

Organized to improve science teaching—through research

# NARST NEWS

NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING

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## PRESIDENT'S MESSAGE

### NSTA/NARST EXAMINE NSF SCIENCE EDUCATION PROGRAMS

James P. Barufaldi

In June I had the opportunity to represent NARST at a meeting convened by the National Science Teachers Association to examine the science education programs of the NSF Directorate for Science and Engineering Education. The major purpose of the meeting was to generate recommendations for new or modified programs. The participants included NSTA staff, Division Directors, Presidents of NSTA affiliated groups, and NABT, NSF, NAGT, NESTA, and SRI International representatives.

Much time was spent discussing research in science education. All participants supported the belief that quality research in science education is essential if science teaching at all education levels is to improve. Several distinctions though were made differentiating the "types" of research. Most participants endorsed the idea that basic education research should be financially supported through agencies such as the National Institute of Education and that basic research on the history of science and on the structure of the discipline should be supported through the appropriate NSF research directorate; basic research on how people learn should be supported by NSF's Cognitive Psychology Division.

It was indicated that the present Science Education Directorate supports very little research. It was the concern of many participants that monies from the Directorate were being allocated to the Cognitive Psychology Division. Many questioned the apparent benefits from this research areas that have direct implications for science teaching. It was interesting to note that many participants held the belief that research in cognitive psychology offers little or no direct benefit to science education and supported the idea that science education funds should be allocated by its own directorate and only for research related to *science* teaching and learning. In general it was suggested that

the Science Education Directorate should support basic and applied research in science education. Needless to say, notions, beliefs and ideas expressed by the participants encouraged and generated many questions and much discussion. What is your understanding and opinion concerning the overall focus, direction and funding patterns of NSF support for research in science education?

Even though we may hold a variety of opinions on the above issues, we are all committed to improving science teaching through quality research. Yet, the rationale and mechanism used in allocating limited resources at the Federal level will initiate much concern and debate within the science education community.

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## 1987 NARST ANNUAL MEETING WASHINGTON, D.C.

The 60th Annual Meeting of the National Association for Research in Science Teaching will be held in the Washington Hilton in Washington, D.C. beginning Thursday, April 23, and ending Saturday evening, April 25, 1987.

Washington is an easy access city with the Washington Hilton being only a short ride by taxi or the Washington Flyer limousine from the D.C. National Airport. The subway from the airport stops about two blocks from the hotel at Dupont Circle. The hotel, located on Connecticut Avenue, is convenient to downtown attractions. Numerous excellent restaurants and the National Zoo are in easy walking distance. The Local Arrangements Committee is putting together an on-the-town guide to Washington for you. The Program Committee has been diligently reading the proposals (approximately 175 have been submitted) and is anticipating an exciting program with lots of variety. General Session speakers include Gene Glass and Ray Hannipel from NSF and a cadre of NARST leaders. Opportunities to meet and greet past presidents, emeritus members, and fellow NARST members are included in the program. Plan to be at the Special 60th Anniversary Session followed by an extended NARST Social.

Over 300 members attended NARST in San Fran-

cisco last year and we are planning for comparable attendance this year. We will meet in conjunction with AREA (April 20-24), overlapping one and a half days. When you register, please identify yourself as a NARST member. The negotiated room rates of \$80 (single) and \$95 (double/twin) are the same as for AREA members. Registration materials will be mailed out shortly.

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## NARST HISTORY TO BE WRITTEN

NARST Archivist Paul Joslin is now able to begin to identify, collect, classify and record locations of records crucial to the history of science education. NARST member Karen Murphy, a doctoral student of Joslin's, is writing a history of NARST as her doctoral dissertation.

They seek the cooperation of all NARST members, especially old timers, who have relevant records and information. They will ask that records be donated or willed to the NARST Archives, currently under the custodial care of Drake's Cowels Library. Where a member wishes to retain records, they will ask permission to study the records and, where appropriate, make photocopies. Some members have already made important contributions.

