell Water Relations

Yael Friedler, Stanford University

Pinchas Tamir, The Hebrew University/Science Teaching Center

Ruth Amir, The Hebrew University/Science Teaching Center

Science Curriculum Development which supports School Board Curriculum Development

Jeff Northfield, Monash University

## **SATURDAY, MARCH 29**

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8:00 a.m. - 9:30 a.m.

Session B-3

Room 3

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### **TOPIC: FACTORS INFLUENCING STUDENT SCIENCE ACHIEVEMENT**

#### **Moderator**

Mark R. Malone  
Louisiana State University

#### **Discussant**

George I. Za'rour  
American University of Beirut

#### **Presentors**

**The Accuracy of Male and Female Junior High School Students' Perceptions of Parental Figures' Science Attitudes and Their Relationship to Students' Achievement in Science**

Melody J. Leithold, Pennsylvania State University  
H. Seymour Fowler, Pennsylvania State University

**The Use of Mnemonics in Teaching Middle School Science**

George Banks, Bingham Middle School  
Michael Piburn, Westminster College of Salt Lake City

**Effects of Ethnicity on Attributions, Self-Concepts and Achievement of Male and Female Westinghouse Award Winners**

James R. Campbell, St. John's University  
Charlene Connolly, Mercer County Community College  
Jean Pizzo, New York City Public Schools

## **SATURDAY, MARCH 29**

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8:00 a.m. - 9:30 a.m.

Session B-4

Room 4

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**TOPIC: COMPUTER APPLICATIONS — CONCEPT AND SKILL DEVELOPMENT**

**Moderator**

William C. Kyle, Jr.  
University of Connecticut

**Discussant**

William Baird  
Auburn University

**Papers**

**The Impact of Microcomputer-based Science Labs on Children's Graphing Skills**

Janice R. Mokros, Technical Education Research Centers, Inc.  
Robert Tinker, Technical Education Research Centers, Inc.

**Use of Microcomputer Simulations of Science Activities to Study the Relationship between Sequencing and Nature of Learning Activities and Concept Development**

Arthur L. White, Ohio State University  
Robert McNemar, Columbus Public Schools

**The Effectiveness of Supplementing the Teaching of the Volume Displacement Concept with Use of an Interactive Computer Simulation**

Bonita DeClercq, University of Minnesota  
Eugene Gennaro, University of Minnesota.

## SATURDAY, MARCH 29

8:00 a.m. - 9:30 a.m.

Session B-5

Room 5

### TOPIC: SCIENCE PROCESS SKILLS

#### **Moderator**

William Capie  
University of Georgia

#### **Discussant**

Kathleen A. O'Sullivan  
University of Texas at Austin

#### **Papers**

#### **Evaluating Construct Validity of a Basic Process Skills Test Using Qualitative Research Methods**

Linda Cronin, University of Georgia  
Meghan Twiest, University of Georgia  
Michael Padilla, University of Georgia

#### **The Development, Validation and Administration of a Test of Science Process Skills to Costa Rican Secondary School Students**

Juan M. Esquivel, University of Costa Rica  
Virginia Sanchez, National University  
Lilliana Quesada, University of Costa Rica

#### **The Development of a Test of Science Process Skills for Elementary Students**

Sylvia Leith, University of Manitoba

## SATURDAY, MARCH 29

8:00 a.m. - 9:30 a.m.

Session B-6

Room 6

### TOPIC: UNDERGRADUATE SCIENCE EDUCATION

#### **Moderator**

Ronald D. Simpson  
The University of Georgia

#### **Discussant**

Patricia E. Blosser  
Ohio State University

#### **Papers**

#### **Preliminary Investigation of Students' Strategies with Electric Current**

David P. Maloney, Creighton University

#### **A Comparative Study of Student Characteristics in Two Science Methods Programs: Field-based Methods and Traditional Methods**

Diana M. Hunn, Ohio State University

#### **Undergraduates Studying Science: Views on STS of Future Scientists and Non-Scientists**

Reg Fleming, University of Saskatchewan

## **SATURDAY, MARCH 29**

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1:00 a.m. - 2:30 a.m.

Session B-7

Room 1

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**SYMPOSIUM TOPIC: ADMINISTRATION OF SCIENCE PROGRAMS: A POLICY PERSPECTIVE**

**Moderator**

John Staver  
University of Illinois at Chicago

**Papers**

What is the Record?

Roger Olstad, University of Washington

Policy Implications?

Roger Bybee, Biological Science Curriculum Study

How Can It (administrative support) Be Improved on the Instructional Side?

Carl Berger, University of Michigan

How Can It (administrative support) Be Improved on the Administrative Side?

William Callison, California State University at Fullerton

## **SATURDAY, MARCH 29**

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1:00 a.m. - 2:30 a.m.

Session B-8

Room 2

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**SYMPOSIUM TOPIC: THE ATTITUDE CONCEPT: CAN IT BE DEFINED?**

**Moderator**

William Leonard  
Louisiana State University

**Presentors**

Robert L. Shrigley, The Pennsylvania State University  
Thomas R. Koballa, Jr., The University of Texas at Austin  
Ronald D. Simpson, The University of Georgia

## SATURDAY, MARCH 29

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1:00 a.m. - 2:30 a.m.

Session B-9

Room 3

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PAPER SET: A STUDY OF UNCERTAINTIES IN THE META-ANALYSIS OF RESEARCH ON THE EFFECTIVENESS OF "NEW" SCIENCE CURRICULA

**Moderator**

Paul J. Kuerbis  
Colorado College

**Discussant**

Marcia C. Linn  
Lawrence Hall of Science

**Presentors**

James A. Shymansky, University of Iowa  
George Woodworth, University of Iowa  
Larry V. Hedges, University of Chicago  
Craig Berg, University of Iowa

## SATURDAY, MARCH 29

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1:00 a.m. - 2:30 a.m.

