

NARST NEWS

NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING

Thaddeus W. Fowler, Editor, University of Cincinnati, OH

Vol. 30 (3) September 1988

P R E S I D E N T

Patricia E. Blosser
The Ohio State University
Columbus, OH

REACTIONS NEEDED

Welcome back to a new academic year! I hope that your summer activities were such that you are ready for all the challenges you may face.

NARST officers are involved in the usual busy schedule that autumn brings, with Program Committee members ready to read proposals for the 1989 NARST meeting in San Francisco. Bill Holliday and Glenn Markle have traveled to San Francisco to check on hotel accommodations, and they assure me that things are well in hand.

In the President's column of last spring, I asked for reactions from NARST members about concerns they might have for the business of the organization so that these items might be discussed at the fall board meeting in November. To date, four members have sent letters, each identifying a different concern.

If you thought about responding but decided to wait until the new fall term began, please take some time to get your thoughts on paper and send them to me.

HIGHLIGHTS OF THE 1989 NARST MEETING

• John Bransford of the University of Vanderbilt, research specialist in classroom cognition and one of the best received NARST speakers during this decade, will return to present recent advances in student thinking and problem solving. He will also describe his current

research as it relates to his 1988 award-winning JRST study, using video disk equipment and presented on oversize monitors.

• Martin Maehr of the University of Illinois, an active researcher in achievement-motivation and an excellent speaker will present paradigms, findings and methodologies useful in investigating classroom motivation problems of science teaching. He authored science-motivation works in AERA's *Review of Educational Research* and the famous research review, "On doing well in science: Why Johnny no longer excels; why Sarah never did."

• Both general speakers will hold follow up sessions for active research particularly interested in asking questions and clarifying points of interest.

• NARST has negotiated with two additional people of prominence to make presentations: Glen Seaborg, Nobel Laureate in Chemistry from the University of California at Berkeley, and Allen Schmieder, Chief, Title II Funding from the U.S. Department of Education.

• The program committee intends to mail the printed 1989 program to each NARST member in February.

• A special field trip to the Exploratorium, the famous nearby science museum, is being planned and includes a hosted wine-and-cheese reception for NARST members. The program committee seeks your reactions to these plans still under consideration and your suggestions for the 1989 San Francisco Meeting.

Second Call for Proposals 1989 NARST Annual Meeting

William G. Holliday, Program Committee Chair

This is a call to NARST members and others to submit proposals for the program for the 1989 NARST Annual Meeting. The 1989 annual meeting will be held at the Holiday Inn-Union Square, San Francisco, March 30 through April 1, 1989.

continued

To promote a broad research base, the Program Committee encourages proposals that describe any of a variety of types of research. Please consider the following types of research: Experimental, Survey, Ex Post Facto, Evaluation, Historical, Philosophical, Case Study, Naturalistic, and other types. Standard guidelines appropriate for reporting each type of research are found in most research methods texts and should be followed in preparation of proposals and abstracts. In general the proposals should include *Objectives or Purpose of the Study, Design and Procedures, Findings or Results, and Conclusions.*

An individual may present only one paper, but may be listed as a co-author of another paper and may participate in a symposium or as a presider or discussant. Presenters are strongly encouraged to stimulate discussion around their presentation. Overhead projectors and screens will be provided; participants needing to use other equipment are expected to provide their own. All presenters must register at the NARST meeting.

Persons wishing to submit proposals need to send:

1. Two copies of the completed cover page provided at the back of the newsletter.
2. Six copies of a three to six page proposal with bibliography. Please omit author name(s) and other identifying information from the proposal.
3. Six copies of an abstract of *no more than 500 words*, to be published in the collection of NARST abstracts, so form and accuracy are important. Please omit author name(s) and other identifying information.
4. Two self-addressed, stamped, envelopes, to be used to acknowledge receipt of proposals and the Program Committee's final decision.
5. Two 3 x 5 in. cards containing *typed* name, address, and telephone number of the author(s) and the title of the paper.