If you have valuable information, you are asked to contact Joslin at Drake University, Des Moines, IA 50311, (515-271-3991). Joslin and Murphy will also be soliciting oral interviews to be done at future meetings.

Please support this important endeavor.

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## NEW NARST COLUMN IN JCST EDITOR NEEDED

The editor of the *Journal of College Science Teaching* is very interested in a regular column in JCST sponsored by NARST. The column is to begin in the fall of 1987 and will focus on research on college science teaching. If you are interested in being the NARST editor for this column, please send a letter of application, curriculum vitae, and writing sample to Roger Bybee, BSCS, The Colorado University, Colorado Springs, CO 80903. All materials should be submitted by January 15, 1987. A decision will be made at the board of directors meeting this coming April.

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## SLATE OF OFFICERS PRESENTED FOR 1987 ELECTIONS

The Election Committee has met and nominated two persons for the position of President and four persons for positions on the Board. It is the responsibility of this committee to present a slate of officers four months prior to the Annual Meeting. Additional nominations may be made by petition of ten members. Petitions must be received by December 31, 1986. Three months prior to the Annual Meeting ballots are to be distributed

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## TRAINING SESSIONS AT THE ANNUAL MEETING

Plan to attend one of the training sessions at the NARST Annual Meeting. Both sessions will be held Thursday, April 23, from 9 a.m. to 11:30 a.m. One session will be conducted by Dr. James P. Stevens of the University of Cincinnati and will be based on his new textbook *Applied Multivariate Statistics for the Social Sciences*. The session will include research design in science education, explanations of various statistical packages (SPSSX, BMDP), and statistical procedures such as multivariate analysis of variance, multiple regression, analysis of covariance, and discriminant analysis.

The other training session will be conducted by Dr. Iris Weiss of the Research Triangle Institute. This session will be based on her work as principle investigator of two national surveys of science, mathematics, and social studies education. The presentation will include the development of survey instruments, identification of samples, data collection, coding, data analysis, and presentation of results.

WHO: James P. Stevens -Applied  
Multivariate Statistics  
for Science Education

Iris Weiss -Surveys in Science  
Education

WHAT: TRAINING WORKSHOPS

WHEN: April 23, 1987 - 9-11:30 a.m.

WHERE: NARST ANNUAL MEETING  
Washington, D.C.

COST: \$10.00 for regular NARST members  
\$5.00 for NARST student members

These sessions promise to be informative for all individuals interested in research in science teaching.

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to the membership. Ballots will be mailed out in January.

### **PRESIDENT ELECT NOMINATIONS**

The two candidates that have been nominated for President are Dr. Patricia E. Blosser and Dr. James A. Shymansky.

#### **PATRICIA E. BLOSSER**

Dr. Blosser earned her Ph.D. from The Ohio State University, Columbus, Ohio, 1970. Present position: Professor of Science Education, Department of Educational Theory and Practice, College of Education, The Ohio State University, and Associate Director for User Services, ERIC Clearinghouse for Science, Mathematics, and Environmental Education, The Ohio State University.

Dr. Blosser holds degrees in biology from The College of Wooster, in science education from the University of Northern Colorado, and in liberal studies from Wesleyan University, Connecticut, in addition to her doctorate in science education. She spent thirteen years as a biology and junior high school science teacher in Ohio and Illinois prior to beginning her doctoral work. Since 1970 she has been a faculty member at Ohio State where she teaches general methods in science education as well as graduate courses in science curriculum and science supervision, and advises masters and doctoral students. For the past eleven years she has coordinated a program in science and mathematics education designed to enable post-baccalaureate students to acquire certification while working toward a graduate degree in science or mathematics education.

Her research interests include work on questioning skills, curriculum development, teacher behavior, and follow-up studies of graduates of the OSU science education preservice programs. She is also interested in middle school science education, both preservice and inservice.

