Mitrea earns Faculty Research Award

by Greg Fornia

Irina Mitrea, Laura H. Carnell Professor of Mathematics, earned the Temple University Faculty Research Award, which recognizes excellence and major contributions in the recipient's field.

Mitrea's work has been focused on the development of a systematic treatment of second and higher-order elliptic boundary value problems using singular integral operators. With more than 60 research articles and nine collaborative monographs, "her contributions in research have been extraordinary and have established her as a leader in her field," said Miguel Mostafá, CST Dean.

Her research has been also recognized through the 2008 Ruth Michler Memorial Prize from the Association for Women in Mathematics, a Von Neumann Fellowship at the Institute for Advanced Study in Princeton in 2014, and a Simons Foundation Fellowship in 2019. Mitrea has been an American Mathematical Society Fellow since 2015.

Most recently, Mitrea has co-authored an unprecedented five-volume, 5,000-page original research monograph that creates a new track in mathematics. The monograph, titled *Geometric Harmonic Analysis*, represents more than 15 years of research at the crossroads of geometry, mathematics concerned with metric properties of the ambient space, and harmonic analysis, which studies a complex object by decomposing it into simpler building blocks and establishing patterns of behavior.

Mitrea was also profiled by Temple as one of five university women trailblazers in STEM.

> **"**In the Geometric Harmonic Analysis Series we construct new tools, reconcile structures which are characteristic to traditionally distinct branches of mathematics, and build portals between these, through which we can travel back and forth without loss of information."
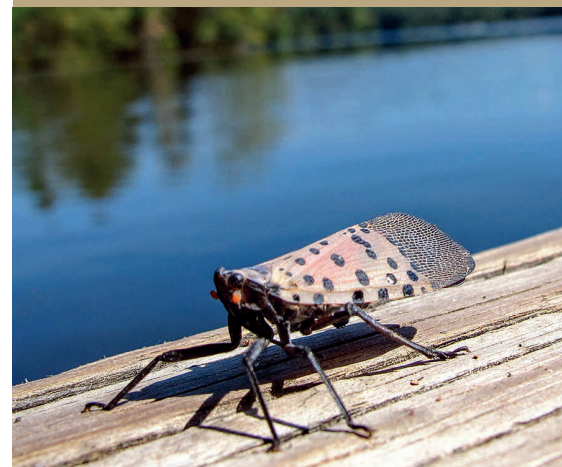
KATRINA MORGAN JOINS DEPARTMENT

by Greg Fornia

Katrina Morgan joined the Department of Mathematics as assistant professor in fall 2023. Before coming to Temple, Morgan was an NSF postdoctoral fellow at Northwestern University. She has also held a postdoctoral appointment at the Mathematical Sciences Research Institute (now Simons Laufer Mathematical Sciences Institute). She earned a PhD in mathematics from the University of North Carolina at Chapel Hill.

Morgan's main research interest is partial differential equations. "I am interested in understanding how geometry affects the behavior of waves like light and sound," explained Morgan. "Many of the questions I study are motivated by general relativity, which tells us the geometry of the universe is affected by massive objects. This in turn affects how light moves through the universe. I use techniques involving Fourier Theory to study the differential equations modeling light waves."

In 2016, Morgan co-founded Girls Talk Math, a free summer day camp for high-school students hosted annually at UNC-Chapel Hill. Students work in groups on a challenging STEM problem set and research the life and work of a scientist from a marginalized group. Student teams then produce a blog post about the math they learned and write and record a podcast about the scientist they researched. The camp expanded to the University of Maryland in 2018, Worcester Polytechnic Institute in 2022 and then to Wake Forest University in 2024.

SK DAY FOR GIRLS RETURNS

by Greg Fornia

Sonia Kovalevsky Mathematics Day for Girls (SK Day) welcomed 31 middle schoolers for a Saturday filled with fun mathematical games. The event, now in its tenth year, was last held virtually in 2021.

The program focuses on providing middle school participants with engaging mathematical instruction and mentorship by female Temple students in STEM disciplines.

The day is organized by Maria Lorenz, professor of instruction and associate chair, Beca Lufi, assistant professor of instruction, and Irina Mitrea, Carnell Professor of Mathematics. Additional support was provided by Jaclyn Lang, assistant professor, Andrew Eisenberg, assistant professor of instruction, Sophia Blakely, graduate student and Nora Melican, undergraduate student.

"Many thanks to the volunteers, high school students and teachers, undergraduate students, graduate students, and faculty, that made this day such a success," said Lorenz.

Kovalevsky was the first woman in modern Europe to obtain a doctorate in mathematics and first woman to be appointed professor of mathematics, among other firsts. The long-term goal of SK Day is to impact the way young women view mathematics as a discipline while strengthening their mathematical skills.

MODELING THE SPREAD OF SPOTTED LANTERNFLIES

by Jillian Kunze

Professor Benjamin Seibold and graduate student Jacob Woods presented at the 2024 SIAM Conference on the Life Sciences, sharing their research on mathematically modeling the spread of spotted lanternflies.

"I'll be highlighting our work with ecologists to understand the spotted lanternfly," Seibold began. "We want to understand their behavior so that stakeholders, like the U.S. Department of Agriculture, can perform interventions." Seibold created a principled mathematical model of the life cycle of spotted lanternflies to explore whether they would be able to establish themselves in particular locations given the local climatic conditions, and calibrated the model based on laboratory and field data.

Woods discussed nuanced principled models of spotted lanternfly movement that could help stakeholders determine the best methods to control them. "I'm going to be focusing on spatial spread," Woods said. "I'm really curious about the geometry of what's happening in the real world."

Contributing to the research were Biology's Matthew Helmus, Jocelyn Behm and Sebastiano De Bona as well as support from the U.S. and Pa. Departments of Agriculture. A longer version of this article originally appeared in *SIAM News* on 6/12/24, available at www.siam.org/publications/siam-news/.