Send this material to:

William G. Holiday
Chair, NARST Program Committee
Science Teaching Center
The University of Maryland
College Park, Maryland 20742
301-454-7346

**DEADLINE: MATERIALS MUST BE POSTMARKED
NO LATER THAN OCTOBER 1, 1988**

All proposals will be reviewed anonymously by the members of the Program Committee. Standard criteria will be applied in the proposal review. The criteria are:

Significance of the problem and conclusions for the advancement of research in science education, as evidenced by the link to or departure from previously published research theories, methods, or conclusions.

Clarity of expression.

Appropriateness of the procedures and conclusions, given the stated purpose and results.

The following types of proposals have served as the basis of NARST Annual Meetings.

1. **Contributed Papers:** Brief 15-minute reports of research. These are grouped by the Program Committee to accommodate three or four per session. This format accommodates persons who have not planned to report their research with other members of a team. Discussants are usually assigned to these sessions. Presenters must provide discussants with a copy of the paper before the annual meeting.
2. **Paper Sets:** Several related studies originating from a common base of research are presented in a single concurrent session, accommodating from three to five persons who may divide a single report representing a major research effort in terms of time, number of researchers and/or geography. This format also allows for common elements of design or approach to be presented once rather than repetitiously. A discussant may be assigned to the session if one is not already identified in the proposal.
3. **Panels:** Panels are constituted to provide a mechanism for debating or discussing serious issues in science education. Each panel has a moderator, who may or may not organize the panel, but who is expected to regulate the flow of discussion or debate. Proposals should describe various aspects of the issue and the diverse views represented by the speakers.
4. **Symposia:** Symposia proposals should be submitted as a package listing participants on the cover sheet. The summary should address itself to the individual presentations and to the thread that ties the papers together. Symposia should promote discussion of current or needed research. Following a brief presentation by each member of the symposium, interaction among presenters and the audience is expected. Proposals should describe the common research interests of symposia members, their varied backgrounds, positions or experience, without naming the individuals.
5. **Poster Sessions:** Poster sessions are designed to enable researchers to share information on research in progress. These sessions combine the graphic display of materials with an opportunity for individualized, informal discussions of the research. Authors are encouraged to bring copies of the full paper for distribution to interested participants.
6. **Round Table Discussions:** Round Table Discussions are used to provide a thorough analysis of a paper by a group. Presenters have an hour in which various aspects of the study are examined by others in a discussion format. One or more papers may be discussed simultaneously in a round table format.

If members agree to present their research in this format, they are expected to bring materials such as protocols, instruments, computer printout, experimental curriculum materials, and logs to aid in the discussion. This format is not conducive to presentations which require the use of audio-visual equipment.

7. **Research Methods Seminar/Workshop:** This format is designed to enable NARST members to acquire new research skills or update old ones. These one or two hour sessions are planned for intensive involvement by those in attendance, and presenters are expected to provide resources for study and discussion.

The Program Committee wishes to accommodate as many papers as possible and asks support from proposers if it is necessary to reassign some papers from one format to another.

INTERNATIONAL ISSUES BOOKS NEEDED:

NARST has identified 36 countries, mostly in Africa, which would like your donations of text, reference, and other books. They are particularly interested in science books but will take others.

Books must be in good condition since heat during shipping is hard on them. Student writing in them must be minimal and no highlighted books are acceptable. Books focusing only on America, such as American History, are also unacceptable.

John Penick has arranged for repackaging and overseas shipping through the International Book Bank in Chicago. Donors must provide shipping to that point (about \$9.00 for 70 pounds). Help with that may be possible through your local Kiwanis International Club since they have expressed a commitment to shipping books to developing countries.

If you can help, please call John at (319) 335-1183 or write him at: Science Education Center, University of Iowa, Iowa City, IA, 52242. He will instruct you on how to package and ship to Chicago.

NOTES:

Marianne and Lehman Barnes will be spending the Fall semester in London pursuing several of their interests. Marianne will be a faculty member at the Florida University System London Study Centre and Lehman will be associated with King's College, The University of London, and the Inner London Education Authority. Marianne and Lehman are involved in research in practical science assessment, staff development strategies, STS, and primary school technology education.