Pat has served NARST as a member of the Publications Advisory Committee, 1973-76; the Elections Committee, 1972-73; Program Committee, 1977-79; Financial Advisory Committee, 1980-83; the Outstanding Paper Awards Committee, 1985-87; the Awards Steering Committee, 1985-87. She served as chair of the ad hoc committee on International Members in 1985-86 as well as chair of the Outstanding Paper Awards Committee in 1985-87. Dr. Blosser is currently serving as a member of the Board of Directors of NARST.

Dr. Blosser serves as editor for *Investigations in Science Education*, a cooperative effort of NARST and the ERIC Clearinghouse for Science, Mathematics, and Environmental Education. She edits the science educa-

tion information analysis products produced by ERIC-SMEAC, has served as ERIC editor for the annual publication of NARST abstracts, and writes the science education information bulletins and digests produced by the Clearinghouse as well as editing those in mathematics education and environmental education. She also serves as editor of *Science Education in Ohio*, the state science teachers' journal, and is a member of the editorial board of *Science Education*. Journal articles she has written have been published in *Science Education*, *Science and Children*, *The Science Teacher*, and *School Science and Mathematics*.

She served twice as Regional Director of Region VI of the National Science Teachers Association, has been president of the Association for the Education of Teachers in Science, and recently completed a term as Director at Large of AETS.

#### **JAMES A. SHYMANSKY**

Jim Shymansky is currently Professor of Science Education at the University of Iowa where he teaches elementary school science methods, research methods and special topics in science education. Jim served as Coordinator of the Science Education Center at Iowa from 1983-86.

Prior to joining the faculty at Iowa in 1973, Jim was an Assistant Professor of Science Education at the Florida State University, a fifth grade science and math teacher at the Florida State University Laboratory School, a math teacher at both New Providence High School and Watchung Hills Regional High School (New Jersey), a physics and math teacher at Hellertown-Lower Saucon High School (Pennsylvania), a junior high science and math teacher at the Indiana State University Laboratory School, and a physics instructor at the Indiana State University.

Jim completed his Ph.D. in Science Education at the Florida State University in 1972, his M.S. in Physics at the Indiana State University in 1969, and his B.S. in Education at Bloomsburg State College in 1965.

Jim has been a member of NARST since 1972 and has served the organization in several capacities. He was on the NARST Program Committee in 1979-80; he served as Editor of *JRST* from 1980-1984; and he chaired the NARST Funding for Special Projects Committee in 1985. Jim has also been active in NSTA. From 1981-83 he served on the Editorial Board of *Science and Children* and is currently Director of the Research Division of NSTA (1985-87). As Research Director of NSTA, Jim is heading the "Every Teacher a Researcher" (ETR) program designed to organize and involve classroom teachers nationwide in cooperative research projects. NSTA will be distributing an ETR Directory later this Spring.

Among his awards Jim has been recognized for his

work as co-author in the following categories: the Outstanding Research Paper of the 1982 NARST Annual Meeting, the Outstanding Research Paper of 1983 Southwest AERA Regional Meeting, and the Outstanding AETS Paper of 1978. Jim has also been recognized by AETS as the Outstanding Science Educator (1982) and has received two NSTA-Ohaus awards for Innovations in College Science Teaching. Jim has authored or co-authored more than 50 journal articles (including 10 in *JRST*) and made over 40 presentations at state, regional, and national meetings. He is currently working on a monograph dealing with the "practical applications of modern methods of meta-analysis" and will be co-editing the Review of Research in Science Education - 1986.

## EXECUTIVE BOARD NOMINATIONS

The following nominations have been made for members of the Board. The persons nominated are Dr. Charles W. Anderson, Dr. Marianne B. Betkouski, Dr. James D. Ellis and Dr. Fred N. Finley. Two positions will be available starting in 1987. Board members serve for a term of three years.

### CHARLES W. (ANDY) ANDERSON

Dr. Anderson received his B.A. in Chemistry from Rice University and two degrees in science education from the University of Texas at Austin, including his Ph.D. in 1979. He has served as a Peace Corps volunteer in Korea and as a middle school science teacher. Since 1980, he has been co-director of the Science Teaching Project at Michigan State University's Institute for Research on Teaching.

