Rare Double Win for Writer

It's impressive to win an MAA prize for writing an article. To win two in the same year makes people blink. MAA President Bob Devaney acknowledged the accomplishment by saying, "And yes, this is Susan's second award of the day" when he called Susan Marshall up for the second time at the MAA MathFest prize session.

Marshall won the Carl B. Allendoerfer Award and the Paul R. Halmos–Lester R. Ford Award. She had different coauthors for each winning article.

Marshall won the Allendoerfer Award, bestowed upon authors of articles of expository excellence published in *Mathematics Magazine,* for a paper she coauthored with Monmouth University colleague Donald Smith. In "Feedback, Control, and Distribution of Prime Numbers" (*Mathematics Magazine.* 86, no. 3 [June 2013]: 189–203; http://bit.ly/ZgKTGn), the pair applies the mathematical modeling technique of feedback and control to the number-theoretic mystery of how the primes are distributed.

The authors' collaboration began when they served on a search committee together and Smith, a professor of business whose training is in operations research, mentioned to Marshall, a number theorist, a differential equation that seemed to model the density of primes. The equation captures the apparent self-regulation of the primes, their seeming tendency to compensate for being too numerous in one interval by being subsequently sparser. This behavior gives the primes the appearance of a feedback and control system, and Marshall and Smith decided to investigate this resemblance further.

The paper that grew out of the pair's shared interest not only shows the derivation of the differential equation that models the density of primes, but, in the process, also gives readers a lively introduction to the theory of feedback and control.

"In this engrossing article," reads the award citation, "descriptions and arguments are interspersed with history, which serves to round out a satisfying tour through both prime density and mathematical modeling."

Marshall's other prize-winning paper also has an interesting backstory. Marshall went to graduate school with both her husband, David, and Louisiana State mathematician Alexander Perlis. At a 2010 get-together the three talked about a 2001 result, written up in the *Monthly,* about Heronian triangles. Heronian triangles are those whose side lengths and area are integers. Marshall and Perlis thought they could generalize the 2001 result to three dimensions, and they set to work.

The resulting paper, "Heronian Tetrahedra Are Lattice Tetrahedra" (*American Mathematical Monthly* 120, no. 2 [February 2013]: 140–149; http://bit.ly/1rGBOgM) won the Paul R. Halmos–Lester R. Ford Award, which recognizes articles of expository excellence published in the *Monthly.*

"Thank you again to the MAA," said Marshall upon accepting the award. "And I just want to say this is especially meaningful to share this with a very dear friend who since our grad student days together has taught me a lot of mathematics, a lot about doing mathematics, and a lot about writing mathematics."

Writing mathematics has been an iterative process for Marshall. The feedback and control paper was rejected twice, and it underwent many, many revisions before arriving at its final form. Marshall says that the paper never would have gone to press without *Mathematics Magazine* editor Walter Stromquist's enthusiastic and

From left: Alexander Perlis, Bob Devaney (twice), Susan Marshall (twice), Donald Smith.

PHOTOS: L. McHUGH

compassionate support for the project.

Marshall and Perlis's initial submission to the *Monthly* reflected both their concern about length and their perception that such a prestigious journal demands a certain formality. At the suggestion of a referee and with the help of editor Scott Chapman, however, the pair ended up reworking their terse and technical text into one that laid out concrete examples in familiar language.

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Although Marshall says the 2014 prizewinning articles make a nice track record, she doesn't claim to have mastered some magic formula for mathematical exposition. "Part of me is worried that this is all beginner's luck," she admits.

Would-be authors should expect to do lots of revisions, Marshall says, but advises that they try to shorten the process by soliciting feedback before submitting a manuscript. "Try to get someone to read it," she says. "Someone who will tell you, 'I have no idea what this word means.'"

No doubt Marshall will herself seek out readers when her latest crop of papers nears completion. She and Perlis are still studying Heronian triangles and tetrahedra, currently puzzling over how many integer placements a particular triangle or tetrahedron will have, and Marshall says Smith is cooking up a project to renew their collaboration. Marshall won't be disappointed, though, if the fruits of her next research and expository labors fail to garner her more prizes.

"I'll just be happy to get more things published," she says. "But it would be nice to get an award. So I have something to shoot for." 👍
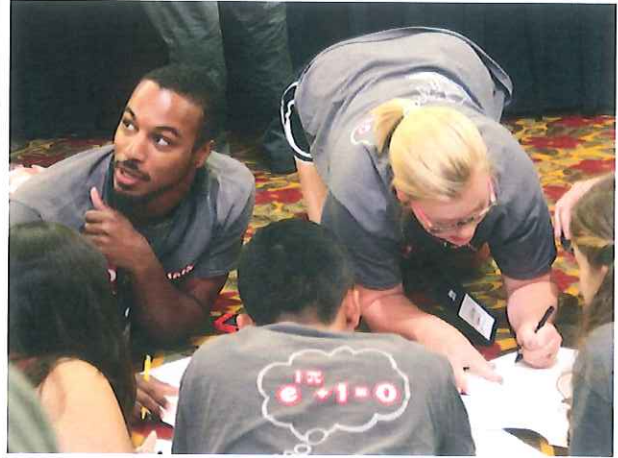
—*Katharine Merow*

> **Online Extra**
> 🖱 *Citations:* http://bit.ly/1rBzxmU *and* http://bit.ly/1xEgRf9.

Snaps at MAA MathFest

Innovative math activities kept attendees busy.

Looks like another interesting student poster session.

Keith Devlin spoke about video games and learning math.