# Departments

## Mathematicians Without Borders

—Michael Dorff, Nancy Ann Neudauer, and Angel R. Pineda

**Here are three different experiences** about how can you get involved with mathematics faculty and students in developing countries.

### Angel Pineda

My involvement in global outreach in mathematics began in 2008 when I was a volunteer lecturer teaching graduate numerical analysis in Cambodia. As a Honduran mathematician working in the US, I had a background that allowed me to contribute to making mathematics more accessible in the developing world. When choosing an area of service, global outreach was a natural choice.

Over the years, I have been part of several programs associated with the Commission for Developing Countries (CDC) of the International Mathematical Union (IMU). My initial in-volvement in the Volunteer Lecturer Program (VLP) led to being a co-author of a report to understand the mathematical challenges and opportunities in Latin America. As Robert Frost eloquently said, "way leads on to way," and co-authoring this report resulted in me becoming a member of the CDC from 2015–18.

As part of the CDC, I helped to coordinate multiple programs but the two of most natural interest to the MAA community are the VLP which sends volunteers to teach 3–4 week master's courses around the world and a new program, Graduate Assistantships in Developing Countries (GRAID), which provides support for graduate students in countries which have a per capita income of less than $4,400. In these countries a relatively small investment has a large impact on the students' educational opportunities. The combination of VLP and GRAID provide both opportunities for faculty to volunteer in developing countries, but also support for graduate students who would otherwise need to have full time jobs outside of mathematics while attending graduate school.

For more information about both the VLP and GRAID programs, including volunteering opportunities as well as other activities of the CDC, check out: www.mathunion.org/cdc. To support the programs of the IMU, you can make tax-deductible donations at: friends-imu.org/donate/.

### Nancy Neudauer

In early 2013, I received a very excited email from Rob Beezer of the University of Puget Sound who was teaching a course at the African Institute for Mathematical Sciences (AIMS) in South Africa. He thought I should return with him the next year to team-teach a course, and he laid out an ambitious plan whereby I would apply for the Fulbright Specialist Roster, teach a course with him, and then return the following year to AIMS Centres in other countries. There aren't enough women lecturing here, he said. He would propose our course to the Academic Director right away, if I was willing. And that's how I got to Africa.

AIMS was founded in Cape Town in 2003, with the belief that Africa houses great untapped talent. AIMS provides an intensive, year-long structured master's program arming students with advanced problem-solving skills for technical careers and for further graduate study in Canada, the United States,



*Members of GRAID committee (Daubechies, Ogana, Pineda) and supported student mentors (Ssevviiri, Tchoundja) at the International Congress of Mathematicians in Rio de Janeiro. (from left to right) Angel Pineda, Wandera Ogana, David Ssevviiri, Ingrid Daubechies, Edgar Tchoundja.*

*Nancy Neudauer with speakers hailing from eight countries at the Workshop for African Women in Discrete Mathematics at AIMS-South Africa in Muizenberg in January 2018.*



*Nancy Neudauer with students and a tutor from her course Designs, Matroids, Graphs, team-taught with Rob Beezer at AIMS-South Africa in January 2014. Photo courtesy Rob Beezer.*

Europe, and Africa. The program relies heavily on visiting lecturers, which means topics and expertise change from year to year. All classes are for three weeks; the year begins with Skills courses, including Scientific Computing and Mathematical Problem Solving, followed by several months of Review courses, which take students from the foundations of a field to research-level problems. Finally, there is an Essay Phase during which the students complete an independent project with a supervisor. In 2008, the Next Einstein Initiative was formed to establish AIMS Centres throughout Africa, so far in Cameroon, Ghana, Rwanda, Senegal, and Tanzania. Some of the locations have other components like a Research Centre, an outreach program to secondary teachers, or a special focus like biomathematics, climate science, or machine intelligence.

For me, teaching Review courses at AIMS and supervising Essay Projects was both a chance to contribute in the developing world in a way I hadn't imagined and an opportunity to work with graduate students, which was new for me. It has also helped me fulfill my dream of bringing matroids to a wider audience. I have now taught eight times at five AIMS Centres and have supervised more than 20 master's projects. In January 2018, with the support of AIMS, I organized a conference for women in mathematics in Africa. A second conference was organized by a local mathematician in July 2019 and will be followed by another in March 2020 at Stellenbosch University. I hope that these are the initial steps toward building a research community of women mathematicians in Africa.