Nominations Requested

Distinguished Contributions to Science Education Research Award

The National Association for Research in Science Teaching seeks to improve Science Education through research. To this end the Association desires to recognize individuals 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 for the award an individual should have contributed for at least 15 years and be at the pinnacle of his/her career.

The award will be made to an individual who has over a period of 15 years or more:

1. made a continuing contribution 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 by **January 16, 1989**:

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.

Submit the information to:

Ann C. Howe
Math and Science Education
North Carolina State University
Raleigh, NC 27695-7801

INTERNATIONAL ISSUES BOOKS NEEDED:

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MISCONCEPTIONS ROUNDTABLE

During the 1988 NARST Meeting over two dozen members interested in misconceptions in science and mathematics meet to informally discuss research on that topic. Joseph D. Novak led the discussion and organized the group meeting. NARST members interested in this topic and who would like to participate in similar discussions in the future should contact Dr. Novak at Cornell University or any group member.

Arzi, Hannah
Monash University
Clayton, Victoria
Australia 3168

LaShier, Bill
School of Education
Univ. of Kansas
Lawrence, KS 66045

Brasell, Heather
PO Box 46
Alapaha, GA 31622

Leith, Sylvia
Univ. of Manitoba
Winnipeg, Manitoba
Canada R3T 2N2

Brockway, Carolyn
520 Teakwood Lane, NE
Cedar Rapids, IA 52402

Liske, Bob
1623 D. Sparton Village
East Lansing, MI 48823

Brody, Michael
Shibles Hall
Univ of Maine
Orono, ME 04469

Lucy, Ed
Georgia State University
Atlanta, GA 30303

Duchett, Jo
Center for Math/Sci Educ
Univ of NC
Chapel Hill, NC 27599

Nakhleh, Mary
Science Teaching Center
University of Maryland
College Park, MD 20742

Dunkhase, John
Science Ed Center
Univ of Iowa
Iowa City, Iowa 52242

Nelson, Mike
School of Educ.
Univ. of Kansas
Lawrence, KS 66044

Eichinger, David
252 Erickson Hall
Michigan State University
East Lansing, MI 48824

Novak, Joseph D.
Dept. of Educ., Roberts Hall
Cornell University
Ithaca, NY 14853-5901

Even, Alex
Eval & Com. App., OISE
Toronto, Ontario
Canada M5S 1V6

Okebukola, Peter A.
Lagos State Univ.
PMB 1087, Apapa
Lagos, Nigeria

Gates, Rosalyn
Box 227, RD#3
Indiana, PA 15701

Powers, Don
Curriculum & Instruction
Kansas State Univ.
Manhattan, KS 66506

Haukoos, Gerry D.
Dept. of Biological Sci.
St. Cloud State Univ.
St. Cloud, MN 56301

Prather, J. Preston
Univ. of Tennessee
112 Brundige St.
Martin, TN 38237

Jones, Gail
College of Education
Box 7801, NC State Univ.
Raleigh, NC 27695-7801

Schoon, Kenneth
8010 Forest Ave.
Munster, IN 46321

Kilburn, Robert
School of Educ
Boston University
Boston, MA 02215

Sihmidt, Hans-Jurgen
Univ. of Dortmund
D-4600 Dortmund 50,
West Germany

Krajcik, Joe
Science Teaching Ctr.
Univ of Maryland
College Park, MD 20742

Wier, Betty
College of Education
Univ of Delaware
Newark—d, DE 19716

Kyle, William Jr.
School of Math. & Sci. Ctr.
Purdue University
West Lafayette, IN 47907

Zaveleta, David
212 Aberhold
Univ of Georgia
Athens, GA 30601

NINETEENTH ANNUAL SYMPOSIUM OF THE JEAN PIAGET SOCIETY

The Nineteenth Annual Symposium of the Jean Piaget Society will be held in Philadelphia on June 1-3, 1989. The theme of the Plenary Speakers will be "Specific Environments: Thinking in Contexts." Plenary Speakers include Urie Bronfenbrenner, Barbara Rogoff, Kurt Fischer, Ed Reed, and David Feldman. Research and conceptual papers, symposia, workshops, and discussions pertaining to Piagetian theory and application, or knowledge of its development are being solicited. NOTE, program proposals do *not* have to be relevant to the specific theme. Deadline for submission is November 18, 1988. For further information, contact William M. Gray, Center for Applied Cognitive Science, The University of Toledo, Toledo, OH 43606.

