Improving science teaching through research

New Perspectives for Research in Science Teaching

60th Annual Meeting
Washington Hilton Hotel
Washington, D.C.
April 23-25, 1987
# TABLE OF CONTENTS

Program Committee ................................................................. 2
NARST Officers ........................................................................ 3
Presidents of NARST ............................................................... 4
Emeritus Members ..................................................................... 5
Local Arrangements Committee ................................................. 6
General Information ................................................................. 7
Thursday's Schedule ................................................................. 9, 10, 11
  Training Sessions ................................................................. 9
  Board Meeting ...................................................................... 12
  Papers .................................................................................. 13
  General Session .................................................................... 26
  Committee Meetings ............................................................. 27
Friday's Schedule ..................................................................... 38, 39
  Papers .................................................................................. 40
  General Session .................................................................... 54
  Papers .................................................................................. 55
  Special Anniversary Session .................................................. 39
Saturday's Schedule ................................................................. 68, 69
  Papers .................................................................................. 70
  General Session .................................................................... 85
  Awards Luncheon ................................................................... 85
  Papers .................................................................................. 86
  NARST Business Meeting ..................................................... 99
  Executive Board Meeting ....................................................... 99
List of Participants ..................................................................... 100
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1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

EXECUTIVE SECRETARY
Glenn Markle
College of Education
University of Cincinnati
Cincinnati, Ohio 45221-0002
<table>
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<td>Harry A. Carpenter</td>
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<td>1944</td>
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<td>1945</td>
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<td>Frederic B. Dutton</td>
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EDITOR, JOURNAL OF RESEARCH IN SCIENCE TEACHING

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

EDITOR, NARST NEWS

Thaddeus W. Fowler
University of Cincinnati
Cincinnati, Ohio 45221-0002

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Rodger W. Bybee
Biological Sciences Curriculum Study
Colorado College
Colorado Springs, Colorado 80903

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H. Craig Sipe
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Rollins College
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Lynn Dierking
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Columbia, MD 21044-2656

William G. Holliday
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Science Teaching Center
College Park, MD 20742

Glenn Markle
University of Cincinnati
401 Teacher's College
Cincinnati, OH 45221
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 papers 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 at 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, OH 45221-0002.
HOW NARST KEETS ITS MEMBERS INFORMED


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).
<table>
<thead>
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<th>Time</th>
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<tr>
<td>7:30 a.m. - 12:30 p.m.</td>
<td>Executive Board Meeting</td>
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| 9:00 - 11:00 a.m. | Training Session A  
Applied Multivariate Statistics  
for Science Education  
James P. Stevens  
University of Cincinnati |
| 9:00 - 11:00 a.m. | Training Session B  
Surveys in Science Education  
Iris Weiss  
Research Triangle Institute |

**Dupont**  
**Edison**  
**Farrigut**
<table>
<thead>
<tr>
<th>Time</th>
<th>Conservatory</th>
<th>Map Room</th>
<th>DuPont</th>
<th>Edison</th>
<th>Farragut</th>
<th>Grant</th>
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<tr>
<td>4:30-6:00 p.m.</td>
<td>SPECIAL SESSION: Perspectives for Research in Science Teaching: A Point of View Mary Budd Rowe, University of Florida Rodger Bybee, BSCS, Boulder, Colorado Marcia Linn, Lawrence Hall of Science Joseph Novak, Cornell University</td>
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<td>Time</td>
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<td>Committee B</td>
<td>Policy Committee</td>
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<td>International Committee</td>
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<td>7:30-8:30 p.m.</td>
<td>Program Committee</td>
<td>Financial Committee</td>
<td>Publications Committee</td>
<td>Awards Committee</td>
<td>Research Committee</td>
<td>JRST Editorial Board</td>
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<td>8:30-9:30 p.m.</td>
<td>Committee A</td>
<td>Committee B</td>
<td>Policy Committee</td>
<td>Elections Committee</td>
<td>International Committee</td>
<td>Committee C</td>
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<tr>
<td>9:30-10:30 p.m.</td>
<td>NARST</td>
<td>RECEPTION FOR NEW MEMBERS</td>
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THURSDAY, APRIL 23

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<th>7:30 a.m.</th>
<th>Executive Board Meeting</th>
<th>DuPont</th>
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<td><strong>Chairman:</strong></td>
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<tr>
<td>President</td>
<td>James P. Barufaldi, The University of Texas at Austin</td>
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<td><strong>Executive Board:</strong></td>
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<tr>
<td>President-Elect</td>
<td>Linda R. DeTure, Rollins College</td>
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<tr>
<td>Immediate Past President</td>
<td>David P. Butts, University of Georgia</td>
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<tr>
<td>Board Members</td>
<td>Patricia E. Blosser, The Ohio State University</td>
<td>Editor, Journal of Research in Science Teaching</td>
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<td>Jane Bowyer, Mills College</td>
<td>Russell H. Yeany, University of Georgia</td>
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<td>Ronald G. Good, Louisiana State University</td>
<td>Research Coordinator</td>
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<td>Michael J. Padilla, University of Georgia</td>
<td>Rodger W. Bybee, Colorado College</td>
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<td>John Staver, University of Illinois at Chicago</td>
<td>Executive Secretary</td>
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<td>Emmett L. Wright, Kansas State University</td>
<td>Glenn Markle, University of Cincinnati</td>
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<td>Mary Budd Rowe, National Science Teachers Association</td>
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THURSDAY, APRIL 23

1:00 p.m. - 2:30 p.m.  Session A-1  Conservatory

SYMPOSIUM TOPIC: KNOWLEDGE AND SKILLS OF SCIENCE TEACHERS: PERSPECTIVE FROM FOUR RESEARCH PROGRAMS

Moderator
Russell Yeany
University of Georgia

Papers
Studies of Physics Learning
  Peter W. Hewson, University of Wisconsin-Madison

Program for Complex Instruction
  Elizabeth G. Cohen, Stanford University

Lessons from Studies of Science Classwork
  Julie P. Sanford, University of Maryland

The Expert Pedagogue Study
  Donna Sabers, University of Arizona
THURSDAY, APRIL 23

1:00 p.m. - 2:30 p.m.  Session A-2  Map Room

TOPIC: VIDEODISC TECHNOLOGY

Moderator  Discussant
Donna Berlin  James Okey
The Ohio State University-Newark  University of Georgia

Papers
The Use of Video-based Technology to Develop Contextually Rich Instruction in Science
  Robert Sherwood, Peabody College of Vanderbilt University

The Influence of Interactive Videodisc Simulations on Student Achievement in an Introductory College Chemistry Course
  Michael L. Waugh, University of Illinois

A Comparison of Student Performance by Interactive Videodisc Versus Conventional Laboratory
  William H. Leonard, Clemson University
THURSDAY, APRIL 23

1:00 p.m. - 2:30 p.m.  
Session A-3  
DuPont

PAPER SET: KNOWLEDGE ORGANIZATION IN SOLVING PHYSICS PROBLEMS

Moderator  
John W. Renner  
University of Oklahoma

Discussant  
Arthur L. White  
The Ohio State University

Papers

Knowledge Organization and Representation in Solving Physics Problems  
George J. Pallrand, Rutgers - The State University of New Jersey

A Processing Approach to Knowledge Organization  
Alan W. Naimoli, Rutgers Graduate School of Education

Mental Models in Qualitative Representation  
Daulat N. Husain, Rutgers - The State University of New Jersey

Knowledge Structures in Problem Solving  
Frank A. Gagliardi, Rutgers - The State University of New Jersey
THURSDAY, APRIL 23

1:00 p.m. - 2:30 p.m.  
Session A-4  
Edison

TOPIC: COGNITIVE LEARNING

Moderator  
Robert Shrigley  
Pennsylvania State University

Discussant  
Joseph D. Novak  
Cornell University

Papers

Interaction of Curiosity and Verbal Fluency with Learning Biologic Concepts Presented Inductively and Deductively  
John J. Koran, Jr., University of Florida  
Mary Lou Koran, University of Florida  
John S. Foster, University of Florida

Elaborations: Differences in Metacognitive Behavior of Successful and Less Successful Science Students in Trinidad  
Lucy Durgadeen, Ministry of Education, Trinidad and Tobago

The Effect Of Verbal and Visual Modes of Presentation on Childrens' Retention of Images and Words  
Ann C. Howe, North Carolina State University  
Ellen Vasu, North Carolina State University

Effects of Analogy Induced Schema in New Domain Learning  
Kenneth German, University of Nebraska  
Donald W. McCurdy, University of Nebraska
### Session A-5

**TOPIC: ATTITUDES AND CAREERS**

<table>
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<tr>
<th>Moderator</th>
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<tr>
<td>Frances Lawrenz</td>
<td>C. Thomas Gooding</td>
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<td>University of Minnesota</td>
<td>State University of NY at Oswego</td>
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**Papers**

