

# Preface



Participants of the 2015 AWM research symposium

In 2011, the Association for Women in Mathematics marked its 40th anniversary with the organization's first major research symposium "40 Years and Counting: AWM's Celebration of Women in Mathematics." The extensive scientific program was a tribute to the depth and breadth of the technical contributions made by today's women mathematicians. Inspired by its success, AWM's leadership decided to make major research gatherings a regular event, thus beginning a new tradition of AWM biennial research symposia. The second conference was held at Santa Clara University in 2013. This volume is based on the third of the series, the 2015 AWM Research Symposium held at the University of Maryland.

**Table 1** 2015 AWM research symposium: the plenary lectures

Ingrid Daubechies	Applied Mathematics helping Art Historians and Conservators: Digital Cradle Removal
Maria Chudnovsky	Coloring square-free perfect graphs
Jill Pipher	Dyadic Analysis: From Fourier to Haar to Wavelets, and back
Katrin Wehrheim	String diagrams in Topology, Geometry and Analysis

The 2015 AWM Research Symposium attracted over 330 participants and showcased research of women mathematicians from academia, industry, and government. With four exciting plenary talks (Table 1) and fourteen special sessions (Table 2) on topics from across the mathematical spectrum, this conference had something for everyone. There was an air of excitement throughout the meeting as participants learned about all sorts of new advances and novel applications to other fields such as art history, biology, and computer science. Plenary lectures and special sessions had packed audiences; attendees wandered through the exhibit hall or spent time at poster sessions featuring results of recent PhDs in between talks. This volume of the new AWM Springer series commemorates the conference through a set of invited peer-reviewed contributions from special session speakers and special session organizers as well as one of the plenary speakers (Katrin Wehrheim). The volume, which includes papers based on talks from eight out of the fourteen special sessions (those starred in Table 2), reflects the broad range of mathematics presented at the conference.

**Table 2** 2015 AWM research symposium: the special sessions

Research from the “Cutting EDGE”*
Many facets of Probability*
Topics in Computational Topology and Geometry
Low-dimensional Topology*
Number Theory
Mathematics at Government Labs and Centers*
Symplectic Topology/Geometry
Recent mathematical advancements empowering signal/image processing
Algebraic Geometry
Statistics*
PDEs in Continuum Mechanics
Discrete Math (and Theoretical Computer Science)*
Mathematical Biology*
Sharing the Joy: Engaging Undergraduate Students in Mathematics*



AWM presidential award winners: Rhonda Hughes (*left*), Sylvia Bozeman (*standing up*) with first AWM president Mary Gray (*right*)



Speakers and organizers for the special session “Research from the ‘Cutting EDGE’”, from *left to right*: Kathleen Ryan, Carmen Wright, Ami Radunskaya, Candice Price, Sarah Bryant, Rhonda Hughes, Amy Buchmann, and Ulrica Wilson

A highlight of the symposium was the presentation of the first AWM Presidential Award to the co-founders Sylvia Bozeman and Rhonda Hughes of the Enhancing Diversity in Graduate Education (EDGE) program. This highly successful venture, established in 1998, was designed to increase the number of women and minorities who complete graduate school in the mathematical sciences. Participants attend an initial intensive summer program and receive extensive mentoring that continues through their first year of graduate school and beyond. To date, a total of 67 EDGE participants have obtained their doctorates in the mathematical sciences. The AWM was also honored to host a special session “Research from the ‘Cutting EDGE’” at the 2015 conference; all eight speakers in this session attended the EDGE program and have finished or are in the process of finishing their PhDs. We are pleased to have a significant EDGE representation in this volume with three papers based on talks by EDGE special session speakers Candice Price, Sarah Bryant, and Raegan Higgins, and a fourth paper whose authors include the EDGE session speaker Amy Buchmann and the current EDGE co-director Ami Radunskaya. Our editorial group benefited greatly by having EDGE graduate and special session presenter Kathleen Ryan, as part of the team.

In addition to the special session and plenary talks, the AWM symposium featured keynote speaker Shirley Malcolm, Head of Education and Human Resources Programs at the American Association for the Advancement of Science and author of “The Double Bind: The Price of Being a Minority Women in Science.” A long-time advocate for underrepresented groups in STEM, Dr. Malcolm spoke eloquently about the challenges faced by women and minorities in the mathematical sciences. Her moving speech affirmed the importance of the AWM as well as initiatives such as the EDGE program in providing the support women need as they pursue mathematical careers. More information about her presentation as well as other symposium events can be found on the symposium blog:

<https://sites.google.com/site/awmmath/home/announcements/awmsymposiumblog>

For the full symposium schedule with a list of all the talks, poster sessions, presenters, and other activities, please follow the program link on the conference’s website:

<https://sites.google.com/site/awmmath/home/awm-research-symposium-2015>



Organizer Talitha Washington (*bottom left*), keynote speaker Shirley Malcolm (*bottom middle*) and AWM presidential award winner Sylvia Bozeman (*top left*) with AWM presidents Kristin Lauter (*top middle*), Jill Pipher (*top right*), Ruth Charney (*bottom right*)

This volume opens with a part entitled *From the Plenary Talks* and consists of a survey of Floer field theory written by Katrin Wehrheim, one of the symposium plenary speakers. After that, the papers are grouped together in parts based on subject areas. For the most part, the parts correspond to special sessions with some modifications. Each paper from the special session “Research from the ‘Cutting EDGE’”, as well as a contribution from the “Mathematics at Government Labs and Centers” and the contributions by special session organizers have been placed in a part based on its content.

Part II, *Low-Dimensional Topology*, consists of three papers based on talks in the special session of the same name and a contribution by the special session organizer Elisenda Grigsby. Part III, *Mathematical Biology*, contains three papers corresponding to presentations in the “Mathematical Biology” special session and two papers written by participants from “Research from the ‘Cutting EDGE’” (one by Candice Price and the other by Amy Buchmann, Ami Radunskaya and others). Part IV, *Probability and Stochastic Processes*, is a combination of a paper co-written by Kavita Ramanan, a speaker from the “Many facets of probability” special session and a paper by “Research from the ‘Cutting EDGE’” speaker Sarah Bryant. Part V, *Statistics*, consists of three papers based on talks from the “Statistics” special session. This is followed by a *Differential Equations* part



(Part VI) that has been created for the paper by Raegan Higgins, a speaker from the “Research from the ‘Cutting EDGE’” session. The volume includes two papers from the special session “Sharing the Joy: Engaging Undergraduate Students in Mathematics” in a part of the same name (Part VII). The last part (Part VIII), *Discrete Mathematics and Computer Science*, contains three papers, each related to a different special session: a paper by Shari Wiley who talked in the special session of the same name, a paper co-authored by Carol Woodward who spoke in the “Mathematics at Government Labs and Centers” special session, and a paper co-authored by Erin Chambers, who organized the special session “Topics in Computational Topology and Geometry”.



Symposium organizers with plenary speaker and past AWM president Jill Pipher from *left to right*: Konstantina Trivisa, Magnhild Lien, Shelly Harvey, Talitha Washington, Kristin Lauter, Jill Pipher, Ruth Charney (missing: Gail Letzter)

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Talitha Washington), Jay Popham from the Springer staff, the referees who reviewed the papers, and the AWM staff including AWM Managing Director Jennifer Lewis whose hard work made both the symposium and this volume possible.

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