Session B-10

Room 4

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TOPIC: COGNITIVE DEVELOPMENT

**Moderator**

Catherine Conwell  
University of North Carolina

**Discussant**

Anton E. Lawson  
Arizona State University

**Papers**

Changes in Logical Reasoning in the Middle School Years  
Michael J. Wavering, University of Arkansas

Children's Formation and Retention of Mental Images  
Ann C. Howe, North Carolina State University  
Ellen Vasu, North Carolina State University

An Experimental Study into the Effect of Outdoor Science Teaching on the Fourth Grade Child's Concept of Piagetian Physical Causality  
Louise L. Gann, Alcoa Elementary School and Pennsylvania State University  
H. Seymour Fowler, Pennsylvania State University

## **SATURDAY, MARCH 29**

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1:00 a.m. - 2:30 a.m.

Session B-11

Room 5

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### **TOPIC: STUDENTS' CONCEPTS IN SCIENCE**

#### **Moderator**

Vincent N. Lunetta  
University of Iowa

#### **Discussant**

Nasrine Adibe  
C.W. Post College

#### **Papers**

##### **Student Conceptions of Chemical Change**

Joseph J. Hesse III, Spring Lake High School  
Charles W. Anderson, Michigan State University

##### **Characterizing Qualitative Mental Models of Learners about Energy Metabolism**

Marcy J. Leeds, Rutgers University

##### **Student Knowledge of a Natural Resource Issue in the Gulf of Maine**

Michael J. Brody, University of Maine at Orono  
Helmut Koch, University of Maine at Orono

## **SATURDAY, MARCH 29**

1:00 a.m. - 2:30 a.m.

Session B-12

Room 6

### **TOPIC: TEACHERS' PERCEPTIONS AND INTERESTS**

#### **Moderator**

Edward L. Smith  
Michigan State University

#### **Discussant**

William Holliday  
Gregory L. Crosby  
University of Maryland

#### **Papers**

##### **Science Teachers' Conceptions of the Nature of Science: Do They Really Influence Teaching Behavior?**

Norman G. Lederman, Oregon State University  
Dana Lewis Zeidler, Delaware State College

##### **Science Education Research Interests of Elementary Teachers**

Dorothy L. Gabel, Indiana University  
K. V. Samuel, Indiana University  
Stanley Helgeson, The Ohio State University  
Joseph Novak, Cornell University  
Saundra McGuire, Alabama A&M University  
John Butzow, Indiana University of Pennsylvania

##### **Teacher Misconceptions — Implications for Science Instruction**

Marianne Betkouski, University of North Florida  
Sandra McDonald, University of North Florida  
Paul Eggen, University of North Florida

##### **An Investigation of the Meaning Exemplary Science Teachers Assign to STS Instruction Concepts**

Peter A. Rubba, The Pennsylvania State University

## **SATURDAY, MARCH 29**

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2:45 a.m. - 4:15 a.m.

Session B-13

Room 1

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**SYMPOSIUM TOPIC: SCIENCE AND WRITING — LINKING RESEARCH WITH CLASSROOM MODELS**

### **Moderator**

Virginia Johnson Gazzam  
Towson State University

### **Papers**

How to Link Science and Writing — What Writing Research Can Offer  
Science Teachers  
Barbara Fassler Walvoord, Loyola College

The Effect of Writing Assignments on Achievement in College General  
Chemistry  
Phillip Horton, Florida Institute of Technology

A Naturalistic Study of Writing and Thinking Processes of Students Con-  
ducting and Recording Original Science Research  
Virginia Johnson Gazzam, Towson State University

## **SATURDAY, MARCH 29**

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2:45 a.m. - 4:15 a.m.

Session B-14

Room 2

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**PAPER SET: WHAT RESEARCH SAYS ABOUT USING SCIENCE TEXTBOOKS**

### **Moderator**

F. Gerald Dillashaw  
Bradley University

### **Presentors**

William G. Holliday, University of Maryland  
J. David Lockard, University of Maryland  
Michael J. Padilla, University of Georgia  
Rosemary K. Padilla, University of Georgia  
Denise Muth, University of Georgia  
Fred Finley, University of Minnesota  
James Shymansky, University of Iowa  
Dianne Schallert, University of Texas  
Larry Yore, University of Victoria  
Carol M. Santa, Kalispell, MT

## **SATURDAY, MARCH 29**

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2:45 a.m. - 4:15 a.m.

Session B-15

Room 3

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### **TOPIC: GENDER RELATED ISSUES IN SCIENCE EDUCATION**

#### **Moderator**

John Butzow  
Indiana University of Pennsylvania

#### **Discussant**

Rita Peterson  
University of California

#### **Papers**

Identifying Gaps in the Research on Precollege Science Education for Females: Opinions of a Sample of Equity Researchers

Marsha Lakes Matyas, American Association for the Advancement of Science

Gender Differences in Science Achievement: A Matter of Knowledge or of Confidence?

Hanna J. Arzi, Monash University

Female Science Majors: Do They Differ from the Male Science Major?

Veronica Reardon Mondrinos, Rutgers University

George Pallrand, Rutgers University

## **SATURDAY, MARCH 29**

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2:45 a.m. - 4:15 a.m.