The Relationship Between Attitude Toward Science, Science Self-Concept and Several Variables of Occupational Choice to the Science Career Choice of Black College Students

- Charles Robert Salters, Morgan State University
- David J. Lockard, University of Maryland

Student Attitudes Toward Science and Science-related Careers: An Investigation of the Efficacy of a High School Biology Teacher's Intervention Program

- Cheryl L. Mason, Purdue University
- Jane Butler Kahle, University of Northern Colorado

Gender Inequity Cycle-The Math Connection

- James Campbell, St. John's University
- Jeanne Pizzo, N.Y. Public Schools, Dist. 24
- Francine Mandel, St. John's University
THURSDAY, APRIL 23

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

Session A-6

Grant

TOPIC: TEACHING STRATEGIES

Moderator  
Lynn Talton  
State Dept. of Education  
Columbia, South Carolina

Discussant  
Bill Capie  
University of Georgia

Papers

The Effects of Hands-on and Teacher Demonstration Laboratory Methods on Science Achievement in Relation to Reasoning Ability and Prior Knowledge  
George E. Glasson, Indiana University

Student Reactions and Feelings Toward Testing and Test Feedback in an Introductory Biology Course  
D. Daryl Adams, University of Georgia

The Effect of Varied Strategies Training on Classroom Lesson Planning Skills  
Virginia Carol Demchik, Jefferson Country Schools, W. Virginia  
Dennis W. Sunal, West Virginia University
THURSDAY, APRIL 23

2:45 p.m. - 4:15 p.m.  Session A-7  Conservatory

SYMPOSIUM TOPIC: CONTENT ANALYSIS OF SCIENCE TEXT

Moderator
William Holliday
University of Maryland

Discussant
Ron Good
Louisiana State University

Papers
Quantitative Structural Analysis of Science Textbooks
  O. Roger Anderson, Columbia University
  Steven Botticelli, Columbia University

Are Science Textbooks Considerate?
  Bonnie Armbruster, University of Illinois

Analysis of Text-Related Science Instructional Materials
  Robert Evans, Wake Forest University

Teacher Use of Science Textbooks
  Larry Yore, University of Victoria
2:45 p.m. - 4:15 p.m. Session A-8 Map Room

PAPER SET: CURRICULAR CHANGES RELATED TO S.T.S.

Moderator
Peter Mecca
Pennsylvania State University

Discussant
Rodger Bybee
Colorado College

Papers

An Ethnographic Study of Curricular Change: High School Chemistry with an Applied and Societal Orientation
Ronald D. Anderson, University of Colorado

Five Critical Factors to Consider in the Development and Implementation of Science-Technology-Society Curriculum from the Perspective of Selected Junior High School Science Teachers
Carole P. Mitchener, University of Missouri - St. Louis

Global Science, an STS Curriculum: A Naturalistic Perspective
MaryAnn Varanka, University of Colorado - Boulder
THURSDAY, APRIL 23

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

Session A-9  

DuPont

PAPER SET: PROBLEM SOLVING IN CHEMISTRY

Moderator  
Henry Heikkinen  
University of Northern Colorado

Discussant  
Dorothy Gabel  
Indiana University

Papers

Qualitative Equilibrium Problem Solving: College Student Conceptions  
Gregory L. Crosby, University of Maryland

The Real Difficulty in Limiting Reagent Problems  
Jean Lythcott, University of Wisconsin - Madison

An Analysis of Problem Solving Processes Used In College Chemistry Quantitative Equilibrium Problems  
Barbara A. Gage, Prince George's Community College, Maryland

An Analysis of Student's Conceptions of Pressure Related Gas Behavior  
Anasuya Swamy, Morgan State University  
Henry Heikkinen, University of Northern Colorado
SESSION A-10  

Topic: THE SCIENCE TEACHER

Moderator  
Patricia R. Swift  
State University of NY at Oswego

Discussant  
Joseph Riley  
University of Georgia

Papers

What Does It Mean To Be An Exemplary Science Teacher?  
Kenneth Tobin, Florida State University  
Barry J. Fraser, Western Australian Institute of Technology

Factors That Influence Rural Science Teachers as Leaders of District Improvement Projects  
Gail Shroyer, Kansas State University  
Larry Enochs, Kansas State University

An Analysis of Factors Encouraging Creative Teachers to Leave The Classroom  
Barbara Spector, University of South Florida
TOPIC: ATTITUDES AND PERCEPTIONS

Moderator
Dennis Showers
State University at Geneseo, NY

Papers
Affective Influences on Commitment to Science: A Longitudinal Study
  J. Steve Oliver, Kansas State University
  Ronald D. Simpson, The University of Georgia

Affective Influences on Achievement in Science: A Longitudinal Study
  Ronald D. Simpson, The University of Georgia
  J. Steve Oliver, Kansas State University

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

continued next page...
2:45 p.m. - 4:15 p.m.  

Transaction Analysis of the Person-Environmental Interactions in High School Biology and Chemistry Classes Over the Course of a School Year  
C. Thomas Gooding, State University of New York at Oswego  
Robert E. Schell, State University of New York at Oswego  
J. Nathan Swift, State University of New York at Oswego  
James H. McCroskery, State University of New York at Oswego  
Patricia R. Swift, State University of New York at Oswego  

Eco-Cultural Influences Upon Students Concept Attainment in Science  
Peter Akinsola Okebukola, Lagos State University  
Jegede, Olugbemiro J., Ahmadu Bello University, Zaria
THURSDAY, APRIL 23

2:45 p.m. - 4:15 p.m.  
Session A-12

TOPIC: LEARNING IN INFORMAL SETTINGS

Moderator
Mary Lou Koran
University of Florida

Discussant
Lynn DiRerking
Howard Chamber of Commerce, Maryland

Papers
The Use of Take Home Kits For Increasing Scientific Literacy in Families
   Eugene D. Gennaro, University of Minnesota
   Elsie A. Rivard, University of Minnesota

Interaction of Cues, Learner Curiosity, Verbal Ability, And Amount of Invested Mental Effort with Achievement in a Museum Setting
   Helma M. Fire, Miami-Dade Community College, Florida
   John J. Koran, Jr., University of Florida
   Mary Lou Koran, University of Florida

A Cross Cultural Analysis of Student Understanding of Marine Science and Natural Resource Concepts Related to the Gulf of Maine
   Susan Stillwell, University of Maine
   Michael J. Brody, University of Maine
### THURSDAY, APRIL 23

<table>
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<th>4:30 p.m. - 6:00 p.m.</th>
<th>General Session I</th>
<th>Georgetown</th>
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**Moderator**
Carl Berger  
University of Michigan

**Speakers**
- Mary Budd Rowe, University of Florida  
- Rodger Bybee, BSCS, Colorado College  
- Marcia Linn, Lawrence Hall of Science, University of California-Berkeley  
- Joseph D. Novak, Cornell University

**Topic**
Perspectives for Research in Science Teaching: Point of View
THURSDAY, APRIL 23

7:30 p.m. - 8:30 p.m.

Program Committee

Chairman:
Linda R. DeTure, Rollins College

Members:
F. Gerald Dillashaw, Bradley University
Thomas R. Koballa, Jr., The University of Texas at Austin
Joseph P. Riley, University of Georgia
Linda Crow, Houston Community College System
Joel E. Bass, Sam Houston State University
Robert L. Shrigley, The Pennsylvania State University
Rodger W. Bybee, Colorado College
Glenn Markle, University of Cincinnati

Conservatory
THURSDAY, APRIL 23

7:30 p.m. - 8:30 p.m.  Financial Committee

Chairman:
John Staver, University of Illinois at Chicago

Members:
Carl Berger, University of Michigan
Ertle Thompson, University of Virginia
Emmett L. Wright, Kansas State University
William G. Holliday, The University of Maryland
Glenn Markle, University of Cincinnati

Map Room
**THURSDAY, APRIL 23**

**7:30 p.m. - 8:30 p.m.**

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<tr>
<td><strong>Members:</strong></td>
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<td>William H. Leonard, Louisiana State University</td>
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<td>Dan L. McKenzie, University of South Carolina</td>
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<td>Charles W. Anderson, Michigan State University</td>
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<tr>
<td>Russell Yeany, The University of Georgia</td>
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THURSDAY, APRIL 23

7:30 p.m. - 8:30 p.m.

