

Introduction



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We call ourselves Women Math Warriors. When we first gathered in 1998, only 13% of US PhDs in the mathematical sciences were awarded to American women, of which only 2% were underrepresented women [1]. We are community members of the Enhancing Diversity in Graduate Education (EDGE) Program, an American Mathematical Society “program that makes a difference” in improving diversity in the US mathematical profession [2]. In *A Celebration of the EDGE Program's Impact on the Mathematics Community and Beyond*, we report on our own program, mathematics outreach and inclusivity work, mathematics teaching, mathematics research, and mathematical lives.

In Part I, we offer a broad overview of the EDGE Program. Sarah Bryant (see editor signature for EDGE involvement) and Jessica Spott (EDGE 2018 administrative support) deliver a comprehensive summary of data, impacts, and outcomes of the EDGE Program's multifaceted approach to mentoring a diverse group of women in pursuit of advanced degrees in the mathematical sciences. The editorial board offers a photographic journey of EDGE Program participants, mentors, local coordinators, instructors, and leaders from 1998 through 2018. Farrah Jackson (EDGE 1999 participant, 2003 and 2004 mentor) and Leona Harris (see editor signature for EDGE involvement) offer an inside account of the EDGE Program's history as told by the original founders and past and present program directors. Rachelle DeCoste (EDGE 1998 participant, 2002 mentor, 2015 instructor) presents the first curated list of local, state, and national leadership positions in which the EDGE community members have served. Alejandra Alvarado (EDGE 2002 participant, 2006 mentor, 2013 instructor, 2016 local coordinator), Donatella

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Danielli (EDGE Mentoring Cluster Leader, Indiana), Rachel Davis, Zenephia Evans (EDGE 2016 Difficult Dialogues Facilitator), and Edray Herber Goins (EDGE 2016 local coordinator) discuss the positive impact the EDGE Program had on Purdue University, the 2016 host institution. In addition, the editorial board presents testimonials describing the EDGE Program's long-lasting impact on participants' lives.

In Part II, we report on mathematics inclusivity and outreach work undertaken by EDGE community members. Alejandra Alvarado (EDGE 2002 participant, 2006 mentor, 2013 instructor; 2016 local coordinator) and Candice Price (EDGE 2012 mentor) provide context and advice for the nearly half of mathematicians who seek employment in business, industry, or government either for first post-doctoral positions or mid-career pivots. Lance Bryant, Sarah Bryant (see editor signature for EDGE involvement), and Diana White argue that math circles—known for benefiting the K–12 students they serve—foster meaningful and spirited professional growth among mathematicians who heed the math circle call. Amy Buchmann (see editor signature for EDGE involvement), Yen Duong (EDGE 2010 participant), and Ami Radunskaya (EDGE 1998–2002, 2009–2011, and 2018 instructor, 2008 local coordinator, 2012–present co-director) explore the history, motivations, data, reflections, and impacts of the Women in Mathematics Symposia, a successful collection of annual, regional women-in-mathematics conferences. Rachele DeCoste (EDGE 1998 participant, 2002 mentor, 2015 instructor), founder of the Career Mentoring Workshop, examines her efforts, lessons learned, and successes in diversifying the mathematics community by way of a program targeting women completing mathematics doctorates. Gizem Karaali (EDGE 2008 instructor) reports on both positive and negative ways that mathematics faculty are asked to provide emotional labor, arguing that mentoring programs, such as EDGE, help diminish the negative and reinforce the positive.

In Part III, we provide a window into contemporary undergraduate mathematics teaching. Michelle Craddock Guinn (see editor signature for EDGE involvement) and Bradford Schleben discuss a summer academic program for US students studying in Europe and Australia that emphasizes cultural understanding and promotes mathematics as a universal language. Jill Jordan (EDGE 1999 participant) offers advice for undergraduate mathematics faculty seeking to transform student attitudes regarding inquiry-based curriculums from skepticism to enthusiasm and confidence. Carolyn Otto (EDGE 2006 participant) introduces engaging activities and assignments for a project-based linear algebra class in which the students are considered members of a “Zombie Containment Task Force.”