Andy has been an active member of NARST and other professional organizations since 1979. He has served on the *JRST* Award Committee and is currently a member of the Publications Advisory Committee. He was the editor of the 1984 AETS Yearbook, *Observing Science Classrooms: Perspectives from Research and Practice*. Dr. Anderson has published articles in *JRST*, *Science and Children*, the *American Educational Research Journal*, and the *Elementary School Journal*, as well as chapters in several books. Since 1979 he has authored or co-authored 32 papers presented at national conventions, including those of NARST, AERA, and other organizations. In 1983, he won the Michigan State University Teacher-Scholar Award for excellence in scholarship and undergraduate teaching.

Dr. Anderson's research has focused on the classroom teaching of science and science teacher education. In particular, he has been interested in the problems posed for classroom teachers by student misconceptions and the need for conceptual change in science learning. Dr. Anderson and his colleagues

on the Science Teaching Project have investigated the dynamics of normal classroom teaching using both commercial and NSF produced-science programs, revealing their failure to produce conceptual change in most students and explaining why that failure occurs. They have developed teaching materials that enable teachers to greatly enhance their effectiveness in teaching for conceptual change at the elementary, middle school, and college levels.

Dr. Anderson has also focused in his research on understanding the nature of the knowledge base, both in individual teachers and in the profession as a whole, that forms the basis for successful teaching practice. He has been one of the primary developers and instructors in the Academic Learning Program at Michigan State University, a teacher education program devoted to building in prospective teachers the knowledge they will need to teach successfully for understanding of academic subjects and to continue learning from their teaching experience.

### MARIANNE B. BETKOUSKI

Marianne B. Betkouski is Professor of Science Education at the University of North Florida and Co-director of the Northeast Florida Institute for Science, Mathematics, and Computer Education. The Institute encompasses a science and mathematics microsoftware library, an electronic bulletin board, a middle school certification program, a series of middle school resource centers, and an instructional research component. As coordinator of the instructional research endeavor, she directed an interdisciplinary faculty team which produced a monograph entitled, *An Integrated Approach to Concept Formation and Problem Solving in Science and Mathematics*. She and her team have conducted research on student and teacher misconceptions in science learning. She is currently consulting with Florida Community College at Jacksonville on ways to incorporate findings from learning theory into science course offerings in an attempt to alleviate a high drop-out rate.

Her educational background is as follows: B.S. in Chemistry, University of Dayton, 1966; M.Ed. in Science Education, University of Florida, 1970; Ed.S. in Science Education, University of Florida, 1972.; and Ph.D. in Science Education, University of Texas, 1975.

Marianne is currently a member of the Editorial Review Board of the *Journal of Research in Science Teaching* and has been a reviewer for *Science Education*. During the 1982-83 academic year she was a visiting scholar in Psychobiology at Stanford University where she participated in research on memory systems. Her sabbatical was partially funded by the National Science Foundation. She has conducted summer institutes for the past three years in elementary

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science, secondary science, and chemistry and has conducted numerous teacher in-service workshops. She has presented papers on learning and memory mechanisms and formal reasoning abilities of students at NARST meetings since 1979. In 1983, she was invited to represent NARST by presenting a two-hour session "What Learning and Memory Research Says to the Science Teacher" at the regional meeting of the National Science Teachers Association in Biloxi, Mississippi. She has been published in *JRST*, *The Science Teacher*, *The 1983 AETS Yearbook*, among other journals. Her book, *Meaningful Learning in Elementary Science*, is in press with Kendall/Hunt Publishing Company. She is a past President of the Southeastern Association for the Education of Teachers in Science (SAETS) and the Florida Association for the Education of Teachers in Science (FAETS). Her current research interests are memory systems and student and teacher alternative frameworks and she is currently completing an extensive review article on memory systems.