Awards Committees

Chairman: (Steering)
Michael J. Padilla, University of Georgia

Members:
Patricia E. Blosser, The Ohio State University
Richard R. Tolman, Brigham Young University
Frank E. Crawley, The University of Texas at Austin
Joy S. Lindbeck, University of Akron
Peter A. Rubba, Jr., Pennsylvania State University
John R. Staver, University of Illinois at Chicago
Glenn Markle, University of Cincinnati

Chairman: (JRST Award)
John R. Staver, University of Illinois at Chicago

Members:
Earl J. Montague, The University of Texas at Austin
Piyush Swami, University of Cincinnati
Eugene L. Chiapetta, University of Houston
Claudia B. Douglass, Central Michigan University
Willis J. Horak, University of Arizona
Julia V. Clark, Texas A&M University
Joy S. Lindbeck, University of Akron
Pat Obenauf, West Virginia University
Donald R. Daugs, Utah State University
Lynn Talton, South Carolina Department of Education

continued next page...
7:30 p.m. - 8:30 p.m.  

Awards Committees Continued  

Edison

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<th>7:30 p.m. - 8:30 p.m.</th>
<th>Awards Committees Continued</th>
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**Chairman:** (NARST Awards)  
Patricia E. Blosser, The Ohio State University

**Members:**  
Rodney L. Doran, SUNY at Buffalo  
Mary M. Atwater, Atlanta University  
Lowell J. Bethel, The University of Texas at Austin  
Ron Bonnstetter, University of Nebraska  
William B. McIlwaine, Millersville State College  
Peter A. Ruba, Jr., Pennsylvania State University  
Mary Westerback, C.W. Post College  
Richard L. Williams, University of Victoria, Canada
### THURSDAY, APRIL 23

<table>
<thead>
<tr>
<th>7:30 p.m. - 8:30 p.m.</th>
<th>Research Committee</th>
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<td><strong>Chairman:</strong></td>
<td>Rodger Bybee, Colorado College</td>
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<td><strong>Members:</strong></td>
<td>Jane Bowyer, Mills College</td>
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<td>Thomas R. Koballa, Jr., The University of Texas at Austin</td>
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<td>Joseph D. Novak, Cornell University</td>
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<td>Glenn Markle, University of Cincinnati</td>
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THURSDAY, APRIL 23

7:30 p.m. - 8:30 p.m.

JRST Editorial Board

Editor:
Russell H. Yeany, Jr., The University of Georgia

Associate Editor:
Joseph P. Riley II, The University of Georgia

Members:
Marianne B. Betkouski, University of North Florida
William Capie, University of Georgia
Linda W. Crow, Houston Community College System
George Deboer, Colgate University
Rosalind Driver, University of Leeds
Richard A. Duschl, University of Houston
Barry J. Fraser, Western Australia Institute of Technology
Ronald G. Good, Louisiana State University
Willis Horak, University of Arizona
Thomas R. Koballa, Jr., University of Texas at Austin
William C. Kyle, Jr., University of Connecticut
Victor J. Mayer, Ohio State University
Antonio Mendez, University of Puerto Rico
Douglas A. Roberts, University of Calgary

continued next page...
Peter A. Rubba, Pennsylvania State University
Robert D. Sherwood, Peabody College
Doris A. Simonis, University of Montana
Barbara Spector, University of South Florida
Barbara Strawitz, Louisiana State University
Pinchas Tamir, Hebrew University
Kenneth Tobin, Florida State University
Euwe Van Den Berg, Sat Ya Wacana Christian University
Victor L. Willson, Texas A&M University
Emmett L. Wright, Kansas State University
Dana L. Zeidler, Delaware State College
<table>
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<tr>
<th>Time</th>
<th>Event</th>
<th>Chairman</th>
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</table>
| 8:30 p.m. | Policy Committee                          | David P. Butts, University of Georgia | James P. Barufaldi, The University of Texas at Austin  
|            |                                            |                                   | Burton E. Voss, University of Michigan  
|            |                                            |                                   | Ann C. Howe, North Carolina State University  
|            |                                            |                                   | Glenn Markle, University of Cincinnati |
**THURSDAY, APRIL 23**

<table>
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<tr>
<th>8:30 p.m. - 9:30 p.m.</th>
<th>Election Committee</th>
<th>Edison</th>
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**Chairman:**
David P. Butts, University of Georgia

**Members:**
Ronald D. Anderson, University of Colorado
Lowell J. Bethel, The University of Texas at Austin
THURSDAY, APRIL 23

8:30 p.m. - 9:30 p.m.

International Committee

Farragut

Chairman:
Glen Aikenhead, University of Saskatchewan

Members:
Pamela Fraser-Abder, University of the West Indies
Barry Fraser, Western Australia Institute of Technology
Karl Krey, Institute for Science Education, Germany
Arthur White, The Ohio State University
John E. Penick, University of Iowa
Deyanira R. Barnett, Republic De Panama
## FRIDAY, APRIL 24, 1987

<table>
<thead>
<tr>
<th>Time</th>
<th>Conservatory</th>
<th>Map Room</th>
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<td>7:30-8:00 a.m.</td>
<td><strong>INFORMAL DISCUSSION WITH COFFEE</strong></td>
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<td>11:30-1:00 p.m.</td>
<td>GEORGETOWN</td>
<td>General Session II: Gene V. Glass</td>
<td>Arizona State University</td>
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## FRIDAY, APRIL 24, 1987

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<td>1:00-2:30 p.m.</td>
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<td>6:00 p.m.</td>
<td>SPECIAL ANNIVERSARY SESSION (60TH) NARST SOCIAL</td>
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FRIDAY, APRIL 24

8:00 - 9:30 A.M.  Session B-1  Conservatory

SYMPOSIUM TOPIC: TEACHING FOR HIGHER COGNITIVE LEVEL LEARNING IN HIGH SCHOOL SCIENCE

Moderator
James G. Gallager
Michigan State University

Presentors
Kenneth Tobin, Florida State University
Jane Kahle, University of Northern Colorado
Maggie Gremlı, Western Australian Institute of Technology
Barry Fraser, Western Australian Institute of Technology
FRIDAY, APRIL 24

8:00 - 9:30 A.M.  Session B-2  Map Room

SYMPOSIUM TOPIC: SCIENCE LEARNING IN MUSEUMS AND OTHER INFORMAL SETTINGS

Moderator
Roger G. Olstad
University of Washington

Presenters
A Theoretical Framework for Exploring Research in Museum Education
  Mary Lou Koran, University of Florida
  John J. Koran, Jr., University of Florida

The Roles of Attention and Curiosity in Museum Learning
  John J. Koran, Jr., University of Florida
  Mary Lou Koran, University of Florida

Families in Free Choice Learning Settings: Possible Cognitive Research Ideas Exploring Attention, Curiosity and Level of Information Exchange
  Lynn D. Dierking, Howard Chamber of Commerce, Columbia, Maryland
  John J. Koran, Jr., University of Florida
  Mary Lou Koran, University of Florida
  James Algina, University of Florida
  John Falk, Smithsonian Institution

continued next page...
Toward an Understanding of Perceptions of and Behavior in Museums and Zoos
Stephen Bitgood, Jacksonville State University

An Analysis of the Verbal and Postural Communication of Zoo Visitors
Steven Hage, Minnesota Zoological Gardens, Apple Valley, Minnesota
Eugene Gennaro, University of Minnesota
FRIDAY, APRIL 24

8:00 - 9:30 A.M. Session B-3 DuPont

PAPER SET: CONCEPTUAL UNDERSTANDINGS AND MISUNDERSTANDINGS OF EIGHTH GRADE STUDENTS OF SELECTED CONCEPTS IN BIOLOGY, CHEMISTRY, PHYSICS

Moderator
Protima Roy
Drury College

Discussant
Anton E. Lawson
Arizona State University

Presentors
John W. Renner, University of Oklahoma
Edmund A. Marek, University of Oklahoma
Eileen B. Grzybowski, Senior High School, Norman, OK
Michael R. Abraham, University of Oklahoma
TOPIC: LEARNING SCIENCE PROCESS SKILLS

Moderator
Juan M. Esquivel
Universidad de Costa Rica

Discussant
Linda Cronin
University of Florida

Papers
Development and Evaluation of a Program for Learning Science Process Skills in Biology
Paul J. Germann, Madawaska High School, Madawaska, Maine

The Learning of Process Skills from Programmed Instruction: Effects of Review
Barbara M. Strawitz, Louisiana State University

Improving Integrated Process Skills in Preservice Elementary Teachers
Richard Duschl, University of Houston
Terry Contant, University of Houston
TOPIC: FACTORS RELATED TO GENDER DIFFERENCES

Moderator
James R. Campbell
St. John's University

Discussant
Dale R. Baker
University of Utah

Papers
Gender Differences in High School Science in Israel
   Pinchas Tamir, Hebrew University, Israel

A Study of Science and Mathematics Education Equity
   Emmett L. Wright, Kansas State University
   Nancy Smith, Kansas State University

A Profile Differentiating Female College Science Majors: A Predictor Set of Variables
   Kathleen G. Sparrow, Akron City Schools, Akron, Ohio
TOPIC: PROBLEM SOLVING IN GENETICS