Session B-16

Room 4

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### **TOPIC: PRESERVICE SCIENCE TEACHER EDUCATION**

#### **Moderator**

Julia Clark  
Texas A&M University

#### **Discussant**

Burton E. Voss  
University of Michigan

#### **Papers**

##### **Evaluating the Teaching Effectiveness of Preservice Science Teachers Using Pupils' Feedback**

Richard A. Duschl, University of Houston-University Park  
Hersholt Waxman, University of Houston-University Park  
Robert Morecock, University of Houston-University Park

##### **The Integration of Science Microteaching and Field Experience with Two Feedback Levels on Preservice Teachers**

Mark R. Malone, Louisiana State University  
Patricia Hauslein, Louisiana State University  
Carolyn Sommersell, Louisiana State University

##### **The Influence of Sequenced Instructional Strategy and Locus of Control on Preservice Elementary Teachers' Understanding of the Nature of Science**

Lawrence C. Scharmann, Indiana University of Pennsylvania

## **SATURDAY, MARCH 29**

2:45 a.m. - 4:15 a.m.

Session B-17

Room 5

### **TOPIC: FACTORS RELATED TO COMPUTER EFFECTIVENESS**

#### **Moderator**

Daniel Sheldon  
University of Iowa

#### **Discussant**

Ann C. Howe  
North Carolina State University

#### **Papers**

Effects of Group Size and Advance Organizers on Achievement, Retention, and Rate of Learning When Using Microcomputer Tutorials in Minematics

Ernest R. Carnes, Hudson High School

Joy S. Lindbeck, The University of Akron

C. Frank Griffin, The University of Akron

Changes in Preservice Elementary Teachers' Hypothesizing Skills and Selected Attitudes Following Group and Individual Study with Computer-Presented Text or Computer Simulation

William E. Baird, Auburn University

Thomas R. Koballa, Jr., The University of Texas at Austin

The Effects of Simulation Mode on Decision-Making

John C. Park, North Carolina State University

## **SATURDAY, MARCH 29**

2:45 a.m. - 4:15 a.m.

Session B-18

Room 6

### **TOPIC: SCIENCE EDUCATION IN NON-TRADITIONAL SETTINGS**

#### **Moderator**

Steven J. Rakow  
University of Houston-Clear Lake

#### **Discussant**

Richard Tolman  
Brigham Young University

#### **Papers**

Effects of Novelty-Reducing Preparation on Exploratory Behavior and Cognitive Learning in Science Museum Settings

Carole Kubota, University of Washington  
Roger Olstad, University of Washington

A Study of Visitor Locus of Attention: Predicting Museum Visitor Behavior

John H. Falk, Smithsonian Institution

An Instructional Program at a Science Museum and its Effect on Sixth Grade Students

Barbara Atwater Parks, Georgia State University  
Mildred W. Graham, Georgia State University

## SUNDAY, MARCH 30, 1986

<b>9:00 a.m.</b>	<b>Easter Morning Tour</b>					
<b>1:00 - 2:45 p.m.</b>	<b>NARST/JRST Awards Luncheon and President's Message</b>					
	<b>Room 1</b>	<b>Room 2</b>	<b>Room 3</b>	<b>Room 4</b>	<b>Room 5</b>	<b>Room 6</b>
<b>3:00 - 4:30 p.m.</b>	<b>C-1 Symposium:</b> <i>Exemplary Practice in Science Classrooms</i>	<b>C-2 Symposium:</b> <i>How Important are Different Types of Scientific Knowledge? Curriculum Implications</i>	<b>C-3 Paper Set:</b> <i>An Innovative Science Teacher Education Program</i>	<b>C-4 Papers:</b> <i>Factors Influencing Student Science Achievement</i>	<b>C-5 Papers:</b> <i>College Science Teaching</i>	<b>C-6 Papers:</b> <i>High School Science</i>
<b>4:45 - 6:15 p.m.</b>	<b>C-7 Symposium:</b> <i>Science Education Research in Latin America and the Caribbean</i>	<b>C-8 Paper Set:</b> <i>Systematic Representation of Biology Knowledge</i>	<b>C-9 Papers:</b> <i>Attitudes and Related Factors</i>	<b>C-10 Papers:</b> <i>Science Curriculum Implementation</i>	<b>C-11 Papers:</b> <i>Contexts for Science Learning</i>	<b>C-12 Papers:</b> <i>Factors Affecting Student Achievement</i>
<b>6:30 - 8:00 p.m.</b>	<b>General Session III: <i>Change is a Process, Not an Event: The Concerns-Based Perspective</i></b> <i>Gene Hall, The University of Texas at Austin</i>					

## **SUNDAY, MARCH 30**

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3:00 p.m. - 4:30 p.m.

Session C-1

Room 1

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### **SYMPOSIUM TOPIC: EXEMPLARY PRACTICE IN SCIENCE CLASSROOMS**

#### **Moderator**

Michael Piburn  
Westminster College

#### **Discussant**

James J. Gallagher  
Michigan State University

#### **Papers**

##### **Exemplary Practice in Science Classrooms**

Kenneth Tobin, Western Australian Institute of Technology

##### **Exemplary Practice in Biology Classes**

David F. Treagust, Western Australian Institute of Technology

##### **Psychosocial Environment in Classrooms of Exemplary Science Teachers**

Barry J. Fraser, Western Australian Institute of Technology

##### **Cognitive and Affective Outcomes in Exemplary Science Classes**

John C. Happs, Western Australian Institute of Technology

## **SUNDAY, MARCH 30**

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3:00 p.m. - 4:30 p.m.

Session C-2

Room 2

---

### **SYMPOSIUM TOPIC: HOW IMPORTANT ARE DIFFERENT TYPES OF SCIENTIFIC KNOWLEDGE?: CURRICULUM IMPLICATIONS**

#### **Moderator**

Glen Aikenhead  
University of Saskatchewan

#### **Presentors**

Leo West, Monash University

Peter J. Fensham, Monash University

Heidi Kass, University of Alberta, Canada

Sunee Klainin, Institute for the Promotion of Teaching Science and Technology, Thailand

Pinchas Tamir, Hebrew University, Israel

## SUNDAY, MARCH 30

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3:00 p.m. - 4:30 p.m.