#### **JAMES D. ELLIS**

James D. Ellis is staff associate and a project director at the Biological Sciences Curriculum Study (BSCS) at the Colorado College. He received his bachelor's degree in zoology, his master's degree in education and his Ph.D. in curriculum and instruction from the University of Kansas. Prior to his appointment to the BSCS in 1982, Ellis was an assistant professor at the Science Education Center at the University of Texas at Austin. He has directed numerous funded research and development projects in science education such as summer institutes on energy education for science teachers, and curriculum development projects for energy education, health education, and educational computing in science.

Jim, who serves on the NARST awards committee, has presented several papers at NARST conventions and has been a member of the organization for nearly a decade. He is currently director of the Southwest Region of the Association for the Education of Teachers of Science (AETS), was program chairman for 1983 national AETS meeting, and is editor for the 1988 yearbook for AETS. He is an active member of American Association for the Advancement of Science (AAAS), American Education Research Association (AERA), Phi Delta Kappa (PDK), National Association of Science Teachers (NSTA), School Science and Mathematics Association (SSMA), and National Association of Biology Teachers (NABT).

Ellis has authored papers published in journals such as *Science Education* and *American Biology Teacher*, in yearbooks for NSTA and AETS, and in a UNESCO monograph with the education commission of the International Union of Biological Scientists. Over the

years he has presented more than 25 papers at professional meetings of NARST, AETS, NSTA, SSMA, and NABT. He has presented short courses on educational computing in science at meetings of NSTA and NABT. Ellis has been a contributing author or editor for more than 20 instructional modules for science education. Recently, he presented an invited address at an international symposium in Helsinki, Finland on "Computers in Biology Education". His research interests are in educational computing, curriculum development, and educational evaluation.

#### **FRED N. FINLEY**

Fred N. Finley is an Associate Professor at the University of Minnesota having served previously on the faculties of University of Maryland and the University of Wisconsin. His research goals are to understand how students' knowledge of scientific content and methods change as a result of instruction and how their prior knowledge influences those changes. The research is based on recent developments in cognitive psychology and the philosophy of science and has resulted in papers critiquing conceptions of the nature of science used in science education, presenting research methods for assessing and representing scientific knowledge, and empirical studies to determine changes in knowledge associated with a variety of types of instruction. He has served on the *JRST* Editorial Board and the Placement Committee for NARST, chaired the Program Committee for the AERA Cognitive Structure/Conceptual Change SIG, coordinated the NSTA Audiovisual Materials Review Committee, and served on the NSTA Task Force on Assessing Computer Augmented Science Instructional Materials, and is participating on the Technology Panel of the AAAS/Carnegie Mellon Project 2061. He believes that NARST is the primary research organization in science education and should facilitate the development and publication of outstanding theoretical and empirical research that has the potential of making a significant contribution to practice. NARST should also significantly influence the formulation of public policies related to science education by federal and state agencies. This can be accomplished by extending the tradition of providing intellectual leadership in theory and practice, by setting high standards for publications and awards that include requiring theory and methods that are current, further developing relationships with AERA, NSTA, NSF, DOE and other groups concerned with science education. Several grants have been successfully sought, including grants received for practicum support-\$44,000; grants received for the Advancement of Economic Education Project-\$45,000; grant received for Curriculum on American Heritage Project, the American Heritage Education Council - \$20,000.

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## RESEARCH MATTERS ... TO THE SCIENCE TEACHER

### Encouraging Student/Student Interaction

Roger T. Johnson  
David W. Johnson

How should students interact with one another in science class? This question has been neglected by those studying teaching. While science teachers are encouraged to plan carefully the interactions between students and material (specific curriculum, specific content) and there is growing concern about the teacher/student interaction, the peer culture of the classroom remains relatively unexplored. Perhaps because we tend to overestimate our own influence on learning as teachers, we have grossly underestimated the power of appropriate student/student interaction on a range of learning outcomes.

There are three basic ways that students can interact with each other. Students can compete with each other to see who are the best students in the class; students can work individually on their own toward an established criterion; or students can work together, cooperatively, taking responsibility for each other's learning as well as their own. Many students in the United States tend to see school as a competitive place where it is important that you do better than the other students. Over the last fifteen years, teachers have been encouraged to structure individualized learning in which students work alone at their own pace.