Moderator
Joy S. Lindbeck
University of Akron

Discussant
Fred N. Finley
University of Minnesota

Papers

The Relationship of Problem Solving Abilities in Genetics to Encoding and Combining Propositions Concerning Disjunctive Reasoning
Sandra J. Costello, Rutgers, The Graduate School of Education

A Description of the Performance of Experts Solving Realistic Genetics Problems
Angelo Collins, Kansas State University
James H. Stewart, University of Wisconsin-Madison

Studying Learners' Problem Solving Strategies and Rationales During a Computer Simulation
Patricia Simmons, The University of Iowa
FRIDAY, APRIL 24

9:45 - 11:15 A.M.  
Session B-7  
Conservatory

SYMPOSIUM TOPIC: NSF/NSTA HIGH SCHOOL CHAUTAUQUA EVALUATION

Moderator
David P. Butts
University of Georgia

Papers

Problem and Advantages of a Large-Scale External Research/Evaluation Agenda on a Nationally Implemented Project: The NSF/NSTA High School Chautauqua Evaluation
Russell H. Yeany, University of Georgia

Overview of the NSTA Chautauqua Short-Course Program: An Example of a Large-Scale, Multiple-Site Science Education Program
John Fowler, National Science Teachers Association, Washington, DC

Evaluation Plan for the Chautauqua Program and Results
Elisabeth Charron, University of Georgia
Hsiao-lin Tuan, University of Georgia

Can Remote Assessment of Large-Scale, Multiple-Site Programs be Meaningful?: The Advantages, the Real World Problems and the Solutions
Elisabeth Charron, University of Georgia

External Evaluation from the Project Director's Point of View
Carolyn Hampton, East Carolina University
Kenneth R. Mechling, Clarion University
TOPIC: TEACHING WITH MICROCOMPUTERS

Moderator
Eugene D. Gennaro
University of Minnesota

Discussant
Gerald Dillashaw
Bradley University

Papers
A Synthesis of Research on the Effects of Teaching Science with Microcomputers
Kevin C. Wise, Southern Illinois University

Teacher Behavior in Whole Class, Computer-Mediated Instruction
Theodore Kellogg, University of Rhode Island
Carol Leonard, Lemon Bay H.S., Englewood, FL

ENLIST - Micros: Training Science Teachers to Utilize Microcomputers
William E. Baird, Auburn University
James Ellis, BSCS - The Colorado College
Paul J. Kuerbis, BSCS - The Colorado College

The Use of Concrete, Manipulative Materials and Computer Simulations for Learning Elementary School Science Process Skills in Trinidad and Tobago
Donna F. Berlin, The Ohio State University at Newark
Arthur L. White, The Ohio State University at Newark
Pamela Fraser-Abder, The University of West Indies
TOPIC: COGNITIVE DEVELOPMENT IN BIOLOGY

Moderator
Michael Abraham
University of Oklahoma

Discussant
William H. Leonard
Clemson College

Papers
Analysis of Selected Cognitive Abilities and Other Factors Associated with Achievement in a Biology Preparatory Course and Beyond at an Urban Community College
Carol Biermann, Kingsborough Community College
Gary Sarinsky, Kingsborough Community College

Studies on Cognitive Development in a Non-Majors Investigative General Biology Laboratory
Alan R.P. Journet, Southeast Missouri State University
Cindy Young, Southeast Missouri State University
C. Michael Stanley, Southeast Missouri State University
John S. Scheibe, Southeast Missouri State University

continued next page...
The Effects of Science Literacy Course on Subsequent Learning in Biology
  Dale R. Baker, University of Utah
  Michael Piburn, Westminster College of Salt Lake City

Correlates with Student Performance in General Biology Lecture and Laboratory Courses
  Patricia McDaniel, Southeast Missouri State University
  Alan R.P. Journet, Southeast Missouri State University
TOPIC: UNDERSTANDING TEXT AND CURRICULAR MATERIALS

Moderator
Julie P. Sanford
University of Maryland

Discussant
Larry D. Yore
University of Victoria

Papers
The Effects of Training and Use of Specially Designed Curriculum Materials on Conceptual Change Teaching and Learning
Edward L. Smith, Michigan State University
Charles W. Anderson, Michigan State University

Reducing Reading Assignments to Focus Attention on Selected Science Concepts
Ann Benbow, University of Maryland
William G. Holliday, University of Maryland
Thomas O'Brien, University of Maryland
Chris Clermont, University of Maryland
Judith Phillippides, University of Maryland
Russell Wright, University of Maryland
Elizabeth Wharton, University of Maryland

The Effects of Prior Knowledge on Science Text Comprehension
Fred N. Finley, University of Minnesota
FRIDAY, APRIL 24

9:45 - 11:15 A.M.  Session B-11  Farragut

PAPER SET: FACTORS RELATED TO INFORMATION PROCESSING

Moderator  Discussant
Mary Westerbach  Betty L. Bitner
C.W. Post College  Southwest Missouri State University

Papers
Research Basis for a Model of Problem Solving in Science
   Ron Good, Louisiana State University

Relating Formal and Physical Knowledge
   Warren Wollman, University of Rochester

The Effects of Teaching Logical Reasoning Upon Students’ Formal Reasoning and Science Achievement
   Linda W. Crow, Houston Community College System

An Analysis of Selected Topics in High School Chemistry from a Cognitive Development Perspective
   Stephen R. Rumsey, Acton-Boxborough Regional High School, Acton, Maine
TOPIC: WAIT TIME AND QUESTIONING TECHNIQUES

Moderator
Pinchas Tamir
Hebrew University of Jerusalem

Discussant
Kenneth Tobin
Florida State University

Papers
Interaction of Ability with Wait Time and Supportive Intervention in Biology and Chemistry Achievement
J. Nathan Swift, State University of New York at Oswego
James H. McCroskery, State University of New York at Oswego
C. Thomas Gooding, State University of New York at Oswego
Robert E. Schell, State University of New York at Oswego
Patricia R. Swift, State University of New York at Oswego

The Effect of Questioning Techniques, Wait Time, and Verbal Quizzes on the Achievement of Students in Lab Based General Biology
Michael J. Demchik, Jefferson High School, West Virginia

Mind Games: A Study of Hypothetical Questioning in a Science Classroom
Ann E. Haley-Oliphant, University of Cincinnati
Moderator:
Russell H. Yeany
University of Georgia

Speaker:
Gene V. Glass
College of Education
Arizona State University

Topic:
An Assessment of the Current Status of Meta-Analysis
FRIDAY, APRIL 24

2:30 - 4:00 P.M.  Session B-13  Conservatory

SYMPOSIUM TOPIC: GRADUATE PROGRAMS IN SCIENCE EDUCATION: THE YEAR 2000 AND BEYOND

Moderator
John J. Koran, Jr.
University of Florida

Presenters
James P. Barufaldi, The University of Texas at Austin
Frank E. Crawley, The University of Texas at Austin
James A. Shymansky, University of Iowa
William G. Holliday, University of Maryland
Russell H. Yeany, University of Georgia
FRIDAY, APRIL 24

2:30 - 4:00 P.M.  Session B-14  Map Room

SYMPOSIUM TOPIC: A REVIEW OF MEMORY SYSTEMS AND IMPLICATIONS FOR RESEARCH INTO STUDENT QUESTIONING BEHAVIOR IN A SCIENCE SETTING

Moderator
Ann Howe
North Carolina State University

Presenters
Marianne B. Betkouski, University of North Florida
Kathy Conklin, Bishop Kenney High School, Jacksonville, Florida
Lehman Barnes, Florida State University
FRIDAY, APRIL 24

2:30 - 4:00 P.M.  Session B-15  DuPont

TOPIC: INSERVICE EDUCATION

Moderator
Thomas Gadsden, Jr.
Richardson Independent School District, Texas

Discussant
Hans O. Anderson
Indiana University

Papers
An Exploratory, Concerns-Based Field Study of a Two-Week, Summer Inservice Program to Increase Science Teachers' Use of Chemical Demonstrations
Thomas P. O'Brien, The University of Maryland
Henry Heikkinen, University of Northern Colorado

Improvement of Science Teaching of Native American Elementary Students Through Staff Development: An Ethnographic Study
Debroah R. First, Pennsylvania State University

A Case Study of a K-3 Science Workshop
Lloyd H. Barrow, University of Missouri-Columbia
Stuart Palonsky, University of Missouri-Columbia
TOPIC: SCIENCE TEXTBOOKS

Moderator
Donald W. McCurdy
University of Nebraska

Discussant
Ronald G. Good
Louisiana State University

Papers

Assertions and Assumptions in School Science Textbooks
   Geoff Giddings, Western Australian Institute of Technology

A Preliminary Exploration of Grade Five Students’ Science Achievement and Ability to Read Science Textbooks as a Function of Gender, Reading Vocabulary, and Reading Comprehension
   Larry Yore, University of Victoria, Canada

A Reappraisal of Science Vocabulary Load Presented in Secondary Science Textbooks
   Fred H. Groves, University of Colorado - Boulder
FRIDAY, APRIL 24

2:30 - 4:00 P.M.  