NARST News

NARST News is published and mailed to members on the first of the month of March, June, September, and December. Contributions need to be received one month before the publication date. Send contributions to the editor:

Dr. Thaddeus W. Fowler, Editor
NARST News
College of Education
University of Cincinnati
Cincinnati, OH 45221-0002

The newsletter is a way for NARST committees to communicate with the membership. Special interest groups can announce their plans, projects and contact persons. Members can announce items of interest. First priority will be given to regular *NARST News* features and other articles will be published as space permits. Please submit copy in printed form and, if possible, also as a text file on a "five inch" floppy MS-DOS computer disc (WordPerfect preferred).

Research Matters... To the Science Teacher

TEACHING FOR GENDER DIFFERENCES

By Dale Baker

All teachers want to provide the best instruction and create the best learning environment for their students. Yet, the research indicates that females are getting a significantly poorer science education than males, even when they are in the same classroom. The consequences of this poorer education can be seen in gender differences in attitude toward science and differential course enrollment patterns. Females hold more negative attitudes toward science than males and are less likely to continue studying science in high school and beyond.

Of course, these male-female differences in attitude and enrollment are not solely the result of what happens in classrooms. However, many teacher behaviors and teaching strategies have been identified that contribute to these problems. These teacher behaviors and strategies are often employed without malicious intent. Nevertheless, the result is gender inequity in science instruction which contributes to negative attitudes toward science and science avoidance on the part of females.

Classroom Interactions

Teacher-student interactions are the clearest form of classroom inequities. Teachers call on boys more often than girls, ask boys more higher-order questions, give boys more extensive feedback, and use longer wait-time with boys than girls. Teachers fail to see girls' raised hands, and limit their interactions with girls to social, non-academic topics. Girls are rarely chosen to give a demonstration or help with an experiment. Boys are usually target students and overall they receive more teacher attention than girls. The proportion of teacher attention given to boys increases as the students move from elementary to junior and senior high school. Even nonverbal teacher behaviors, such as head nodding and encouraging smiles, favors boys over girls.

Grouping Students

Cooperative learning groups have been promoted as a good way to bring about positive attitudes toward instruction, mastery of content, and self-esteem. However, when group dynamics are examined carefully, some disturbing interactions are seen. Simply making mixed gender groups does not promote good cross-gender relationships or dispel stereotypes. Group dynamics often reinforce stereotypes. Boys will take leadership roles and girls will defer to their decisions. Girls have less opportunity to speak in groups. When they do speak, they have difficulty holding the boys' attention or their ideas are rejected. Girls are often found in stereotypical roles, such as secretary, and they take a passive rather than active role in hands-on science activities.

Other examples of frequently used but poor grouping strategies include assigning tasks, making seating arrangements, or arranging students according to gender when any other criterion would work just as well.

Classroom Climate

Boys and girls react differently to various aspects of the climate of the classroom. Girls react more negatively than boys to friction between students, strict rules, and teacher favoritism. The presence of these factors in a classroom are related to a general decline in attitude toward science. The more negative response of girls contributes to the poorer attitudes toward science held by girls.

A classroom that is highly structured, teacher controlled, and has clear directions and constant feedback is associated with achievement in science and is favored by girls. However, this climate inhibits interests and activities outside of class. This latter situation becomes a special problem where girls are concerned because they report fewer outside science activities and opportunities.

Teachers who emphasize the difficulty of science also create a negative learning climate for girls. Girls, unlike boys, avoid tasks labeled difficult and don't return to difficult tasks if they experience failure.

Materials, Topics, and Activities

Despite the efforts to change textbooks, females are still under-represented. Pictures of women appear less frequently than men and more often show women in traditional roles. When men and women are shown in the same picture, the woman is in a subordinate role, such as the female nurse with the male doctor. Further examination of textbooks reveal that even when the pictures show equal numbers of men and women in traditional and non-traditional roles, the text may still use sex-biased language and contain no examples of women scientists.

