FG02-03ER25555 Project Title: Workshop on Women of Applied Mathematics: Research and Leadership Final Report, September 2004

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Executive Summary

We held a two and a half day workshop on *Women of Applied Mathematics: Research and Leadership* at the University of Maryland in College Park, Maryland, October 8–10, 2003. The workshop provided a technical and professional forum for eleven senior women and twenty-four early-career women in applied mathematics. It consisted of research symposia and panel discussions on career development. Each participant committed to an outreach activity and publication of a report on the workshop's web site. The final session of the workshop produced recommendations for future action.

Background and Motivation

To address the crucial need for women as role models and leaders in the profession, we held a two and a half day workshop entitled *Women of Applied Mathematics: Research and Leadership* at the University of Maryland on October 8–10, 2003. This conference brought together outstanding women leaders in applied mathematics with women in the early stages of their careers (5–12 years beyond the Ph.D.) who are poised to become the leaders of the future.

Workshop Objectives

The goal for this workshop was to enable women mathematicians who have already launched their careers to get mentoring and build networks that will enable them to become strong leaders and role models. The workshop addressed two objectives:

- To provide advice and guidance to women who are a few years past the postdoctoral stage and are now facing new challenges as they transition to positions beyond entry-level.
- To provide networking among applied mathematicians who have become, or are striving to become, leaders in their fields.

Participants

Senior Participants (positions are as of the dates of the workshop)

- Marsha Berger, Professor, Computer Science Department; Deputy Director, Courant Institute, New York University
- Lisa Fauci, Professor, Department of Mathematics, Tulane University; Associate Director, Center for Computational Science at Tulane and Xavier Universities, New Orleans, Louisiana
- Barbara Keyfitz, Professor, Department of Mathematics; John and Rebecca Moores Professor, University of Houston, Texas

- Maria Klawe, Dean, School of Engineering and Applied Science; Professor, Department of Computer Science, Princeton University, New Jersey
- Deborah Lockhart, Program Director, Applied Mathematics Program, National Science Foundation, Arlington, Virginia
- Joyce R. McLaughlin, Professor and Ford Foundation Professor, Department of Mathematical Sciences, Rensselaer Polytechnic Institute, Troy, New York
- Linda Petzold, Professor, Department of Mechanical and Environmental Engineering and Department of Computer Science; Director, Computational Science and Engineering Program, University of California, Santa Barbara, California
- Cynthia A. Phillips, Distinguished Member of Technical Staff, Discrete Algorithms and Math Department, Sandia National Laboratories, Albuquerque, New Mexico
- Dianne P. O'Leary, Professor, Department of Computer Science and Institute for Advanced Computer Studies (UMIACS), University of Maryland at College Park (co-organizer)
- Mary Wheeler, The Ernest and Virginia Cockrell Chair in Engineering; Professor, Departments of Mathematics, Aerospace Engineering and Engineering Mechanics, and Petroleum and Geosystems Engineering; Director, The Center for Subsurface Modeling, The University of Texas at Austin
- Margaret Wright, Silver Professor and Chair, Computer Science Department, Courant Institute, New York University

Early-Career Participants

- Lisette DePillis, Associate Professor of Mathematics and Co-Director for the Center for Quantitative Life Sciences, Harvey Mudd College, Claremont, California
- Karen Devine, Principal Member of Technical Staff, Discrete Algorithms and Mathematics Department, Sandia National Laboratories, Albuquerque, New Mexico
- Lori A. Freitag Diachin, Research Program Manager, Lawrence Livermore National Laboratory, Livermore, California
- K. Renee Fister, Associate Professor of Mathematics, Murray State University, Murray, Kentucky
- Holly Gaff, Research Scientist, Dynamics Technology, Inc., Arlington, Virginia
- Maria Gordina, Assistant Professor, Department of Mathematics, University of Connecticut, Storrs, Connecticut
- Laura K. Gross, Assistant Professor of Applied Mathematics, University of Akron, Ohio
- Gwendolen Hines, Assistant Professor of Mathematics, University of Nebraska, Lincoln, Nebraska
- Kathleen Hoffman, Assistant Professor, Department of Mathematics and Statistics, University of Maryland, Baltimore County
- Naira Hovakimyan, Associate Professor, Department of Aerospace and Ocean Engineering, Virginia Polytechnic Institute & State University, Blacksburg, Virginia
- Misha Kilmer, Assistant Professor, Department of Mathematics, Tufts University, Medford, Massachusetts