Session B-17  
Farragut

TOPIC: ATTITUDES TOWARD SCIENCE

Moderator  
Ronald D. Simpson  
University of Georgia

Discussant  
Piyush Swami  
University of Cincinnati

Papers

Designing the Nuclear Energy Attitude Scale  
Lawrence Calhoun, Slippery Rock University  
Robert Shrigley, The Pennsylvania State University  
Dennis Showers, State University at Geneseo

Credible Communications and Persuading Girls to Take Elective Science Courses in High School  
Thomas R. Koballa, Jr., The University of Texas at Austin

Costa Rican Teachers' Attitude Toward Science and Teaching and its Relationship to Selected Variables  
Juan Manuel Esquivel Alfaro, Universidad De Costa Rica

A Comparison of Oral and Written Channels of Persuasive Communication in Change of Attitudes Toward Teaching Science in the Elementary School  
Susan C. Demers, Pennsylvania State University
TOPIC: CONCERNS OF TEACHERS

Moderator
Ronald J. Bonsetter
University of Nebraska

Discussant
Barbara Spector
University of South Florida

Papers
Follow-up Study of the Concerns of Texas Science Teachers About the Forty Percent Lab Time Rule
Robert K. James, Texas A&M University

Performance-Based Instructions and Testing as a Constraint in Learning Science
Terry L. Wood, Purdue University

Science and Mathematics Education Leadership Program: A Case Study
Michael J. Brody, University of Maine
Warren Tomkiewicz, University of Maine

The Pennsylvania Science Teaching Needs Assessment and its Implications for Science Educators
David B. Klindienst, Pennsylvania State University
Peter M. Mecca, Pennsylvania State University
H. Seymour Fowler, Pennsylvania State University
SYMPOSIUM TOPIC: SECONDARY SCHOOL SCIENCE TEACHERS

Moderator
Lloyd Barrow
University of Missouri - Columbia

Papers
Secondary Science Teachers' Perceptions of their Own Classroom Performance
  James Gallagher, Michigan State University
  David Cline, Michigan State University

A Change in the Science Curriculum: Students' Needs or Teachers' Ease?
  David A. Cline, Michigan State University

Continuing Professional Development Activities of Secondary School Science Teachers
  Okhee Lee, Michigan State University
  James Gallagher, Michigan State University

Differential Treatment of Students by Middle School Science Teachers: Unintended Cultural Bias
  Armando Contreras, Michigan State University
  Okhee Lee, Michigan State University

continued next page...
An Ethnographic Study of High School Physics Laboratory Experiments
Ribhi Abu-Isneieh, Michigan State University
Amandro Contreras, Michigan State University
SYMPOSIUM TOPIC: A TECHNOLOGY FOR OPERATIONALIZING SCIENCE OBJECTIVES FOR SCIENCE ASSESSMENT

Moderator
James A. Shymansky
University of Iowa

Discussant
Russell Yeany
University of Georgia

Presentors
Jeanne Miyasaka, SC Department of Education
E. Lynn Talton, SC Department of Education
L. Lynne Mappus, SC Department of Education
Gayle Killian, SC Department of Education
FRIDAY, APRIL 24

4:15 - 5:45 P.M.  Session B-21

TOPIC: SCIENCE CURRICULUM IMPLEMENTATION

Moderator
Essie Beck
Jefferson Parrish School Board
Greta, LA

Discussant
David J. Lockard
University of Maryland

Papers
Factors Influencing the Success of Science Curriculum Implementation in Middle Schools
  Linda L. Cronin, University of Florida
  Michael J. Padilla, University of Georgia
  Kenneth Tobin, Florida State University

A Process Approach to Improved Science Instruction: Preliminary Findings at the Elementary Level
  David L. Haury, Tufts University

An Analysis of Parent, Student and Teacher Evaluation of an Elementary Process—Approach Curriculum
  Pamela Fraser-Abder, The University of the West Indies
TOPIC: CREATIVE PROBLEM SOLVING

Moderator
Eugene L. Chiapetta
University of Houston

Discussant
Marianne B. Betkouski
University of North Florida

Papers
Effect of Surface Structure and Deep Structure on Novice Rules of Physics
  David P. Maloney, Creighton University

An Investigation of the Application of Training in Creative Problem Solving to Scientific Problems
  Bonnie Cramond, Southeastern Louisiana University
  Edward L. Shaw, Southeastern Louisiana University

Improving Problem Solving in a Statewide Physics Program
  Maria Varella, University of Rochester
  Warren Wollman, University of Rochester

Measuring Conceptual Understanding in Introductory Physics
  William C. Robertson, Colorado College
FRIDAY, APRIL 24

4:15 - 5:45 P.M.  
Session B-23  
Farragut

TOPIC: CLASSROOM ENVIRONMENT

**Moderator**  
J. Nathan Swift  
State University of NY at Oswego

**Discussant**  
Barry J. Fraser  
Western Australia Institute of Technology

**Papers**

- Modeling Science Classroom Environments with Large Scale Survey Data: An Analysis of the IEA Ninth Grade Sample  
  Michael A. Dryden, Arizona State University

- Science Education for Native Americans: School Environments  
  Frances Lawrenz, University of Minnesota  
  Heather McCreath, Arizona State University

- Interaction Between Examination Type, Anxiety State, and Academic Achievement in College Science  
  Uri Zoller, Haifa University-Oranim, Israel  
  D. Ben-Chaim, Haifa University-Oranim, Israel
TOPIC: PRESERVICE EDUCATION

Moderator
Barbara Strawitz
Louisiana State University

Discussant
Burton E. Voss
University of Michigan

Papers
Predictive Validity of GPA, CAT and NTE Specialty Tests on Scores of a Performance Based Student Teaching Evaluation Instrument
Roger G. Olstad, University of Washington
Andrea V. Marrett, University of Washington

A Comparative Analysis of NOSS Profiles on Nigerian and American Pre-Service, Secondary Science Teachers
William W. Cobern, Austin College

Influencing Preservice Elementary Teachers' Views of Science Through Films
Betty Crocker, Southern Oregon State College
Joseph P. Riley, II, University of Georgia
<table>
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<td>8:00-9:30 a.m.</td>
<td>C-1 Symposium: Microcomputer Based Laboratories</td>
<td>C-2 Symposium: Issues in Teacher Evaluations</td>
<td>C-3 Papers: Misconceptions in Science</td>
<td>C-4 Papers: Teaching Science for Conceptual Changes in Primary Grades</td>
<td>C-5 Papers: Science, Technology Society</td>
<td>C-6 Papers: Problem Solving Chemistry</td>
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<td>9:30-10:00 a.m.</td>
<td>INFORMAL DISCUSSION WITH COFFEE</td>
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<td>10:00-11:00 a.m.</td>
<td>C-7 Posters:</td>
<td>C-8 Posters:</td>
<td>C-9 SPECIAL SESSION: Position Papers</td>
<td>C-10: Research Workshop</td>
<td>C-11: Report from National Conf Tech &amp; Teach Ed</td>
<td>C-12: Informal discussion with the President</td>
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<td>11:15-12:15 p.m.</td>
<td>General Session III</td>
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<td>GEORGETOWN Ray Hannapel — National Science Foundation</td>
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<td>12:30-2:15 p.m.</td>
<td>AWARD LUNCHEON Presidential Address</td>
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<td>6:00-6:30 p.m.</td>
<td>NARST BUSINESS MEETING</td>
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</table>
**SATUREDAY, APRIL 25**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 - 9:30 A.M.</td>
<td>C-1</td>
<td>Conservatory</td>
</tr>
</tbody>
</table>

**SYMPOSIUM TOPIC: MICROCOMPUTER BASED LABORATORIES**

**Moderator**
Marcia C. Linn
University of California - Berkeley

**Papers**

- Microcomputer-based Laboratories: Theory into Practice
  Joanne S. Stein, University of California - Berkeley

- Fostering Scientific Reasoning Skills as a Consequence of Using MBL
  Yael Friedler, University of California - Berkeley
  Rafi Nachmias, University of California - Berkeley

- Microcomputer-based Laboratories: Questions and Consequences for Teachers
  John Layman, University of Maryland

- The Use and Impact of MBL as a Function of Learner Characteristics
  Jancie R. Mokros, Technical Education Research Centers, MA
  Deborah L. Levine, Technical Education Research Centers, MA

*continued next page*...
8:00 - 9:30 A.M.