Many of the traditional topics of science and examples favor boys' interests and experiences. Girls favor topics that emphasize health, food, and safety rather than the more common topics that relate science to industry and the military. Examples from contact sports may help the boys understand a concept or law, but for girls, they confuse more than clarify.

Girls also have fewer classroom experiences than boys actually doing science. They engage in fewer activities and have fewer experiences using a variety of scientific equipment.

Testing

Some testing formats and test materials are less effective with girls than boys. Girls dislike being tested individually, orally, or in small group situations. In addition, girls are more likely than boys to answer "I don't know" to questions that have a masculine theme, such as football.

Teaching Strategies

Changing behavior and creating a learning environment that promotes equity takes time and effort. Teaching that promotes equity must be active and intentional behavior. It also requires sensitivity, tact, and a willingness to examine one's own behavior and assumptions.

To be effective, equity strategies must be continuous and inte-

grated into daily instruction. They must pervade all aspects of classroom life. Token or intermittent exposure is not effective because people don't generalize from single examples and because boys and girls have been exposed to differential treatment and expectations from birth.

Given all of this, what can teachers do? To start, classroom interactions can be monitored. A colleague can observe your teaching using a simple interaction analysis sheet to record the number of times you call on boys and girls and the types of questions you asked. He or she can record the number of instances of positive and negative feedback, disciplinary and social interactions, as well as the name and sex of students who do not receive your attention. The observer could also look for examples of biased language, such as the use of predominantly male nouns and pronouns and male-biased examples from sports or the military. Wait-time, although a difficult behavior to change, could also be monitored. A conference between the observer and the observed should be held as soon as possible after the lesson has taken place so that the experience is still fresh. Alternatively, a teacher can be video taped and self or group analyses could take place.

When inequities are identified, the following strategies have been found useful. Work on one problem at a time. Don't try to change the level of questioning as well as the kind of feedback all at once. Use a list of students' names and check them off after you ask a question. Alternate questioning boys and girls. Ignore raised hands when selecting students, but allow students the option of saying "I'd like to pass on that question now." This makes students who are reluctant to raise their hand more comfortable and will in time increase the number of students who do raise their hand. Prepare a list of questions ahead of time which are categorized into higher- and lower-level questions. Prepare a list of examples that reflect the interests or experiences of both males and females or that emphasize a female activity. Try teaching a class in which all names or pronouns are feminine. Talk with your students about how they felt when you used female names and pronouns and be candid with them about your own reactions. Monitor your progress periodically with additional observations and video taping.

A positive classroom climate can be created by reducing favoritism and friction. Classroom observations will help you identify instances of these two problems. Impose more structure by using clear directions, both verbal and written, and make expectations for assignments and grading criteria clear.

Present science as a subject that everyone can learn rather than an elite and difficult subject. Motivate your students to solve a problem for the fun of it or the satisfaction of getting a right answer, not because it is a really tough problem that will show you how smart the students are.

When using groups for activities, such as lab work, assign each student a specific role. Keep a record of these roles and rotate students through the different roles. This gives girls opportunities to be the team leader and boys to be the group recorder. Observe the group dynamics and praise positive cross gender interactions. Use the Student Team Achievement Division (STAD) approach in which students do their own work, but a single grade is given to the group which is the average of all individual grades of the group members. Discuss sex segregation and male domination of groups. Last of all, never assign any task by gender.

Examine texts and other materials for women in science. If women are not mentioned as contributing to science, discuss the omissions in the text with students and point out examples of stereotyping. Infuse the extant district curriculum and inservice programs with equity materials such as COMETS, EQUALS, or SPACES. If you are unaware of materials that promote equity or focus on the accomplishments of women, contact the affirmative action or equity director of your district or state board of education. Other good sources of information are the Women's Resource Center or Women's Studies Program at a university or college.

Look for, create, and use a test bank and set of examples that are gender neutral or emphasize female interests. Have the students participate in this process by writing short reports about female scientists and creating their own examples and test questions.

