

Women in Mathematics Society

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In November 1993, responding to the dearth of competitive employment applications from women mathematicians, senior mathematicians at the National Security Agency (NSA) sponsored the *Women in Mathematics Symposium*, a two-day workshop attended by approximately 60 female mathematicians from the U.S. academic community. Not only did the Symposium give the participants a better understanding of NSA's mission and its mathematics community, but it also enabled the academic visitors to share insights on how NSA could better attract qualified female mathematicians to its ranks. After the Symposium, the organizers continued to meet regularly to work on ways to improve NSA's outreach to colleges and universities, as well as to enhance career opportunities for women in mathematics. The original group of conference organizers grew into a vibrant group of energetic mathematicians who are now collectively known as the Women in Mathematics Society (WiMS).

In this article, we chronicle the evolution of WiMS over the last decade, and describe its outreach efforts towards the academic mathematics community.

The 1993 Women in Mathematics Symposium

Prior to the 1993 Symposium, the statistics on the number of women with advanced degrees hired in the mathematics community at NSA were not encouraging. Records from fiscal years 1987 to 1993 revealed that only 26 percent of the women hired during this time span had higher than a Bachelor's degree, compared to 61 percent of men. Furthermore, of the roughly 30 Ph.D. mathematicians hired during that time, not a single one was female.

A group of Agency mathematicians brainstormed how they could encourage applications from qualified women. Out of these sessions came the idea of holding a conference for some of the nation's top female academic mathematicians. Conference organizers hoped to give the academic participants a better idea of how mathematicians contribute to NSA's mission, and solicit advice on how to better reach women in their recruiting efforts. As planning for the conference got underway, more Agency mathematicians got involved. Looking back on the origins of the 1993 Women in Mathematics Symposium, Dr. Barbara Flinn recalls thinking that "we really could put a female face on the NSA, and that this could be a beneficial outcome."

The Symposium took place in November 1993, when approximately 60 women mathematicians from academia travelled to NSA for two days of technical talks, panel discussions, and feedback sessions. The most informative and provocative sessions of the conference were group discussions and daily feedback sessions. Academic participants shared their insights on the issues that women face in their pursuit of successful careers in mathematics, and made valuable suggestions on how the NSA

could encourage more women to pursue studies and careers in mathematics. From these discussions emerged four major themes:

1. NSA was still relatively unknown, and its role in mathematics was misunderstood by many of the external visitors.
2. Participants indicated that female mathematicians have different career concerns than men, and saw NSA employment as having a number of attractive features for women applicants.
3. The state of the job market at that time discouraged many mathematicians, not just women, from pursuit of higher education in mathematics.
4. Academic participants identified numerous inadequacies in NSA's hiring process, such as recruiters' emphasis on the military mission of the NSA, and the lack of direct contact between female NSA mathematicians and female applicants.

At the end of the two-day Symposium, the academic participants left with a better understanding of the role that mathematics plays in NSA's mission. Simultaneously, NSA was armed with information that could be used to enhance its attractiveness as an employer for women mathematicians. While there is still work to do in balancing the playing field for men and women, the numbers are more encouraging than ever. In particular, of the women mathematicians who have been hired since 1994, 38 percent hold a Doctoral degree, and 27 percent hold a Master's degree. Another sign of NSA's commitment to support the development of female mathematicians is the Women in Mathematics Society (WiMS), a group that carries on the legacy and spirit of the 1993 Symposium.

WiMS and its Mission

After the 1993 Symposium, the organizers continued meeting regularly to find ways to improve NSA's outreach to the academic community and enhance the career development of women mathematicians at the Agency. WiMS holds monthly meetings featuring technical talks given by female mathematicians. These talks were intended to give women a relaxed venue in which they could practice giving talks on their work and provide outlet for advertising and sharing the contributions of female mathematicians at the Agency. At these meetings, women have the chance to make connections with other female mathematicians, and discuss shared experiences.

As WiMS became more established at NSA, its members came up with additional ways to support women mathematicians and to contribute to the overall health of the mathematics community. One of its most successful ventures has been the MathNet program. This program matches volunteers at NSA with newly hired mathematicians in an effort to ease the transition of new hires at the Agency. Recent hires have appreciated this informal way of learning the ropes and getting a personal welcome into the Agency.

WiMS has strong ties with the academic mathematics community and sends representatives to participate in Sonya Kovalevsky Days (SK Days) at colleges and

universities. SK Days, which are named in honor of the Russian mathematician Sonya Kovalevsky, are aimed at encouraging high school girls to study advanced mathematics. The events are typically held on the campus of a college or university, and give the girls the chance to learn about new kinds of mathematics that are not usually covered at the high school level. WiMS representatives sometimes participate in SK Days by speaking about their work at NSA and encouraging the girls to consider careers in mathematics.

WiMS financially supports a number of programs for women in mathematics. For the last several years, the George Washington University Summer Program for Women in Mathematics has been funded by WiMS. During this intensive five-week program, mathematically talented undergraduate women attend seminars, take weekly field trips to facilities of mathematical interest in the Washington, D.C. area, and learn more about career opportunities and graduate study in mathematics. Similarly, WiMS has provided funding for the Carleton and St. Olaf Colleges Summer Mathematics Programs, and continues to support the Nebraska Conference for Undergraduate Women in Mathematics.

Another way that WiMS maintains contact with the academic community is by sponsoring an annual networking session at one of the nation's largest mathematics meetings. Each January, thousands of mathematicians from across the world gather for the Joint Mathematics Meetings of the American Mathematical Society and the Mathematical Association of America. The annual WiMS networking session, which usually takes place during one of the evenings of the conference, has drawn a regular following over the past several years. The session typically draws well over a hundred participants, and provides mathematicians in both government and academia the chance to socialize and keep up with the latest news in their respective fields. This past January when the Joint Mathematics Meetings were held in Baltimore, the WiMS networking session took on a special meaning by celebrating the ten-year anniversary of the 1993 Women in Mathematics Symposium. In honor of the occasion, the academic mathematicians from the 1993 Symposium were invited to attend. The session featured two technical talks and a panel discussion on women in mathematics at NSA. Some of the audience members at the session have already asked when the next special session like this will take place (they didn't want to wait another decade).

In addition to the above ventures, WiMS works jointly with another Agency program called the Mathematics Education Partnership Program (MEPP). Whereas WiMS is primarily focused on outreach activities to colleges and universities, MEPP promotes mathematics and science education at non-profit educational institutions, particularly at the K-12 level. Together, MEPP and WiMS work to provide NSA volunteers for activities such as the Mathematics Speakers Bureau, summer camps for K-12 students, summer workshops for teachers, and tutoring and enrichment activities in mathematics and science.

Through its outreach activities and contributions to NSA's mathematics community, WiMS is thriving as an organization. As more women enter the mathematics profession,

whether in government, industry, or academia, the role that WiMS plays in the development of mathematics careers will continue to be a crucial one.

About the Author

Michelle D. Wagner joined the National Security Agency in 2001 as an Applied Research Mathematician, and chairs the WiMS Outreach Committee. Her educational background include a B.S.Ed. in Mathematics and M.S. Applied Mathematics from Western Carolina University in 1992 and 1994, respectively, and a Ph.D. in Mathematics from Emory University in 1999. She was an Assistant Professor of Mathematics at University of Wisconsin-LaCrosse from 1999 to 2001.