Reports on over 600 research studies, dating back to the late 1800's which compare learning in cooperative, competitive and individualistic goal structures have been collected at the Cooperative Learning Center at the University of Minnesota. From these studies it has been concluded that having students work together cooperatively is much more powerful than having students work alone, competitively or individually (Johnson & Johnson, 1982; Johnson, Maruyama, Johnson, Nelson & Skon, 1981). Some of the findings include:

- More students learn more material when they work together, cooperatively, talking through the material with each other and making sure that all group members understand, than when students compete with one another or work alone, individualistically.
- More students are motivated to learn the material when they work together, cooperatively, than when students compete or work alone, individualistically (and the motivation tends to be more intrinsic).

- Students have more positive attitudes when they work together cooperatively than when they compete or work alone, individualistically. Students are more positive about the subject being studied, the teacher, themselves as learners in that class, and are more accepting of each other (male or female, handicapped or not, bright or struggling, or from different ethnic backgrounds) when they work together cooperatively.

The positive effects of cooperative learning in science go beyond the immediate gains in achievement, motivation, self-esteem and acceptance of differences. Students learning in a cooperative goal structure also develop skills in communication, leadership and conflict resolution that are basic to productive, working teams.

There is more to cooperative learning than a seating arrangement or sharing lab equipment (Johnson & Johnson, 1985). Cooperation requires a sense of positive interdependence and a "sink or swim together" perception, where one person's contributions are celebrated by all group members. A shared group goal and often a shared group reward (bonus points for group success) is essential to encourage cooperation. Individual accountability is also important in cooperative learning groups. All group members need to understand the material and be able to explain the group's answers.

It is clear that many students do not have basic skills in interacting with other people in a work group. These collaborative skills need to be taught (i.e., active listening, checking other group members for understanding, etc.). Current research on student/student interaction is focused more on internal dynamics of cooperative groups and less on comparisons with competitive and individualistic goal structures. A few findings from these studies are summarized here.

1. It appears that constructive argument is important to a cooperative group and enhances learning. The use of controversy, disagreement and discussion in groups is encouraged.
2. There is increasing evidence that students who "talk through" material with peers learn it in a more effective way than students who just read or listen to material.
3. A number of studies focus on the effects of positive interdependence on learning of groups. It appears that the stronger the "we sink or swim together" feeling in a group, the more likely the group will be successful and that all members will master the material.
4. A number of current studies indicate that sending students to the computer in small groups that "cannot touch the key until they all agree" is a more powerful way to learn at the computer than having each student working alone at his or her own

computer.

5. It appears that retention of information is enhanced in the cooperative setting and that students who work in cooperative relationships are more likely to have a conscious strategy for how they got to the answer. It would appear that initial strategies for problem solving are often intuitive when seeking an answer and are invented when students try to explain to each other the rationale for their answers.

The implications for science teachers from this research area would be to structure much of the science class cooperatively with the teacher only teaching enough to get the groups operating and then monitoring and interacting with small (2 to 4 students) cooperative groups. It may be useful to encourage all the students to verbalize significant content in the groups and to encourage constructive argument. Teachers should "mix" the class members in heterogeneous groups (male/female, handicapped and nonhandicapped, different ethnic backgrounds, etc.), so that students get beyond their initial stereotypes and are able to treat each other as "other science students" and fellow group members. Such grouping should improve the attitudes toward science of student populations not presently positive about science.

We need to acknowledge the academic influence students have with each other, and enlist the help of students to set norms in schools so students will encourage each other to learn in science. In this way, the classroom will become a place where students care about each other's learning and are successful.

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## REPORT FROM INTERNATIONAL COUNCIL OF ASSOCIATIONS FOR SCIENCE EDUCATION (ICASE)

The ICASE Executive Committee, following up on suggestions made at the Bangalore General Assembly in August, 1985, has recently produced a 1987 Year-book covering a variety of international issues in science education. In addition ICASE is planning an International Day at the 1987 NSTA Conference in Washington, D.C. which will feature a variety of symposia, panels, and single presentations. Other international conferences are also being planned for the future, including a major conference in Canada in 1988.