Session C-1 Continued

Conservatory

Students' Perspective on the Validity of Computer-presented Graphs in an MBL Environment
Rafi Nachmias, University of California - Berkeley
Yael Friedler, University of California - Berkeley

The Computer as Lab Partner Project: Students' Subject-matter Achievements
Joanne Stein, University of California - Berkeley
Rafi Nachmias, University of California - Berkeley
SATURDAY, APRIL 25

8:00 - 9:30 A.M. Session C-2 Map Room

SYMPOSIUM TOPIC: ISSUES IN TEACHER EVALUATIONS

Moderator
Joseph S. Krajcik
University of Maryland

Papers
Issues in Teacher Evaluation: Examples from Science Teachers
  William Capie, University of Georgia

A Comparison Between Quantitative and Qualitative Data: Implications for Teacher Evaluation
  Pamela Sloan, University of Georgia

The Relationship Between Experienced Teacher Planning and the Quality of Instruction: Implications for Teacher Evaluation
  Chao Ti Hsiung, University of Georgia
  William Capie, University of Georgia

The Stability of Measuring Teacher Performance: Implications for Teacher Evaluation
  Zurida Ismail, University of Georgia
  William Capie, University of Georgia
SATURDAY, APRIL 25

8:00 - 9:30 A.M. Session C-3 DuPont

TOPIC: MISCONCEPTIONS IN SCIENCE

Moderator
William C. Kyle, Jr.
University of Connecticut

Discussant
Thaddeus Fowler
University of Cincinnati

Papers

Relationships Among Biological Misconceptions, Reasoning Ability, Mental Capacity, Verbal I.Q. and Cognitive Style
Anton E. Lawson, Arizona State University
Lois Thompson, Chaparral High School, Scottsdale, AZ

Understandings and Misconceptions of Biology Concepts Held by Students Attending Small High Schools and Students Attending Large High Schools
William D. Simpson, Tipton High School, Tipton, Ok
Edmund A. Marek, University of Oklahoma

Student Misconceptions of Physical Science Concepts: Implications for Science Instruction
Paul Eggen, University of North Florida
Sandra McDonald, St. Johns Country School Board, St. Augustine, FL
Don Kauchak, University of Utah
PAPER SET: TEACHING SCIENCE FOR CONCEPTUAL CHANGE IN PRIMARY GRADES: PROBLEMS AND PRACTICE

 Moderator                              Discussant
 Doris Simonis                          Charles W. Anderson
 University of Montana                 Michigan State University

Papers
Primary Teachers’ Syntactic, Substantive and Pedagogical Knowledge of Science Lessons
    Deborah C. Smith, University of Delaware

Primary Teachers’ Current Practices and Needed Expertise in Science Lessons
    Daniel C. Neale, University of Delaware

Primary Teachers’ Perceptions of Barriers to Teaching Science
    Elizabeth Wier, University of Delaware
**SATURDAY, APRIL 25**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
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<tr>
<td>8:00 - 9:30 A.M.</td>
<td>C-5</td>
<td>Farragut</td>
</tr>
</tbody>
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**TOPIC: SCIENCE, TECHNOLOGY, SOCIETY**

**Moderator**
Peter A. Rubba  
Pennsylvania State University

**Discussant**
Jane Bowyer  
Mills College

**Papers**

**An Analysis of Factors Influencing the Adoption and Implementation of STS Themes**  
Janet Carlson Powell, BSCS - The Colorado College  
Emmett L. Wright, Kansas State University

**An Analysis of Four Methods which Assess Students' Beliefs About Science**  
Glen S. Aikenhead, University of Saskatchewan

**An Experimental Study of the Relationship Between Knowledge About Nuclear Science and Attitudes Toward Nuclear Power Plants**  
Dennis E. Showers, SUNY at Geneseo

**Development of A Likert-type Attitude Scale for Preservice Elementary Teachers Toward the Teaching of Water Education**  
Peter Mecca, Pennsylvania State University
SATURDAY, APRIL 25

8:00 - 9:30 A.M.         Session C-6                 Grant

TOPIC: PROBLEM SOLVING IN CHEMISTRY

Moderator
Hanna Arzi
Monash University, Australia

Discussant
George Bodner
Purdue University

Papers

The Particle Nature of Matter Approach: Its Effectiveness on Chemistry Achievement
  Dorothy L. Gabel, Indiana University
  K.V. Samuel, Indiana University
  Clifford Schrader, Dover High School, Dover, Ohio

Cognitive Development and Problem-Solving of Afro-American Students in Chemistry
  Bonita Alick, Clark College
  Mary A. Atwater, Atlanta University

The Effects of an Explicit Problem Solving Study in General Chemistry
  Diane M. Bunce, The Catholic University of America
SATURDAY, APRIL 25

10:00 -11:00 A.M.

Session C-7

Conservatory

POSTER SESSIONS

Presenters
The Development and Validation of Science Inservice Materials for K-6 Teachers
Charles R. Barman, Indiana University

Cognitive Conflict and Science Conceptions
Garth D. Benson, The University of Calgary

Observational Analysis of the Effects of EQUALS Training on Participating Teachers
Catherine R. Conwell, University of North Carolina at Charlotte
Richard B. White, University of North Carolina at Charlotte

Effect of Field Activities on Student Affective Responses and Cognitive Performance
Ernest L. Kern, Southeast Missouri State University

Information Theoretic Analysis of Science Learning by College Biological Science Students
David W. Kopp, University of Pittsburg
Gene W. Moser, University of Pittsburg
An Examination of Multiple Choice Items Used to Measure the Skill of Variable Identification
Danny L. McKenzie, University of South Carolina
Christine Keuhn, University of South Carolina
Catherine Kennedy, University of South Carolina
Edward Shaw, Jr., Southeastern Louisiana University

The Roles of Verbal Opinion and Chess Playing Behavior Information in High School Biology Course Performance
Gene W. Moser, University of Pittsburgh

Introductory Research Efforts on Microcomputer-based Laboratories
John C. Park, North Carolina University

Innovation in Science Education: The Experience of Incorporating Senior High School Students Into the Research Community
Naama Sabar, Tel Aviv University
Vered Gingburg, Tel Aviv University

Stepping Into Successful Science Teaching
Karen L. Ostlund
Southwest Texas State University
POSTER SESSION

Presenters
Initial Development of an Environment for Student Authorship of Geological Reasoning Systems
  - Charles R. Ault, Jr., Lewis & Clark College
  - Stan C. Kwasny, Indiana University
  - Erich Smythe, Indiana University
  - Roger F. Boneham, Indiana University
  - Thomas E. Kesler, Purdue University
Beliefs and Problem Solving in General Chemistry: A Qualitative Study
  - Carolyn Sue Carter, Purdue University
  - George M. Bodner, Purdue University
Computer Facilitated Concept Mapping: A Two Year Study Involving 1000 High School Chemistry Students and Their Instructors
  - Laine Gurley-Dilger, Rolling Meadows High School, IL
A Comparison of the Instructional Effectiveness of Directed Discovery and Verification Laboratory Activities
  - Jerry Ivins, Northwest School District, Cincinnati, OH
  - Glenn Markle, University of Cincinnati

continued next page...
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 - 11:00 A.M.</td>
<td>C-8 Continued</td>
<td>Map Room</td>
</tr>
</tbody>
</table>

**Environmental Ethics Development of Elementary Science Students**  
Doris A. Simonis, University of Montana

**Mental Representation of Textbook Genetics Problems: Students, Faculty, Physicians, and Genetic Counselors**  
Mike U. Smith, Mercer University School of Medicine

**Differences in Science Teaching Attitudes Among Undergraduate and Graduate Science Education Majors**  
Victor L. Willson, Texas A&M University  
Robert K. James, Texas A&M University

**Middle School Teacher Certification: Fact or Fantasy?**  
Edward L. Shaw, Jr., Southeastern Louisiana University  
Bryan L. Schisler, Southeastern Louisiana University

**An Analysis of the Effects of Using Instructional Games to Teach Science to Elementary School Students**  
Edward L. Shaw, Jr., Southeastern Louisiana University  
Kevin C. Wise, Southern Illinois University
SATURDAY, APRIL 25

10:00 -11:00 A.M.        Session C-9        DuPont

SPECIAL SESSION

Moderator
Glen Aikenhead
University of Saskatchewan

Papers
Emerging Trends from a Decade of Science Education Research: 1976-1986
   Saouma Bou Jaoude, University of Cincinnati

Needed Changes in Science/Math Teacher Education
   Jack Easely, University of Illinois, Urbana-Champaign
   Deborah Trumbull, Cornell University

Goals and Competencies for Precollege STS Literature in Environmental Education
   Peter A. Rubba, The Pennsylvania State University
   Randall L. Wiesenmayer, The Pennsylvania State University
SATURDAY, APRIL 25

10:00 -11:00 A.M.  Session C-10  Edison

RESEARCH WORKSHOP

Paper
A Workshop on Selected Techniques for the Evaluation of Science Teacher Education Programs
  Jerry B. Ayers, Tennessee Technological University
ROUND TABLE DISCUSSION
REPORT FROM THE NATIONAL CONFERENCE ON TECHNOLOGY AND TEACHER EDUCATION: RECOMMENDATION FOR ACTION

Moderator
Bernard Gifford
University of California - Berkeley

Participants
Sue Ann Ambron, Apple Computer, Inc.
Carl Berger, University of Michigan
Marcia Linn, University of California-Berkeley
Karen Sheingold, Bank Street College of Education, NY
SATURDAY, APRIL 25

10:00 -11:00 A.M.  Session C-12  Grant

INFORMAL DISCUSSION WITH THE PRESIDENT

James P. Barufaldi, University of Texas at Austin
SATURDAY, APRIL 25

11:15-12:15 P.M.  General Session III  Georgetown

Moderator
Rita W. Peterson
University of California - Irvine

Speaker
Raymond J. Hannapel
Program Director for Research in Teaching and Learning in Science and Mathematics

Directorate for Science and Engineering Education
National Science Foundation
Washington, D.C.