Session C-3

Room 3

---

### PAPER SET: EVALUATING SCIENCE TEACHER EDUCATION PROGRAMS

#### **Moderator**

Peter A. Rubba  
Pennsylvania State University

#### **Discussant**

Stanley L. Helgeson  
Ohio State University

#### **Papers**

##### Evaluation of an Innovative Science Teacher Education Program

Joseph S. Krajcik, University of Iowa

John E. Penick, University of Iowa

Robert E. Yager, University of Iowa

##### Characteristics of Science Teachers from an Innovative Science Teacher Education Program

John E. Penick, University of Iowa

Joseph S. Krajcik, University of Iowa

Robert E. Yager, University of Iowa

##### An Evaluation of a Performance-based Secondary Science Education Program

Ronald J. Bonnstetter, The University of Nebraska

Donald W. McCurdy, The University of Nebraska

## SUNDAY, MARCH 30

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3:00 p.m. - 4:30 p.m.

Session C-4

Room 4

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### TOPIC: FACTORS INFLUENCING STUDENT SCIENCE ACHIEVEMENT

#### **Moderator**

Mildred W. Graham  
Georgia State University

#### **Discussant**

Ronald G. Good  
Florida State University

#### **Papers**

The Relationships between Performance on Science Thinking Skills and Reading Comprehension Skills of Elementary Students

Betty Crocker, Southern Oregon State College  
David P. Butts, University of Georgia

The Effects of Diagnostic Testing Using Different Item Formats and Cognitive Levels on Science Achievement

Janet Irby, University of Georgia  
Russell H. Yeany, University of Georgia

## SUNDAY, MARCH 30

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3:00 p.m. - 4:30 p.m.

Session C-5

Room 5

---

### TOPIC: COLLEGE SCIENCE TEACHING

#### **Moderator**

Dale Baker  
University of Utah

#### **Discussant**

Emmett L. Wright  
Kansas State University

#### **Papers**

A Study of Factors Affecting Student Performance in Junior College General Chemistry Courses

Karen Sanchez, Florida Junior College  
Marianne Betkouski, University of North Florida

Anxiety Levels of College Students Taking Required Science Courses

Mary Westerback, C.W. Post College  
Clemoncia Gonzalez, C.W. Post College

Influence of Prior Familiarity and Text Structure on College Student's Recalls of Earth Science Passages

Sarah L. Ulerick, University of Oregon

## **SUNDAY, MARCH 30**

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3:00 p.m. - 4:30 p.m.

Session C-6

Room 6

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### **TOPIC: HIGH SCHOOL SCIENCE**

#### **Moderator**

James R. Campbell  
St. John's University

#### **Discussant**

J. Hugh Baird  
Brigham Young University

#### **Papers**

**A Preacademic Preparatory Crash Course in Science as a Factor in Enhancing Equal Opportunities and Excellence in Academic Higher Science Education**

Uri Zoller, Haifa University-Oranim

D. Ben Chaim, Haifa University

M. Danot, Haifa University

**Variables that Affect Students' Enrollment in Science Courses: It is not only Achievement**

Avi Hofstein, The Weizmann Institute of Science

Ruth Ben-Zvi, The Weizmann Institute of Science

Nava Milner, The Weizmann Institute of Science

**Academic Work in High School Science Courses**

Kenneth Tobin, Western Australian Institute

James J. Gallagher, Michigan State University

## **SUNDAY, MARCH 30**

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4:45 p.m. - 6:15 p.m.

Session C-7

Room 1

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**SYMPOSIUM TOPIC: A SYMPOSIUM ON SCIENCE EDUCATION RESEARCH IN LATIN AMERICA AND THE CARIBBEAN**

### **Moderator**

Barry Fraser

Western Australia Institute of Technology

### **Presentors**

Arthur L. White, Ohio State University

Pamela Fraser-Abder, University of West Indies - St. Augustine

Deyanira Bennett, Universidad de Panama

Juan Esquivel, University of Costa Rica

Donna F. Berlin, Ohio State University

Rita Peterson, University of California

David Butts, University of Georgia

## SUNDAY, MARCH 30

4:45 p.m. - 6:15 p.m.

Session C-8

Room 2

### PAPER SET: SYSTEMATIC REPRESENTATION OF BIOLOGY KNOWLEDGE

#### **Moderator**

Mary Westerback  
C.W. Post College

#### **Discussant**

James D. Ellis  
BSCS

#### **Papers**

##### Systematic Representation of Biology Knowledge

J. Faletti, University of California - Davis

##### Systematic Representation of Molecular Biology Knowledge

Kathleen M. Fisher, University of California - David

##### Computer-Based Semantic Network in Molecular Biology: A Demonstration

J. Callman, University of California - Berkeley

K. Fisher, University of California - Davis

J. Faletti, University of California - Davis

##### Systematic Representation of Knowledge of Ecology: Concepts and Relationships

Y. Garb, University of California - Berkeley

J. Faletti, University of California - Davis

K. Fisher, University of California - Davis

## **SUNDAY, MARCH 30**

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4:45 p.m. - 6:15 p.m.