ICASE membership is growing with the greatest representation being in the developing countries. ICASE now includes more than 80 associations in 75 nations and is viewed by many associations as their principle link to the science education systems of the developing world. NARST, with many members active in international science education, is viewed by the majority as the most authoritative voice in science education research.

Member associations are always pleased when a NARST member is present at one of their meetings. So, if you are traveling out of the U.S., you might be interested in visiting another association or the ICASE representative in that nation. You can obtain such names and information from John Penick at The University of Iowa.

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## Nominations Requested—

### Distinguished Contributions to Science Education Research Award

Deadline: January 15, 1987

The National Association for Research in Science Teaching seeks to improve Science Education through research. To this end the Association desires to recognize and reward individual(s) who have made significant contributions to Science Education through research. Contributions may be of several types, including but not limited to empirical, philosophical or historical research, evaluative studies, policy related research and studies reflecting new techniques to be applied in research. To be considered, an individual should have contributed over a period of many years (at least 15) and should be considered at the pinnacle of his/her career.

The award will be made to an individual who has over a period of many years (at least 15):

1. made a continuing contribution(s) to Science Education through research;
2. provided notable leadership in Science Education through research; and
3. had a substantial impact on Science Education through research.

This award is intended to be the highest recognition NARST can bestow for contributions to Science Education through research. The award will be bestowed only when a superior candidate has been identified by the awards committee.

To apply, a nominator or candidate should submit 10 copies of the following:

1. a cover letter, not to exceed 5 pages in length,

describing the nature of the contributions of the individual, including specific documentation as to why these contributions are considered outstanding and substantive;

2. up to five letters of support, each not to exceed two pages in length, which provide evidence of extraordinary contributions of the individual; and
3. a curriculum vita including a complete list of publications and accomplishments.

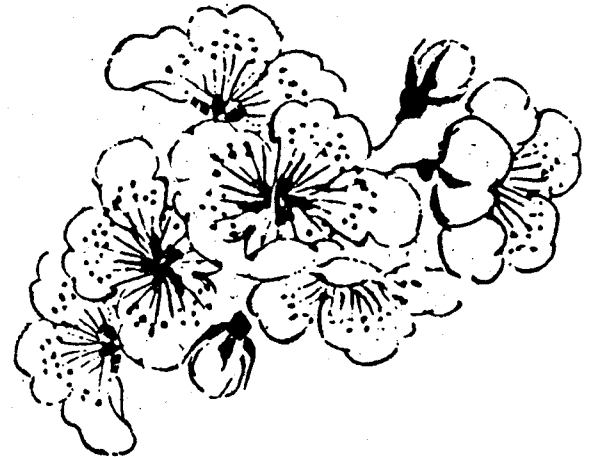
Dr. Michael J. Padilla, Chairperson  
 NARST Awards Committee  
 Department of Science Education  
 University of Georgia  
 Athens, GA 30602

## BE PART OF A RESEARCH CELEBRATION ATTEND THE 60TH ANNIVERSARY OF THE NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING

When: April 23-25, 1987  
 Where: Washington Hilton Hotel  
 Washington, D.C.  
 Theme: "New Perspectives for Research in Science Teaching"  
 Schedule of Events:

More than 140 contributed research papers  
 Symposia  
 Training sessions on research methods and techniques  
 Cherry blossoms and coffee on the Terrace  
 Paper sets  
 Special Awards Luncheon  
 Special Anniversary Social  
 Time to meet and interact with Past presidents  
 Emeritus members  
 NARST members

General sessions featuring  
 Gene Glass and Ray Hannapel from NSF, Mary Budd  
 Rowe, Roger Bybee, Marcia Linn, Joe Novak  
 Poster session  
 Roundtable discussions



For more information write to:  
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