Topic:
The Role of Research in Science and Engineering Education at the National Science Foundation

12:30-2:15 P.M.  Awards Luncheon  International Ballroom West
SATURDAY, APRIL 25

2:30 - 4:00 P.M. Session C-13 Conservatory

SYMPOSIUM TOPIC: THE THEORY OF REASONED ACTION: CAN IT BE USED TO PREDICT AND UNDERSTAND THE BEHAVIOR OF SCIENCE TEACHERS AND STUDENTS?

Moderator
Ertle Thompson
University of Virginia

Presentors
Thomas R. Koballa, Jr., The University of Texas at Austin
Frank E. Crawley, The University of Texas at Austin
Robert L. Shrigley, The Pennsylvania State University
TOPIC: COMPUTER ASSISTED INSTRUCTION

Moderator
Lowell J. Bethel
University of Texas at Austin

Discussant
Robert Sherwood
Peabody College of Vanderbilt University

Papers
Student Estimation on Linear and Logarithmic Scales Using Microcomputers
  Carl F. Berger, University of Michigan
  Paul Pintrich, University of Michigan
  Paul Stemmer, University of Michigan

Effects of Modes of Computer-Assisted Instruction on Conceptual Understanding and Achievement of College Students Exhibiting Individual Differences in Learning
  Paul Rowland, New Mexico State University
  Carol L. Stuessy, New Mexico State University

continued next page...
<table>
<thead>
<tr>
<th>Time</th>
<th>Session C-14 Continued</th>
<th>Map Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:30 - 4:00 P.M.</td>
<td><strong>The Effect of Microcomputer Assisted Instruction on Achievement in High School Chemistry</strong>&lt;br&gt; Burton E. Voss, University of Michigan&lt;br&gt; Zelpha Ayoubi, University of Michigan</td>
<td>Map Room</td>
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<td><strong>Learning from Computer Simulations</strong>&lt;br&gt; James R. Okey, The University of Georgia&lt;br&gt; Ronald G. Oliver, Western Australia College of Advanced Education</td>
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<td>Patricia Blosser (NARST)</td>
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<td>Michael Padilla</td>
<td>Ohio State University</td>
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<tr>
<td>University of Georgia</td>
<td>John Staver, (JRST)</td>
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<td>University of Illinois at Chicago</td>
<td></td>
</tr>
</tbody>
</table>
SATURDAY, APRIL 25

2:30 - 4:00 P.M.  Session C-16  Edison

PAPER SET: CROSS-CULTURAL RESEARCH

Moderator  
Lucy Durgadeen  
University of West Indies

Discussant  
Pam Fraser-Abder  
University of West Indies

Papers

The Development of Logical Thinking Skills Among Indonesian and Philippine Students  
Joseph P. Riley, II, University of Georgia  
Subiyanto, M.Sc., Fakultas Pasca Sarjana, Indonesia  
Laurena Chuapoco, Marikina Institute of Science and Technology

Relationships Among Science Process Skills, Logical Thinking Abilities and Science Achievement of Senior High Students in Taiwan  
Chao-Ti Hsiung, University of Georgia  
Hsiao Lin Tuan, University of Georgia

A Cross-Culture Qualitative Study of Instructional and Motivational Strategies Used by Expert and Novice Teachers in the U.S. and Taiwan  
Hsiao Lin Taun, University of Georgia  
Chao-Ti Hsiung, University of Georgia  
Russell H. Yeany, University of Georgia

Teacher Behavior in Japanese Elementary Schools  
Elisabeth H. Charron, University of Georgia
SATURDAY, APRIL 25

2:30 - 4:00 P.M.  Session C-17  Farragut

PAPER SET: IMPLEMENTATION AND EVALUATION OF AN EXEMPLARY SCIENCE PROGRAM

Moderator: Michael Piburn  Westminster College of Salt Lake City

Discussant: Joel Bass  Sam Houston State University

Papers

A Longitudinal Assessment of Students' Attitudes Toward Science During a Three Year Curriculum Implementation Project
Thomas Gadsden, Jr., Richardson Independent School District, TX
William C. Kyle, The University of Connecticut
Ronald J. Bonnstetter, University of Nebraska

A Longitudinal Assessment of the Effect of Process-Science on Student Achievement
William C. Kyle, Jr., The University of Connecticut
Ronald J. Bonnstetter, University of Nebraska

A Longitudinal Assessment of 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
**SATURDAY, APRIL 25**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session C-18</th>
<th>Grant</th>
</tr>
</thead>
<tbody>
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<td>2:30-4:00 P.M.</td>
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</tbody>
</table>

**TOPIC: PROCESSING INFORMATION**

**Moderator**
Mary Atwater
Atlanta University

**Discussant**
David L. Haury
Tufts University

**Papers**

- **The Difficulty of the Logical Syllogism: Is it Encoding or Combining?**
  Dorothy A. Petrushka, Somerset County College

- **The Development of an Instrument to Measure the Processing of Spatial-Symbolic Information**
  Arthur L. White, The Ohio State University
  Donna F. Berlin, The Ohio State University at Newark

- **Knowledge Structure Organization in Nutrition Students**
  Marcy J. Leeds, Slippery Rock University
SATURDAY, APRIL 25

4:15 - 5:45 P.M.

Session C-19

Conservatory

SYMPOSIUM TOPIC: LINKING THREE RESEARCH AGENDAS IN SCIENCE TEACHING: STUDYING, WORK AND COMPUTERS

Moderator
Audrey Champagne
AAAS, Washington, D.C.

Presentors

Studying Science and Science Teaching
William G. Holliday, University of Maryland

Academic Work in the Science Classroom
Julie P. Sanford, University of Maryland

Learning Science Concepts Through Computer Assisted Instruction
Joseph Krajcik, University of Maryland
SYMPOSIUM TOPIC: IMPROVEMENT OF SCIENCE TEACHING PRACTICE THROUGH THE USE OF COACHING

Moderator
Lehman Barnes
Florida State University

Presenters
Kenneth Tobin, Florida State University
Mariona Espinet, University of Georgia
Pam Sloane, University of Georgia
Steven Byrd, University of Georgia
Nancy Davis, University of Georgia
TOPIC: LOGICAL THINKING

Moderator
George Pallrand
Rutgers, The State University of New Jersey

Discussant
Linda W. Crow
Houston Community College System

Papers

The GALT: A Measure of Logical Thinking Ability of 7th through 12th Grade Students
Betty L. Bitner, Southwest Missouri State University

Maximizing Students’ Learning by Matching Teaching Strategies to Their Cognitive Abilities
Herbert G. Cohen, Arizona State University

Teaching Problem Solving to University General Chemistry Students
David V. Frank, Ferris State College
J. Dudley Heron, Purdue University
SATURDAY, APRIL 25

4:15 -5:45 P.M.  Session C-22  Edison

PAPER SET: ELEMENTARY SCIENCE TEXTBOOKS

<table>
<thead>
<tr>
<th>Moderator</th>
<th>Discussant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nancy Romance</td>
<td>James Barufaldi</td>
</tr>
<tr>
<td>Broward County, Florida</td>
<td>University of Texas at Austin</td>
</tr>
</tbody>
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Papers

Elementary Science Textbooks: Their Contents, Characteristics, and Comprehensibility
- Eunice A. Greer, University of Illinois at Urbana-Champaign
- Linda A. Meyer, University of Illinois at Urbana-Champaign
- Lorraine Crummey, University of Illinois at Urbana-Champaign

