AWM Awards Given in Baltimore

The Association for Women in Mathematics (AWM) presented several awards at the Joint Mathematics Meetings in Baltimore, Maryland, in January 2014.

Schafer Prize

The Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman was established in 1990. The prize is named in honor of Alice T. Schafer, one of the founders of AWM and one of its past presidents. Schafer passed away in September of 2009.

The 2014 Schafer Prize was presented to SARAH PELUSE, a senior mathematics major at the University of Chicago. She is hailed by the faculty there as one of the "top five undergraduates in forty-nine years". Peluse transferred to the University of Chicago in 2011 from Lake Forest College and has gone on to take a rigorous curriculum of advanced mathematics courses. In one reading course, she gave a "seminar-quality presentation at the board" each week, skillfully fielding questions on extensions and applications of the material and discussing current research. She is currently working as a research assistant to a faculty member in the area of model theory.

Peluse attended an REU at Williams College; her work there resulted in a talk and poster at the Joint Mathematics Meetings in 2012. She also attended an REU in number theory at Emory University in 2012 and 2013 and was recognized as a "true star". At Emory, she worked on problems concerning lacunary q-series, irreducible representations of SU(n) which have prime power degree, and zeros of Eichler integrals of cusp forms. This work has resulted in one published article and others submitted for publication.

Peluse is described as having impressive creativity and the capability to obtain deep understanding of sophisticated material on her own. Peluse's recommendation letters praise not only her "impressive talent" but also her motivation, saying that she is a "ferocious worker" who "has a drive…only observed in a few top people". She is viewed as a "future superstar".

In addition, MORGAN OPIE of the University of Massachusetts, Amherst, was honored as runner-up for the Schafer Prize. SHIYU (JING JING) LI of the University of California Berkeley and JESSE ZHANG of the Massachusetts Institute of Technology were awarded honorable mentions.

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Louise Hay Award

Established in 1991, the Louise Hay Award for Contributions to Mathematics Education recognizes outstanding achievements in any area of mathematics education. Louise Hay was widely recognized for her contributions to mathematical logic and her devotion to students.

The 2014 award was presented to SYBILLA BECKMANN, Josiah Meigs Distinguished Teaching Professor of Mathematics at the University of Georgia, in recognition of her vision, persistence, and leadership in enhancing the teaching and learning of mathematics in this country and beyond. Her work is based on her insight that sustainable improvement in mathematics education can only occur when the mathematical culture in the schools and the universities is "built on respect for the innate mathematical abilities that are the birthright of every student." She has worked to energize every link of this chain, from the daily challenges that teachers face in their classrooms to the highest levels of the national discussions of K–12 education.

Beckmann has made substantial contributions to Galois theory. She began her career as a Gibbs Instructor at Yale University and has been at the University of Georgia since 1988. More bravely, she taught sixth grade for a year and volunteered at another elementary school where she "started a math revolution." Her redesigned mathematics courses for prospective elementary teachers led to her highly regarded and widely adopted textbook, and she created the Mathematicians Educating Future Teachers program. She was a writer of the NCTM's Curriculum Focal Points for PreKindergarten through Grade Eight and two supplemental books. She played a significant role in writing the Common Core State Standards in Mathematics and was the lead writer on the elementary grades for the *Mathematical Education of Teachers II*.

M. Gweneth Humphreys Award for Mentorship of Undergraduate Women in Mathematics

This award is named for M. Gweneth Humphreys (1911–2006). Humphreys graduated with honors in mathematics from the University of British

Columbia in 1932, earning the prestigious Governor General's Gold Medal at graduation. After receiving her master's degree from Smith College in 1933, Humphreys earned her Ph.D. at age twenty-three from the University of Chicago in 1935. She taught mathematics to women for her entire career. This award, funded by contributions from her former students and colleagues at Randolph-Macon Woman's College, recognizes her commitment to and her profound influence on undergraduate students of mathematics.

The 2014 award was presented to WILLIAM YSLAS VÉLEZ of the University of Arizona. He is legendary for his ability to encourage women to study mathematics and pursue mathematical careers. Particularly impressive is his success in instilling confidence in first-generation and minority students who are often struggling to overcome expectations based on culture and gender. At an early stage, Vélez identifies and recruits students he believes would benefit from taking more math courses. Numerous women describe how he met with them their first days on campus and got them thinking about degree and career paths. Others gratefully express how he completely changed their academic horizon when he pulled them aside and urged them to consider graduate studies in mathematics. Many appreciate how he listened carefully to their interests and guided them to attain well-matched research experiences. He challenges his students to step out of their comfort zones so they can achieve greater success. One former student writes: "I catch myself encouraging others to obtain an education and specifically that they should consider a degree in mathematics.… I have experienced firsthand how much impact one person alone can have on a student's academic and professional life, and I hope to be to other students what Dr. Vélez was to me."

AWM Service Award

Two women were presented with the AWM Service Award, which recognizes individuals for helping to promote and support women in mathematics through exceptional voluntary service to the AWM. The award is given annually to one or two AWM members in recognition of their extensive time and effort devoted to AWM activities during the previous seven years. The 2014 awardees are TAI MELCHER of the University of Virginia and KATHARINE OTT of the University of Kentucky. They were recognized for their service as principal investigators on the NSF Sonia Kovalevsky Day grant, as well as for organizing AWM activities at the 2012 USA Science and Engineering Festival.

— AWM announcement

About the Cover

From the garden of spectrahedra

This month's cover image was suggested by Cynthia Vinzant's article "WHAT IS… a spectrahedron?" in this issue. The image was produced by Vinzant, but is based on a similar image produced by Pablo Parrilo for the article "Semidefinite representation of the k-ellipse" (*Algorithms in Algebraic Geometry*, 2008) jointly written by him together with Jiawang Nie and Bernd Sturmfels.

We asked Sturmfels to comment on it. He replied:

"Fix three general points in the plane and consider the set of all points (x,y) whose distance sum to the three given points is a certain constant d. This set is a convex curve, known as a 3-ellipse, or an ellipse with three foci. The interior of the 3-ellipse is a spectrahedron, that is, a convex set belonging to the class of objects introduced in Cynthia Vinzant's article. Such higher ellipses and their connections to optimization theory are studied in the article I wrote with Nie and Parrilo.

Spectrahedra are the feasible regions in semidefinite programming. This includes convex polyhedra,which are the feasible regions in linear programming. Both convex polyhedra and spectrahedra can be quite beautiful. While the description of convex polyhedra is based on linear algebra and combinatorics, the boundaries of spectrahedra are usually nonlinear. Their study requires some use of nonlinear algebra and algebraic geometry.

The boundary of the 3-ellipse is an algebraic curve of degree 8. It is represented by a unique (up to scaling) irreducible polynomial $P(x, y, d)$ of degree 8 in three unknowns. The diagram shows the surface $P(x, y, d) = 0$. The convex region seen in the middle is a three-dimensional spectrahedron. Slicing the surface with the horizontal plane at height d gives the planar 3-ellipse for radius d. The other branches of this irreducible surface illustrate the algebraic structure inherent in semidefinite programming."

We wish to thank Vinzant, Sturmfels, and Parrilo for assistance.

—Bill Casselman
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