- Sandra Kingan, Assistant Professor, Department of Mathematical and Computer Sciences, Penn State Harrisburg, Middletown, Pennsylvania
- Tamara Kolda, Principal Member of Technical Staff, Computational Sciences and Mathematics Research Department, Sandia National Laboratories, Livermore, California (co-organizer)
- Rachel Kuske, Associate Professor of Mathematics, University of British Columbia, Vancouver
- Sabine Le Borne, Assistant Professor, Department of Mathematics, Tennessee Technological University, Cookeville, Tennessee
- Sharon Lubkin, Associate Professor, Biomathematics Program, Department of Mathematics and Statistics, North Carolina State University, Raleigh, North Carolina
- Maeve L. McCarthy, Associate Professor, Department of Mathematics & Statistics, Murray State University, Murray, Kentucky
- Lois Curfman McInnes, Software Engineer, Mathematics and Computer Science Division, Argonne National Laboratory, Argonne, Illinois
- Jodi Mead, Assistant Professor, Department of Mathematics, Boise State University, Boise, Idaho
- Sue Minkoff, Assistant Professor, Department of Mathematics and Statistics, University of Maryland, Baltimore County
- Shari Moskow, Associate Professor, University of Florida, Gainesville, Florida
- Suely Oliveira, Associate Professor member of AMCS (Applied Mathematics and Computational Science) program, University of Iowa, Iowa City, Iowa
- Konstantina Trivisa, Assistant Professor of Mathematics, University of Maryland at College Park
- Carol Woodward, Group Leader, Numerical Methods Group, Center for Applied Scientific Computing, Lawrence Livermore National Laboratory (LLNL), Livermore, California

The Workshop Format

The sessions of the workshop were roughly equally divided between research presentations (30 minute talks by the junior and senior participants) and leadership sessions, including talks, panel discussions, brainstorming sessions, and informal mentoring activities. Communal breakfasts and lunches provided opportunities for continuing the discussions.

The leadership sessions were:

- Keynote Address — Women of Applied Mathematics: Research and Leadership (Tamara Kolda and Dianne O'Leary)
- Panel 1 — Becoming a senior researcher or project leader: How to write proposals, manage budgets, attract students, and build teams (Deborah Lockhart, Linda Petzold, Cynthia Phillips, and Chuck Romine)
- Panel 2 — How to merit promotion: Setting priorities and taking action (Marsha Berger, Lisa Fauci, Rachel Kuske, and Lori Frietag Diachin)
- Panel 3 — The administrative track: Becoming a department vice-chair or chair, a dean, or a manager (Marsha Berger, Lisa Fauci, Maria Klawe, Margaret Wright)

- Panel 4 — Leading and serving the profession: Becoming a journal editor, or an elected officer in a professional society (Barbara Keyfitz, Joyce McLaughlin, Mary Wheeler, and Margaret Wright)
- Panel 5 — Mentoring younger colleagues: How to guide students, junior faculty, and those you supervise (Deborah Lockhart, Linda Petzold, and Mary Wheeler)
- Panel 6 — Brainstorming session: Change through our actions and those of funding agencies. (Tamara Kolda and Dianne O'Leary)

The parallel research symposia were well attended by the participants as well as by approximately 50 members of the applied mathematics community at the University of Maryland.

Evaluation, Outreach, and Feedback

We maintain a web page for the workshop: http://www.cs.umd.edu/users/oleary/leaderworkshop. This contains information about the workshop logistics, a summary of the discussions, reports on the activities organized by the participants after the workshop, and recommendations arising from the discussions.