Science Instruction in Kindergarten, First and Second Grade: A Longitudinal Discipline Study
- Robert L. Linn, University of Illinois at Urbana-Champaign
- Linda Meyer, University of Illinois at Urbana-Champaign
- C. Nicholas Hastings, University of Illinois at Urbana-Champaign
Assessing Science Concept and Process Acquisition for First, Second, and Third Grade Children
C. Nicholas Hastings, University of Illinois at Urbana-Champaign
Linda A. Meyer, University of Illinois at Urbana-Champaign
Robert L. Linn, University of Illinois at Urbana-Champaign

Parental Reports of Interactions, Experiences, and Resources Provided to Their Children Related to Science
Linda A. Meyer, University of Illinois at Urbana-Champaign
C. Nicholas Hastings, University of Illinois at Urbana-Champaign
Robert L. Linn, University of Illinois at Urbana-Champaign
TOPIC: COGNITIVE REASONING LEVEL

Moderator
Uri Zoller
Haifa University-Oranim, Israel

Discussant
Jane Butler Kahle
University of Northern Colorado

Papers
The Influence of Cognitive Reasoning Level, Cognitive Restructuring Ability, Working Memory Capacity, and Prior Knowledge on Students' Performance on Balancing Equations by Inspection
  John R. Staver, University of Illinois at Chicago
  Tom Jacks, Glenbrook North High School, Northbrook, IL

Students' Cognitive Level and Laboratory Experience in Biology
  Reuven Lazarowitz, Technion-Israel Institute of Technology
  Shulamit Witenoff, Comprehensive High School, K.Tivoa, Israel

The Relationship Between Contrasting Advanced Organizers and Achievement of Students with Different Preferences for Sensory Input Modality and Aptitude in a High School Biology Laboratory
  Robert H. Barron, Habersham High School, Cornelia, GA
  David P. Butts, The University of Georgia
SATURDAY, APRIL 25

4:15 - 5:45 P.M.  Session C-24  Grant

TOPIC: PHILOSOPHY OF SCIENCE

Moderator
Stanley L. Helgeson
Ohio State University

Discussant
Douglas A. Roberts
University of Calgary, CANADA

Papers
The Functional Paradigms of High School Biology Teachers
  Warren Tomkiewicz, University of Maine
  Gerald Abegg, Boston University

The Effect of Teachers' Language on Students' Conceptions of the Nature of Science
  Dana Lewis Zeidler, Delaware State College
  Norman G. Lederman, Oregon State University

Analysis of the Educational Implications of the Concept of Scientific Revolutions
  J. Preston Prather, University of Tennessee at Martin

6:00 - 6:30 P.M.  NARST Annual Business Meeting  Georgetown

7:30 P.M.  Executive Board Meeting  DuPont
<table>
<thead>
<tr>
<th>Presentor</th>
<th>List Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abegg, Gerald</td>
<td>C-24</td>
</tr>
<tr>
<td>Abraham, Michael</td>
<td>B-3; B-9</td>
</tr>
<tr>
<td>Adams, D. Daryl</td>
<td>A-6</td>
</tr>
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<td>Aikenhead, Glen S.</td>
<td>C-5; C-9</td>
</tr>
<tr>
<td>Algina, James</td>
<td>B-2</td>
</tr>
<tr>
<td>Alick, Bontia</td>
<td>C-6</td>
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<tr>
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<td>B-15</td>
</tr>
<tr>
<td>Anderson, Charles</td>
<td>B-10; C-4</td>
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<td>A-7</td>
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<td>A-8</td>
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<td>A-7</td>
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<td>C-6</td>
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<td>C-6; C-18</td>
</tr>
<tr>
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<td>C-8</td>
</tr>
<tr>
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<td>C-14</td>
</tr>
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<td>C-10</td>
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<td>B-8</td>
</tr>
<tr>
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<td>B-5; B-9</td>
</tr>
<tr>
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<td>C-7</td>
</tr>
<tr>
<td>Barnes, Lehman</td>
<td>B-14; C-20</td>
</tr>
<tr>
<td>Barron, Robert H.</td>
<td>C-23</td>
</tr>
<tr>
<td>Barrow, Lloyd H.</td>
<td>B-15; B-19</td>
</tr>
<tr>
<td>Barufaldi, James P.</td>
<td>B-13; C-12;</td>
</tr>
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<td>C-17</td>
</tr>
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<td>Beck, Essie</td>
<td>B-21</td>
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<td>B-23</td>
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<td>B-10</td>
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<td>C-7</td>
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<td>GS-1; C-11; C-14</td>
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<td>A-2; B-8; C-18</td>
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<td>B-14; B-22</td>
</tr>
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<td>C-14</td>
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<tr>
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<td>B-2</td>
</tr>
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<td>B-11; C-21</td>
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<td>B-9</td>
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<td>C-15</td>
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<td>Bodner, George</td>
<td>C-6; C-8</td>
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<td>C-8</td>
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<td>Bossetter, Ronald</td>
<td>B-18; C-17</td>
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<tr>
<td>Botricelli, Steven</td>
<td>A-7</td>
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<td>Bowyer, Jane</td>
<td>C-5</td>
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<td>BouJaoude, Saouma B.</td>
<td>C-9</td>
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<td>A-12; B-18</td>
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<td>C-6</td>
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<td>Butts, David</td>
<td>B-7; C-23</td>
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<td>C-20</td>
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<td>A-8; GS-1</td>
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</tr>
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<td>A-5; B-5</td>
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Fire, Helma M. A-12
First, Deborah R. B-15
Fowler, John B-7
Fowler, Seymour B-18
Fowler, Thaddeus C-3
Frank, David V. C-21
Fraser-Abder, Pamela B-8; B-21; C-16
Fraser, Barry A-10; B-1; B-23
Freidler, Yael C-1
Gabel, Dorothy L. C-6; A-9
Gadsden, Tom B-15; C-17
Gage, Barbara A. A-9
Gagliardi, Frank A. A-3
Gallagher, James J. B-1; B-19
Gennaro, Eugene D. A-12; B-8
German, Kenneth A-4
Germann, Paul J. B-4
Giddings, Geoff B-16
Gifford, Bernard C-11
Gingburg, Vered C-7
Glass, Gene V. GS-II
Glasson, George E. A-6
Good, Ron A-7; B-16; B-11
Gooding, C. Thomas A-5; A-11; B-12
Greml, Maggie B-1
Greer, Eunice A. C-22
Groves, Fred H. B-16
Grzybowski, Eileen B-3
Hage, Steven A-12
Hannapel, Raymond GS-III
Hastings, C. Nicholas C-22
Haury, David L. B-21; C-18
Helgeson, Stanley C-24
Heron, J. Dudley C-21
Hewson, Peter A-1
Heikkinen, Henry A-9; B-15
Holliday, William G. A-7;
Husain, Daulat N. A-3
Hsiung, Chao-Ti B-7; C-16
Isneineh, Ribbi Abu B-19
Ismail, Zurida C-2
Ivins, Jerry C-8
Jackas, Tom C-23
James, Robert K. B-18
Journet, Alan R.P. B-9
Kahle, Jane A-5; B-1; C-23
Kauchak, Don C-3
Kellogg, Theodore M. B-8
Kennedy, Catherone C-7
Kern, Ernest L. C-7
Kesler, Thomas E. C-8
Kleinh, Cristine C-17
Klindienst, David B-18
Killian, Gayle B-20
Koballa, Thomas R., Jr. A-11;
Kopp, David W. B-17; C-13
Koran, John J., Jr. A-4; B-2; B-13
Koran, Mary Lou A-12; B-2
Krajick, Joseph C-2; C-19
Kwasny, Stan C. C-8
Kyle, William C., Jr. C-3; C-17
Kuerbis, Paul B-8
LaShier, William B-7
Lawrenz, Frances A-5; B-23
Lawson, Anton B-3; C-3
Layman, John C-1
Lazarowitz, Reuven C-23
Lederman, Norman G. C-24
Lee, Okhee B-19
Leeds, Marcy J. C-18
Leonard, Carol B-8
Leonard, William A-2; B-9
Levine, Deborah C-1
Lindbeck, Joy B-6
Linn, Marcia GS-1; C-11
Linn, Robert L. C-22
Lockard, David J. A-5; B-21
Lythcott, Jean A-9
Maloney, David P. B-22
Mandell, Francine A-5
Mappus, Lynne B-20
Marett, Andrea V. B-24
Marek, Edmund A. B-3; C-3
Markle, Glen C-8
Mason, Cheryl L. A-5
McCroskiy, Heather B-23
McCreath, Heather B-24
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The National Association for Research in Science Teaching
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The Sixtieth (60th) Anniversary Special Session and Social
Honoring
NARST PAST PRESIDENTS
with
James Barufaldi Presiding
Friday, April 24, 1987

Reception: 6:30 P.M.
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