In Part IV, we showcase new developments in mathematics research. Jamye Curry (EDGE 2009 participant), Xin Dang, and Hailin Sang offer a new multivariate, rank-based test statistic for determining whether two samples hail from the same population. Karamatou Yacoubou Djima (EDGE 2008 participant; 2013 mentor) and Wojciech Czaja present a result on composite wavelet frames, a tool for representing data at increasingly precise resolution. Erica Graham (EDGE

2006 participant, 2010 mentor) and Ami Radunskaya (EDGE 1998–2002, 2009–2011, and 2018 instructor; 2008 local coordinator; 2012 – present Co-Director) introduce a mathematical model of deep vein thrombosis that identifies contributing factors to embolus formation, an important step for informing clinical treatment. Torina Lewis (EDGE 2008 participant) introduces a new class of periodic functions known as “geometric polygon functions” that may be useful in matroid theory. Erin Craig and Eirini Poimenidou (EDGE 2006 and 2013 local coordinator, 2002, 2014, 2016 instructor) extend Wolfram’s Rule 90 for one-dimensional cellular automata over non-abelian group alphabets and applies the finding to automata over dihedral groups. Candice Price (EDGE 2012 mentor) and Nina Fefferman discuss preliminary results exploring EDGE Program network organization metrics, establishing a foundation for understanding features essential for participant success. Kimberly Spayd and Ellen Swanson (EDGE 2006 participant, 2013 instructor) extend Hayes and LeFloch’s work by deriving a model for a three-phase flow in porous media with rate-dependent capillary pressure, research that helps engineers and environmentalists understand accidental pipeline leaks contaminating soil and water supplies. Chelsea Walton (EDGE 2012, 2013, 2014, 2015 instructor) delivers an engaging introduction to noncommutative algebra appropriate for advanced undergraduate and graduate students.

Finally, in Part V, we tell engaging mathematical stories about some EDGE community members’ lives. Karoline Pershell’s (EDGE 2003 participant, 2008 mentor) narrative of her post-PhD trajectory, including a leap from academe into public, private, and not-for-profit work, demonstrates the value of an ongoing self-reflection in defining personal success. Carla Cotwright-Williams (EDGE 2001 participant, 2005 mentor) examines how her childhood in a service-oriented family set her on a course for a public-service career as a mathematician at the US Social Security Administration and the NASA Ames Research Center. Carol Wood (EDGE 2004 instructor) draws on her experiences teaching EDGE students to discuss the challenges of finding a just-right balance between encouraging and preparing students to succeed in mathematics.

As publishing this volume was an it-takes-a-village endeavor, we have many people and organizations to thank, including Ami Radunskaya for suggesting that we edit this volume; Sylvia Bozeman, Rhonda Hughes, Ulrica Wilson, Ami Radunskaya, and Raegan Higgins for the ongoing inspiration and EDGE Program leadership; EDGE Program sponsors for generously providing us financial and moral support (see <https://www.edgeforwomen.org/our-sponsors/>); Dimana Tzvetkova at Springer for the early encouragement and ongoing assistance; Dahlia Fisch at Springer for the assistance in the final stretch; anonymous peer-reviewers for their time and expertise; allies at the Association for Women in Mathematics, the National Association of Mathematicians, and the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science; and, of course, the Women Math Warriors of the EDGE Program whose mathematics research, teaching, leadership, testimonials, and rich professional and personal lives are the subjects of this book.

“I stood at the border, stood at the edge and claimed it as central, claimed it as central and let the rest of the world move over to where I was,” [3] Toni Morrison once said in an interview about her books. Morrison’s statement captures the spirit of what we have worked to accomplish in our book. That is, we claim the EDGE Program as central and invite readers to move over to where we are. Editing this uncommon volume of papers during the Me Too and Black Lives Matter era—a period that has overlapped with a need for Marches for Science—has provided deeply meaningful work. Be inspired by the intelligent, thoughtful, and bold writing of EDGE Program community members. Then, go and affect positive change in the world.

Respectfully,

Susan D'Agostino

Editor in Chief

On behalf of the editorial board:

Sarah Bryant, Editor (EDGE 2002 participant; 2005 and 2006 mentor; 2012, 2015, 2018 instructor; 2014–2016 EDGE foundation executive director)

Amy Buchmann, Editor (EDGE 2010 participant, 2012–2014 mentor)

Michelle Craddock Guinn, Editor (EDGE 2004 participant, 2008 mentor)

Susan D'Agostino, Editor in Chief (EDGE 1998 participant)

Leona Harris, Editor (EDGE 2008 and 2018 instructor)



From left: Susan D'Agostino, Michelle Guinn, Amy Buchmann, Leona Harris, Sarah Bryant

References

1. A. M. Society, “Annual Survey of the Mathematical Sciences PhDs Awarded,” American Mathematical Society, 1998. [Online]. Available: <http://www.ams.org/profession/data/annual-survey/phds-awarded>. [Accessed 1 March 2019].
2. American Mathematical Society, “American Mathematical Society Mathematics Programs That Make a Difference 2007,” 2007. [Online]. Available: <http://www.ams.org/profession/prizes-awards/ams-supported/emp-citation2007> . [Accessed 28 February 2019].
3. T. Morrison, Interviewee, *Toni Morrison Uncensored, Princeton, NJ : Films for the Humanities & Sciences*. [Interview]. 2003.