Bring role models into the classroom. Invite women scientists

to talk about their careers and their academic preparation. National programs such as Women and Mathematics (WAM), Visiting Scientist Program, and community groups of professional women such as the Math/Science Network have speakers who want to come to your school. Use peer tutoring, with older girls providing help in math and science for younger girls and boys.

Encourage participation and make girls aware of out-of-school activities in science, such as a junior science academy at your local museum, or Expanding Your Horizons, or other science conferences for girls. Provide extra credit or other incentives for participation. Start a science club for girls with activities that focus on their interests such as the physics of ballet or the chemistry of cooking.

At this point, a word of caution is needed. It is possible that the boys in your class may not be comfortable with all the suggested equity strategies. This is particularly true with materials that emphasize women's contributions to science or grouping strategies that reallocate roles. Some research suggests that boys feel neglected and will resist giving up their central role in the classroom. This is best handled in open discussions of fairness.

If things are not going as well as you would like, remember that change takes place slowly. Teaching for gender equity implies everyone in the classroom, boys, girls, and the teacher must critically examine their behavior and assumptions to create an environment that supports and encourages learning for all students.

Dale Baker is an associate professor of education at the University of Utah. She is a member of the National Association for Research in Science Teaching, an organization dedicated to improving science teaching through research.

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- Baker, D. (1987). Sex differences in classroom interactions in secondary science, *Journal of Classroom Interaction*, 22, 2, 6-12.
- Deboer, G. (1987). Predicting continued participation in college chemistry for men and women. *Journal of Research in Science Teaching*, 24, 6, 527-538.
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COVER SHEET FOR NARST PROPOSAL

1989 ANNUAL NARST MEETING, HOLIDAY INN—UNION SQUARE, SAN FRANCISCO, CA

(Please type the requested information)

1. Title _____

2. First author presenting paper

Name _____ Phone () _____

Institution _____

Address _____

Zip _____

3. Name and Institutional Address of Co-Author(s) and, if appropriate, Sub-titles (please include zip code for all co-author(s))

4. Signature _____ Date _____

5. Type of activity proposed (check appropriate entry)

- Contributed Paper Paper Set Panel Symposium Poster Session
 Round Table Research Methods Workshop/Seminar

6. Special Instructions or Comments:

7. Descriptors that would identify the topic of the proposal:

8. Are you a member of NARST? _____ Yes _____ No

9. Please include the following materials with your proposal
(Omit author name(s) and identifying information in abstracts)

- Two completed cover sheets
- Six copies of a 500-word abstract (to be published)
- Three to six page proposal with bibliography (6 copies)
- Two self-addressed, stamped envelopes
- Two 3 × 5 index cards containing name, address and telephone number of author and paper title

PROPOSALS MUST BE POSTMARKED NO LATER THAN October 1, 1988

NARST News	June 1, 1988
First Call for Proposals for 1989	June 1, 1988
NARST Annual Meeting	
NARST News Submission Deadline	August 1, 1988
NARST News	September 1, 1988
Second Call for Proposals for 1989	September 1, 1988
NARST Annual Meeting	
Deadline: Submission for	September 15, 1988
Outstanding Paper and Practical	
Application Paper Awards	
Deadline: Proposals for 1989	October 1, 1988
NARST Annual Meeting	
Fall Board Meeting (Little Rock)	November 4, 5, 1988
NARST News Submission Deadline	November 1, 1988
NARST News	December 1, 1988
Payment of 1989 Dues	January 1, 1989
Deadline: Nominations for	January 15, 1989
Distinguished Contributions to	
Science Education Research	
Award	
Elections Ballots Distributed	January 7, 1989
Return of Ballots	February 7, 1989
NARST News Submission Deadline	February 1, 1989
NARST News	March 1, 1989
Deadline: Pre-Registration for	March 15, 1989
NARST Annual Meeting	
AERA Annual Meeting	March 27-31, 1989
(San Francisco)	
NSTA Convention (Seattle)	April 6-9, 1989
NARST Annual Meeting	March 30-April 1, 1989
(San Francisco)	
NARST News Submission Deadline	May 1, 1989

University of Cincinnati
Cincinnati, OH 45221-0002

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Drake University
Des Moines, IA 50311