Session C-9

Room 3

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### **TOPIC: ATTITUDES AND RELATED FACTORS**

#### **Moderator**

Ronald J. Bonnstetter  
University of Nebraska

#### **Discussant**

Robert L. Shrigley  
Pennsylvania State University

#### **Papers**

**Changing Preservice Teachers' Attitudes: The Effect of Anecdotal and Data-Summary Persuasive Communications**

Thomas R. Koballa, Jr., The University of Texas at Austin

**Classroom Climate and Science - Related Attitudes of Junior High School Students in Taiwan**

Frank E. Crawley, University of Texas at Austin  
Bao-Shan Lin, National Kaohsiung Teachers' College

**The Effect of Persuasive Communication on Female Preservice Elementary School Teachers' Attitudes Toward Viewing Science as an Enterprise for Both Sexes**

Martha L. Nabors, Newberry College  
H. Seymour Fowler, Pennsylvania State University

# SUNDAY, MARCH 30

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4:45 p.m. - 6:15 p.m.

Session C-10

Room 4

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## TOPIC: SCIENCE CURRICULUM IMPLEMENTATION

### **Moderator**

Lloyd H. Barrow

University of Missouri-Columbia

### **Discussant**

J. David Lockard

University of Maryland

### **Papers**

#### A Study of the Implementation of the Components of Intermediate Science Curriculum Study

Robert K. James, Texas A&M University

Stephen E. Holaday, Abilene

#### Curriculum Emphasis by California's Eighth-Grade Science Teachers

David R. Stronck, California State University, Hayward

#### Concerns of Texas Science Teachers About the 40% Lab Time Rule

Robert K. James, Texas A&M University

Don Hein, Southwest State University

**TOPIC: CONTEXTS FOR SCIENCE LEARNING**

**Moderator**

Joy S. Lindbeck  
University of Akron

**Discussant**

John W. Renner  
University of Oklahoma

**Papers**

**An Analysis of Fifth and Sixth Grade Students' Acquisition of the Inventing Process**

Christine Kuehn, University of South Carolina  
Gerald H. Krockover, Purdue University

**The Effect of Imagining Behavioral Scenarios on Students' Intentions to Engage in Science-Related Activities**

Elisabeth H. Charron, University of Georgia

**Differences Among Fifth Grade Elementary Science Students' Attitudes by Culture (Lebanon, Saudi Arabia, United States) and Language of Instruction (Arabic, English)**

Carlton W. Knight II, American University of Beirut

## SUNDAY, MARCH 30

4:45 p.m. - 6:15 p.m.

Session C-12

Room 6

### TOPIC: FACTORS AFFECTING STUDENT ACHIEVEMENT

#### **Moderator**

Heidi Kass  
University of Alberta, Canada

#### **Discussant**

Linda R. DeTure  
Rollins College

#### **Papers**

#### **Cognitive Development, Science-Related Attitudes and Achievement of Pre-secondary Portuguese Students**

Amalia Barrios, University of Lisbon  
Robert E. Kilburn, Newton Public Schools  
Gerald L. Abegg, Boston University

#### **Relationships Between Teacher Competencies and Student Cognitive Gain in Achievement on Criterion-Referenced Mathematics Test: Implications for Science Teaching**

Janet G. Warren, Rockbridge Elementary School, Georgia  
Mildred W. Graham, Georgia State University  
Sidney P. Smith, Georgia State University

#### **Differential Treatment of Individual Students and Whole Classes by Middle School Science Teachers: Causes and Consequences**

Okhee Lee, Michigan State University  
James J. Gallagher, Michigan State University

**MONDAY, MARCH 31, 1986**

	<b>Room 1</b>	<b>Room 2</b>	<b>Room 3</b>	<b>Room 4</b>	<b>Room 5</b>	<b>Room 6</b>
8:00 - 9:30 a.m.	D-1 Symposium: <i>Qualitative Ethnographic and Structured Quantitative Data Collection: Grounded Theory versus A Priori Design: A Data Based Comparison</i>	D-2 Paper Set: <i>Implementation and Evaluation of an Exemplary Elementary Science Program</i>	D-3 Papers: <i>Cognitive Development</i>	D-4 Papers: <i>Computer Applications Simulations</i>	D-5 Papers: <i>Logical Thinking in Science</i>	D-6 Papers: <i>Science Curriculum Development</i>
9:45 - 11:15 a.m.	D-7 Symposium: <i>A Descriptive Research Strategy Assessing Computer Assisted Instruction in Science Education</i>	D-8 Outstanding NARST Paper JRST Award	D-9 Papers: <i>Science Careers - Ethnicity and Gender</i>	D-10 Papers: <i>Technology in Science Education</i>	D-11 Papers: <i>Students' Misconceptions in Science</i>	D-11 Papers: <i>Goals and Issues</i>
11:30 - 12:30 p.m.	Business Meeting					
1:00 - 3:00 p.m.	Incoming Executive Board Meeting — Board Room					

# MONDAY, MARCH 31

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8:00 a.m. - 9:30 a.m.

Session D-1

Room 1

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SYMPOSIUM TOPIC: QUALITATIVE ETHNOGRAPHIC AND STRUCTURED  
QUANTITATIVE DATA COLLECTION-GROUNDED THEORY VERSUS A  
*PRIORI* DESIGN: A DATA BASED COMPARISON

**Moderator**

Russell H. Yeany  
University of Georgia

**Papers**

Science Classroom Interactions as Described through Interpretive Data  
Collection and Grounded Theory

Kenneth G. Tobin, Western Australia Institute  
D. Daryl Adams, University of Georgia

Science Classroom Interactions as Described through *A Priori* Design and  
Structured Data Collection

Russell H. Yeany, University of Georgia  
Elisabeth H. Charron, University of Georgia  
Michael E. Hale, University of Georgia

# MONDAY, MARCH 31

8:00 a.m. - 9:30 a.m.