AWM published a report on the workshop in its newsletter (Volume 34, Number 1, Jan–Feb 2004, "Applied Mathematics Research and Leadership Workshop," K. Renee Fister and Maeve L. McCarthy, pp. 12–13).

Attendees were uniformly enthusiastic about the experience. Here are some comments from Early-Career Participants:

> The tips on how to handle grants, research, and service were most useful and finding out what people do in some of the applied areas was informative. One of the biggest things I got from this conference was that junior faculty should not neglect research in favor of other stuff. That's something worth hearing several times.
>
> I was impressed with the quality of the technical talks.
>
> The information that I obtained provided food for continuing thought.
>
> What an impressive group of people! I hope it can be done again in the future.

Here are some comments from senior participants:

> I really think the meeting was inspiring.
>
> It was a wonderful experience for me too.
>
> The workshop was really excellent—I enjoyed every minute, and once again let me thank both of you for thinking of the idea and bringing it to such a successful conclusion!

This workshop had a beneficial impact on our profession, and the status of women in it, far beyond the effect on the funded participants. Each participant committed to doing something to further women in mathematics. These projects included:

- Developing web site for information and collaborative connections for women in mathematical biology (Holly Gaff),

- Participating in the Expanding Your Horizons (EYH) conference which targets middle and high school age girls with a day long conference filled with math and science activities (Lori Freitag Diachin), and
- encouraging undergraduates to attend math student activities by rewarding them with a fee waiver for membership in the mathematics honor society Pi Mu Epsilon with a fee waiver or with a free book (Laura Gross).

In addition, AWM sponsored a workshop modeled on this one for women in core mathematics in Spring 2004 at the University of Maryland.

Recommendations

The last panel discussion produced the following list of possible ideas:

- What applied mathematicians can do:
  - Promote well-designed salary equity studies.
  - Get involved with AWM; contact Barbara Keyfitz (AWM President-Elect).
  - Negotiate well.
  - Promote "loyalty pots" to keep salary equity for faculty who do not seek outside offers. (Women are often unable to seek outside offers because of family constraints.)
  - Take advantage of opportunities (parental leave, tenure delays, etc.) without guilt.
  - Promote gender-neutral parental policies.
  - Be conscious that we are role models.
  - Organize minisymposia at professional society meetings, and invite women colleagues as well as men.
  - Encourage universities to look at the NSERC/Luce model to provide funds to hire women faculty.
  - Find ways to meet collaborators for research. For example, apply for grants to go to Banff International Research State for Mathematical Innovation and Discovery with a small group of colleagues to work on research for 1-2 weeks.
  - Be aware of other institutes like the American Institute of Mathematics (AIM) and write proposals to them.
- What professional societies can do:
  - At national meetings, schedule a brainstorming session on two-career families.
  - Reestablish and maintain the list of women in applied mathematics, or a list with searchable gender and area fields.
  - Choose some conference themes from areas where women are established experts.
  - Make sure that conference committees are diverse: gender, seniority, geography, etc. Start by filling the hardest positions first.
  - AWM: give recognition to men who have promoted diversity in organizing conferences and other activities.
- What funding agencies can do:
  - Make early career programs more flexible so that women (and men) who have had career delays due to family considerations are eligible for a longer period.

- Study productivity and career paths of male and female mathematicians to see if longevity compensates for maternity patterns. (Studies exist: Judy Myers, UBC)
- Model a program on the NSERC program in Canada: an asset for the department and a seal of approval for the woman.
- Sponsor more workshops like this one.
- Sponsor leadership training.
- Sponsor programs for women coming back from child-care commitments.
- Support a larger variety of workshops that give time for research.

Conclusions

Overall, the workshop was considered quite successful, based on the feedback on the evaluation forms, on the informal comments from the participants, and on the fact that another workshop was modeled on it. It is recommended that the DOE and other funding agencies strongly consider sponsoring similar workshops in the future. Complete information about the workshop, including final reports from all participants and summaries of the panel discussions, can be found at the workshop web page: http://www.cs.umd.edu/users/oleary/leaderworkshop.