

STUDENT CHAPTER CORNER

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Mathematics in the Sea

Laura P. Schaposnik and James Unwin, University of Illinois at Chicago

On May 4th 2019, with the help of several volunteers, we organized the fifth Sonia Kovalevsky Day for girls at the University of Illinois at Chicago (UIC), in cooperation with the AWM. As we highlighted in the preceding *AWM Newsletter*, Sonia Kovalevsky Days have been organized nationwide by AWM members for almost 30 years. Sonia Kovalevsky Days consist of a program of workshops, talks, and problem-solving competitions for female high school and middle school students and their teachers, both women and men. These days are hosted to encourage young women to continue their study of mathematics, and to introduce them to older women who could act as mentors and role models in years to come. It has been of much importance to us to create links with female principals of local schools in Chicago who are now

actively helping to promote the UIC Kovalevsky days. Together with the help of the Public School District offices, this year the registration included students from about 20 schools, and 93% of the girls registered had never been to a Sonia Kovalevsky Day before.

On the day itself, after an introduction to the AWM for the students and teachers, there was a brief presentation of Sonia Kovalevsky's achievements and the obstacles she overcame in her life. The students were then separated into groups for the activities of the day. The theme for this fifth Sonia Kovalevsky Day at UIC was Mathematics in the Sea, and the students were taught three different lessons.

Fractal Coastlines. In the mid-20th century Lewis Fry Richardson pointed out that the question "How long is the coastline of Great Britain?" has no explicit answer and can only be estimated. Indeed, a coastline typically has a fractal dimension, thus making the notion of length inapplicable, leading to the coastline paradox, which states that the coastline of a landmass does not have a well-defined length. This lesson was presented to teach the students to appreciate the appearance of fractals in nature, understand the main properties of fractals (e.g. recursion, self-similarity, scaling ratio, and scaling exponent), and introduce Richardson's theory of coastlines.

Seaweed Tangles. Seaweed naturally tangles in the ocean and provides perfect examples of knots and links appearing in nature. These tangles can be classified using different invariants. The linking number and writhe are the first numbers one can associate to knots and links. We highlighted the use of seaweed in understanding long-standing problems, for instance the Collatz conjecture. This lesson had three overall goals: Understanding the linking number of a tangle; calculating the writhe of knots; and appreciating the appearance of diverse knot theory in nature.

Geometry of Seashells. The third lesson was seashells. The natural world is a rich source of inspiration for mathematics. In particular spirals arise in seashells, flowers, and spiral galaxies, all following the same geometric principles: the beauty of nature arising from the elegance of mathematics. In this class the students learned about the Fibonacci sequence and golden ratio, and how they arise in the geometry of nautilus seashells. In particular the students constructed a Golden Spiral and compared this to seashell patterns, and were able to appreciate the appearance of mathematical structures in nature.

At the end of the day, the participants were asked to complete a short anonymous questionnaire about their experiences at the event. Interestingly, everyone agreed that they were somewhat likely to encourage their friends to

Sonia Kovalevsky Day Mathematics in the Sea

For high school girls (grades 8-12)

Organized by James Unwin and Laura Schaposnik

University of Illinois at Chicago

Saturday, 4. May 2019

10:30 a.m. to 3 p.m.



Free Lunch, T-Shirt and Prizes!
SEO, 851 S. Morgan Street - University of Illinois at Chicago
Register at <http://schapos.people.uic.edu/Sonia2019.html>
Art: Philip Longson (Daemen College)

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AT CHICAGO

attend a similar event in the future, and almost everyone said they'd like to attend future Sonia Kovalevsky Days. We also asked the students how likely they were to study math in the future, and over 50% responded as "very likely" to do so, and about 40% had not made up their mind yet. When asked about what aspects of the day they liked most, the girls mentioned the lectures as their main attraction, together with the activities done during lunch. One of the highlights of their day was the lunch time magic show presented by Lou Kauffman (from UIC's Mathematics Department). Moreover, one student mentioned that what she liked most was that



"Everyone was eager to help," which is exactly the impression one wants to transmit during these days.

The website for the 2019 event (with more photos) is <http://schapos.people.uic.edu/Sonia2019.html>. This year's event was financed through Schaposnik's start-up fund (50%) and her NSF grant (50%). Since similar events could be hosted without much difficulty at other institutions, we prepared a short note on how to organize a Sonia Kovalevsky day; see the Student Chapter Corner in the preceding issue of this *Newsletter* for some details on what needs to be done during, before and after the event.

In Memoriam

Mariangely (Mari) Castle

Mari Castle, born May 6, 1969, died on July 9, 2019. She received bachelor's degrees in mathematics and computer science from Kennesaw State University in 2003 and her PhD from Emory University in 2008. She brought joy and support to other women in the Emory mathematics program, where she was a founding member of the Emory AWM student chapter.

Upon graduation she joined the mathematics faculty of Kennesaw State University, leaving academia in 2014 to pursue work in data science at SalesLoft. Mari was involved with the Atlanta Roller Derby, where she skated under the very mathematical name Quadratic Abrasion. A tribute to her from her roller derby friends appears at https://www.facebook.com/permalink.php?id=66175306334&story_fbid=10157058635866335.

Her former professors and classmates at Emory University made a gift to AWM in her honor, saying: *We remember her laughter, strength, courage and support with this memorial gift.*

Share Your News!

Denise A. Rangel Tracy, Fairleigh Dickinson University

AWM celebrates the work and accomplishments of women throughout the mathematical sciences. You can learn about these achievements on any of our social media platforms. We are on Facebook (Association for Women in Mathematics), Twitter (@AWMmath) and most recently Instagram (awmmath). Please feel free to tag us in any relative post.

Do you know of any opportunities for or accomplishments of women in mathematics? If you do, we would love to hear about it. You can simply make a visitor post on our Facebook page. Once it's reviewed and approved it'll appear on our community page. We love pictures, too. You can send us photos of AWM-related events through our website (<https://awm-math.org>): just click on MEETINGS, scroll down a bit, and on the left you'll see the link to share a photo.

Are you a super fan of AWM who wants to help spread the news? Join our social media committee. Email Marie Vitulli at vitulli@uoregon.edu for more information.