Session D-2

Room 2

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## PAPER SET: IMPLEMENTATION AND EVALUATION OF AN EXEMPLARY ELEMENTARY SCIENCE PROGRAM

### **Moderator**

Kathleen Fisher  
University of California-Davis

### **Discussant**

Thomas R. Koballa, Jr.  
The University of Texas at Austin

### **Papers**

#### **A Conceptual Framework for Implementing an Exemplary Elementary Science Curriculum**

Thomas Gadsden, Jr., Richardson Independent School District  
William C. Kyle, Jr., The University of Connecticut  
Sylvia McCloskey, Richardson Independent School District  
Betty Ann Fults, Richardson Independent School District

#### **A Longitudinal Assessment of Students' and Teachers' Attitudes Toward Science in Process-Approach vs. Traditional Science Classes**

Ronald J. Bonnstetter, University of Nebraska  
William C. Kyle, Jr., The University of Connecticut

#### **An Analysis of Student and Teacher Behaviors in Process-Approach vs. Traditional Elementary Science Classes**

William C. Kyle, Jr., The University of Connecticut  
James A. Shymansky, The University of Iowa

# MONDAY, MARCH 31

8:00 a.m. - 9:30 a.m.

Session D-3

Room 3

## TOPIC: COGNITIVE DEVELOPMENT

### **Moderator**

Glen Aikenhead  
University of Saskatchewan

### **Discussant**

Betty Bitner  
Arkansas Tech University

### **Papers**

A Comparison of Piagetian Developmental Levels to Video Concept Learning

John W. Butzow, Indiana University of Pennsylvania  
Jay Calkins, Georgia Marine Advisory Service

Can You Breathe Formally? (Students' Cognitive Development and their Biology Learning Outcomes)

Michael Shemesh, Technion, Haifa  
Sophia Penso, Technion, Haifa  
Reuven Lazarowitz, Technion, Haifa

An Analysis of the Developmental Pattern of Brain Weight Growth Among Six to Eighteen Year Olds and Factors Related to Weight Variability: Implications for the Phrenoblysis Hypothesis

Raymond W. Walton, Florida Institute of Technology  
Phillip B. Horton, Florida Institute of Technology

## MONDAY, MARCH 31

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8:00 a.m. - 9:30 a.m.

Session D-4

Room 4

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### TOPIC: COMPUTER APPLICATIONS - SIMULATIONS

**Moderator**

Jane Bowyer  
Mills College

**Discussant**

Arthur L. White  
Ohio State University

**Papers**

The Effect of Teacher Involvement on Student Performance in a Computer-Based Science Simulation

Michael L. Waugh, University of Illinois at Urbana-Champaign  
Kevin C. Wise, New York University

Learning from Science Computer Simulations

Fred N. Finley, University of Minnesota

Children's Natural Inference Rules During Computer Simulated Problem Solving Task

Larry Flick, University of Oregon

## MONDAY, MARCH 31

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8:00 a.m. - 9:30 a.m.

Session D-5

Room 5

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### TOPIC: LOGICAL THINKING IN SCIENCE

**Moderator**

John Staver  
University of Illinois at Chicago

**Discussant**

Earl J. Montague  
The University of Texas at Austin

**Papers**

The Four-Card Problem Resolved? Proportional Reasoning and Reasoning to a Contradiction

Anton E. Lawson, Arizona State University

The Relationship of Success With Logical Syllogisms to Success in Science Courses

Dorothy A. Petrushka, Somerset County College

## MONDAY, MARCH 31

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8:00 a.m. - 9:30 a.m.

Session D-6

Room 6

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### TOPIC: SCIENCE CURRICULUM DEVELOPMENT

#### **Moderator**

William G. Holliday  
University of Maryland

#### **Discussant**

Larry Yore  
University of Victoria

#### **Papers**

How to Develop Positive Attitudes Towards Science and Chemistry through a New Chemistry Curriculum

Zahava Scherz, The Weizmann Institute of Science

Ruth Ben-Zvi, The Weizmann Institute of Science

Avi Hofstein, The Weizmann Institute of Science

Active Hierarchical Organization - A Vehicle for Promoting Recall and Problem Solving in Introductory Chemistry

Bat-Sheva Eylon, The Weizmann Institute of Science

Ruth Ben-Zvi, The Weizmann Institute of Science

Judith Silberstein, The Weizmann Institute of Science

Research on Conceptual Difficulties in Chemistry as a Basis for Curriculum Development and Evaluation

Bat-Sheva Eylon, The Weizmann Institute of Science

Ruth Ben-Zvi, The Weizmann Institute of Science

Judith Silberstein, The Weizmann Institute of Science

## MONDAY, MARCH 31

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9:45 a.m. -11:15 a.m.

Session D-7

Room 1

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### SYMPOSIUM TOPIC. A DESCRIPTIVE RESEARCH STRATEGY ASSESSING COMPUTER ASSISTED INSTRUCTION IN SCIENCE EDUCATION

#### **Moderator**

Fred Finley  
University of Minnesota

#### **Discussant**

Fred Finley  
University of Minnesota

#### **Presentors**

Vincent N. Lunetta, University of Iowa

Patricia Simmons, University of Iowa

Joseph Krajcik, University of Iowa

## MONDAY, MARCH 31

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9:45 a.m. -11:15 a.m.

Session D-8

Room 2

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OUTSTANDING NARST PAPER

JRST AWARD

**Moderator**

Michael J. Padilla  
University of Georgia

## MONDAY, MARCH 31

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9:45 a.m. -11:15 a.m.

Session D-9

Room 3

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TOPIC: SCIENCE CAREERS - ETHNICITY AND GENDER

**Moderator**

Thomas R. Koballa, Jr.  
The University of Texas at Austin

**Discussant**

Frances Lawrenz  
Arizona State University

**Papers**

The Influence of Sex Role Conflict and Role Specific Identity to Course Taking Behavior and Career Preferences in Science  
Dale Baker, University of Utah

Increasing the Participation of Minorities in Science: Research Perspectives for Change  
Julia V. Clark, Texas A&M University

Eighth Grade Science Teachers as Sex-role Models for Eighth Grade Girl's Science and Engineering Career Interests  
Edward P. Donovan, University of South Carolina-Spartanburg  
Robert H. Fronk, Florida Institute of Technology  
Phillip B. Horton, Florida Institute of Technology

# MONDAY, MARCH 31

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9:45 a.m. -11:15 a.m.

Session D-10

Room 4

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## TOPIC: TECHNOLOGY IN SCIENCE EDUCATION

### **Moderator**

Rodger W. Bybee  
BSCS

### **Discussant**

Carl F. Berger  
University of Michigan

### **Papers**

The Development of Videodisc Based Environments to Facilitate Science Instruction

Robert D. Sherwood, Peabody College of Vanderbilt University

An Evaluation of Alternative Strategies for Using Instructional Software to Teach Measurement Skills to Seventh Grade Science Students

Kevin C. Wise, New York University

Computer Utilization in Texas Secondary Science Classrooms

Keith L. Mitchell, The University of Texas at Austin and Texas Education Agency

Earl J. Montague, The University of Texas at Austin

# MONDAY, MARCH 31

9:45 a.m. -11:15 a.m.

Session D-11

Room 5

## TOPIC: STUDENTS' MISCONCEPTIONS IN SCIENCE

### **Moderator**

Gerald Abegg  
Boston University

### **Discussant**

Ertle Thompson  
University of Virginia

### **Papers**

Misconceptions of Some Biological Concepts by African Students and the Effect of an Instructional Intervention

Peter Akinsola Okebukola, Lagos State University

Evaluating Secondary Students' Misconceptions of Photosynthesis and Respiration in Plants using a Two-Tier Diagnostic Instrument

David F. Treagust, Western Australian Institute of Technology  
Filocha Haslam, Education Department of Western Australia

Remediation of Student-Specific Misconceptions Relating to Three Science Concepts

Alan K. Griffiths, Memorial University of Newfoundland  
Kevin Thomey, Memorial University of Newfoundland  
Bren Cooke, Memorial University of Newfoundland  
Glen Normore, Memorial University of Newfoundland

# MONDAY, MARCH 31

9:45 a.m. -11:15 a.m.

Session D-12

Room 6

## TOPIC: GOALS AND ISSUES

### **Moderator**

Roger G. Olstad  
University of Washington

### **Discussant**

Willard J. Jacobson  
Columbia University

### **Papers**

Analysis of the Project Synthesis Goal Cluster Orientation and Inquiry  
Emphasis of Elementary Science Textbooks

John R. Staver, University of Illinois at Chicago  
Mary Bay, University of Illinois at Chicago

Teachers' Conceptions of the Contemporary Goals of Science Education

William J. McIntosh, Delaware State College  
Dana L. Zeidler, Delaware State College

Venezuelan National Assessment of Science-Related Environmental Issues

Omas Campos Arredondo, Ministry of Education, Caracas  
Ronald D. Anderson, University of Colorado

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Walton, Raymond W.	D-3
Walvoord, Barbara Fassler	B-13
Warren, Janet G.	C-12
Waugh, Michael L.	D-4
Wavering, Michael J.	B-10
Waxman, Hersholt	B-16
Welch, Wayne	D-1
West, Leo	C-2
Westerback, Mary	C-8, C-5
White, Arthur L.	A-5, B-4, C-7, D-4
White, Richard T.	B-1
White, Richard B.	A-18
Wise, Kevin C.	D-10, D-4
Woodworth, George	B-9
Wright, Emmett L.	C-5
Yager, Robert E.	C-3, A-14
Yarroch, W.L.	A-12
Yeany, Russell H. Jr.	D-1, C-4, B-1, A-11
Yore, Larry	D-6, B-14
Za'Rour, George I.	B-3
Zeidler, Dana Lewis	B-12, D-12
Zoller, Uri	C-6

**FRIDAY, MARCH 28, 1986**

7:30 a.m. - 12:30 p.m.	Executive Board Meeting	Board Room
9:00 - 11:00 a.m.	Training Session A <i>Statistical Methods of Meta-Analysis: Theory and Applications</i> Larry V. Hedges, University of Chicago George Woodsworth, University of Iowa James A. Shymansky, University of Iowa	Room 1
9:00 - 11:00 a.m.	Training Session B <i>Use of Microcomputers for Laboratory Interaction and Research</i> John Layman, visiting scholar Lawrence Hall of Science	Room 2

## FRIDAY, MARCH 28, 1986

	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
1:00 - 2:30 p.m.	A-1 Symposium: <i>Secondary School Science Instructional Practices</i>	A-2 Symposium: <i>Research on Computers in Science Learning Beyond French Lick Springs</i>	A-3 Paper Set: <i>Teacher's Professional Knowledge and Conceptual Change in Students</i>	A-4 Papers: <i>Factors Influencing Student Science Achievement</i>	A-5 Papers: <i>Contexts for Science Learning</i>	A-6 Papers: <i>Surveys</i>
2:45 - 4:15 p.m.	A-7 Symposium: <i>Research on Classroom and School Environment</i>	A-8 Paper Set: <i>A Cooperative Study</i>	A-9 Papers: <i>Students' Attitudes</i>	A-10 Papers: <i>Secondary Science Teacher Education</i>	A-11 Papers: <i>Computer Applications</i>	A-12 Papers: <i>Assessments</i>
4:30 - 6:00 p.m.	A-13 Symposium: <i>Second International Science Study — A Multinational Report</i>	A-14 Symposium: <i>Focusing Pre-College Curriculum: A Discussion of Five Orientations</i>	A-15 Paper Set: <i>Process Product Studies in Middle School Science Classes</i>	A-16 Papers: <i>Logical Thinking in Science</i>	A-17 Papers: <i>Alternatives in Science Education</i>	A-18 Posters:
6:00 - 7:00 p.m.	SPECIAL SESSION: <i>"Setting A Research Agenda For Science Education: Report of a National Committee; Marcia C. Linn, Lawrence Hall of Science Marjorie Gardner, Lawrence Hall of Science James Greeno, University of California, Berkeley Alan Shoenfeld, University of California, Berkeley</i>					
7:00 - 8:30 p.m.	Program Committee	Financial Committee	Publications Committee	Policy Committee	Research Committee	Election Committee
8:30 - 10:00 p.m.	Awards Committee	JRST Editorial Board	International Committee	Committee A	Committee B	Committee C
10:00 - 10:30 p.m.	NARST Social Hour					

## SATURDAY, MARCH 29, 1986

	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
8:00 - 9:30 a.m.	B-1 Symposium: <i>Developments in Style and Purpose of Research on The Learning of Science</i>	B-2 Posters:	B-3 Papers: <i>Factors Influencing Student Science Achievement</i>	B-4 Papers: <i>Computer Applications-Concept and Skill Development</i>	B-5 Papers: <i>Science Process Skills</i>	B-6 Papers: <i>Undergraduate Science Education</i>

9:30 - 10:00 a.m.

Informal Discussion - Coffee Break

10:15 - 11:45 p.m.

General Session I: *Computer as Agents of Educational Change*  
*New Directions for Computers in Education*  
*Sueann Ambron, Apple Computer Corporation*

NARST is grateful to Delta Education, Inc. for its financial support of General Session Speakers.

	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
1:00 - 2:30 p.m.	B-7 Symposium: <i>Administration of Science Programs: A Policy Perspective</i>	B-8 Symposium: <i>The Attitude Concept: Can It Be Defined</i>	A-9 Paper Set: <i>A Study of Uncertainties in the Meta-Analysis of Research on the Effectiveness of "New" Science Curricula</i>	B-10 Papers: <i>Cognitive Development</i>	B-11 Papers: <i>Students' Concepts in Science</i>	B-12 Papers: <i>Teachers' Perceptions and Interests</i>
2:45 - 4:15 p.m.	B-13 Symposium: <i>Science and Writing — Linking Research with Classroom Models</i>	B-14 Paper Set: <i>What Research Says About Using Science Textbooks</i>	B-15 Papers: <i>Gender Related Issues in Science Education</i>	B-16 Papers: <i>Pre-Service Science Teacher Education</i>	B-17 Papers: <i>Factors Related to Computer Effectiveness</i>	B-18 Papers: <i>Science Education in Non-Traditional Settings</i>

4:30 - 6:00 p.m.

General Session II: *Demolishing the Myth of Scientific Objectivity*  
*Ian I. Mitroff, University of Southern California*

7:15 p.m.

Reception for New Members

## SUNDAY, MARCH 30, 1986

9:00 a.m.	Easter Morning Tour					
1:00 - 2:45 p.m.	NARST//RST Awards Luncheon and President's Message					
	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
3:00 - 4:30 p.m.	C-1 Symposium: <i>Exemplary Practice in Science Classrooms</i>	C-2 Symposium: <i>How Important are Different Types of Scientific Knowledge? Curriculum Implications</i>	C-3 Paper Set: <i>An Innovative Science Teacher Education Program</i>	C-4 Papers: <i>Factors Influencing Student Science Achievement</i>	C-5 Papers: <i>College Science Teaching</i>	C-6 Papers: <i>High School Science</i>
4:45 - 6:15 p.m.	C-7 Symposium: <i>Science Education Research in Latin America and the Caribbean</i>	C-8 Paper Set: <i>Systematic Representation of Biology Knowledge</i>	C-9 Papers: <i>Attitudes and Related Factors</i>	C-10 Papers: <i>Science Curriculum Implementation</i>	C-11 Papers: <i>Contexts for Science Learning</i>	C-12 Papers: <i>Factors Affecting Student Achievement</i>
6:30 - 8:00 p.m.	General Session III: <i>Change is a Process, Not an Event: The Concerns-Based Perspective Gene Hall, The University of Texas at Austin</i>					

**MONDAY, MARCH 31, 1986**

	<b>Room 1</b>	<b>Room 2</b>	<b>Room 3</b>	<b>Room 4</b>	<b>Room 5</b>	<b>Room 6</b>
8:00 - 9:30 a.m.	D-1 Symposium: <i>Qualitative Ethnographic and Structured Quantitative Data Collection: Grounded Theory versus A Priori Design: A Data Based Comparison</i>	D-2 Paper Set: <i>Implementation and Evaluation of an Exemplary Elementary Science Program</i>	D-3 Papers: <i>Cognitive Development</i>	D-4 Papers: <i>Computer Applications Simulations</i>	D-5 Papers: <i>Logical Thinking in Science</i>	D-6 Papers: <i>Science Curriculum Development</i>
9:45 - 11:15 a.m.	D-7 Symposium: <i>A Descriptive Research Strategy Assessing Computer Assisted Instruction in Science Education</i>	D-8 Outstanding NARST Paper JRST Award	D-9 Papers: <i>Science Careers - Ethnicity and Gender</i>	D-10 Papers: <i>Technology in Science Education</i>	D-11 Papers: <i>Students' Misconceptions in Science</i>	D-11 Papers: <i>Goals and Issues</i>
11:30 - 12:30 p.m.	Business Meeting					
1:00 - 3:00 p.m.	Incoming Executive Board Meeting — Board Room					