Teaching a three-week course at AIMS (aims.ac.za/teaching-at-aims/), supervising a master's project, or coming to a conference for women mathematicians are just three ways you can get involved. Please join us in Africa.
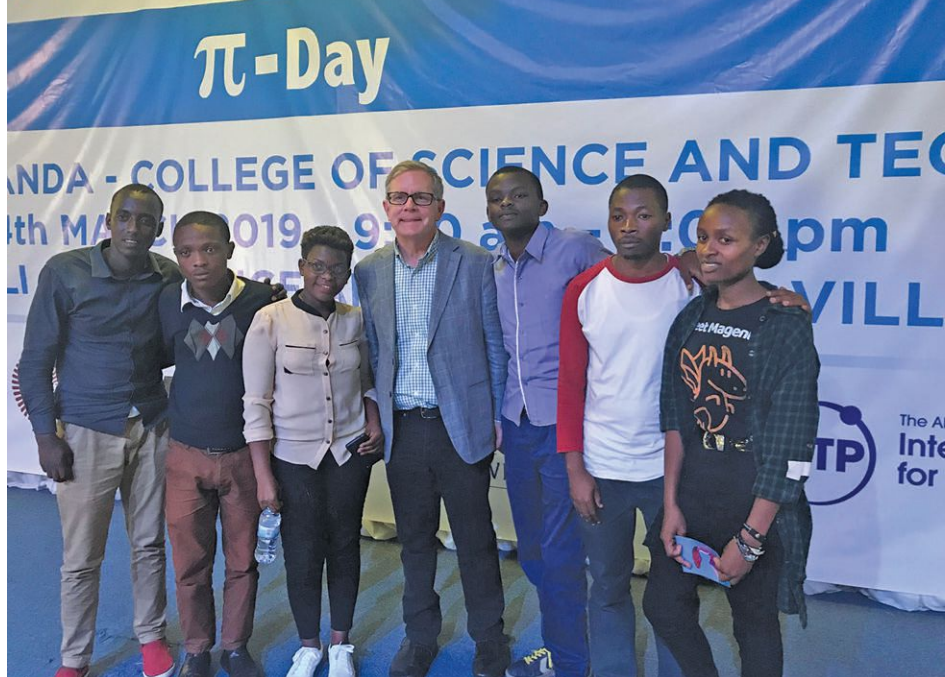
## Michael Dorff

About two years ago I was on a bus traveling in Myanmar (Burma) with a small group of mathematicians from different countries. Along the way we saw the raw and beautiful countryside, farmers dressed in traditional clothes harvesting watermelons, historic Buddhist pagodas scattered in unexpected places as if they were dropped from the clouds, and workers modernizing the road by placing freshly cut stones together on the ground like assembling a jigsaw puzzle. The bus trip was to take us to give a set of workshops in mathematics and mathematics education for faculty and students in Myanmar. A few days later we would join the main conference, the Tenth International Conference on Mathematics and Mathematics Education in Developing Countries



*Stopping to see the farmers gathering the fall harvest near Mandalay, Myanmar as we were traveling to give workshops at ICMMEDC 2017.*

(ICMMEDC 2017) attended by 800 local and regional participants with over 75% being female. At ICMMEDC 2017 I had the chance to give an hour-long talk on math, soap films, and minimal surfaces which included getting participants to come on stage to dip frames into a soap solution and see fascinating soap films that modeled minimal surfaces. The next day I spent an afternoon introducing the game SET and other math puzzles to high school students who typically only see math being taught by way of memorizing a collection of rules. ICMMEDC is interested in US mathematicians attending and giving talks, although financial support is limited. These countries are poor, and so I see my involvement as a way to support mathematicians in Southeast Asia while also getting a chance to see the area and interact with people.

In the past three years I have had the opportunity to travel to Cambodia, Laos, Myanmar, Rwanda, Ethiopia, and Mozambique to talk about math to students and faculty and to work with them on solving math problems. These trips have mixed three of my interests —mathematics, traveling, and people. I have traveled to over 40 countries both as a tourist and to attend math conferences. But these recent trips to developing countries in Southeast Asia and in East Africa are different. I get to really interact with local mathematicians



*Michael Dorff with Rwandan students at the 2019 Pi-Day math celebration with support from the University of Rwanda (UR), the African Institute of Mathematical Sciences-Rwanda, the UR-Sweden Programme, and the International Centre for Theoretical Physics.*

and students while also experiencing cultures that are different from what I am used to. In Rwanda, I stayed at the Hotel Rwanda that was the sanctuary during the 1994 Rwandan Genocide. In Myanmar, we ended the conference with an outdoor banquet with karaoke —they even got me to sing. All the while I feel like I am making a difference. In Ethiopia, three faculty, two graduate students, and I formed a complex analysis research group where we have scheduled Skype meetings to discuss our research problem followed up with a planned face-to-face meeting

next year. My trips to East Africa are funded by SIDA, the Swedish International Cooperation Agency. If you are interested in knowing about opportunities, you can contact me at mdorff@math. byu.edu. ∎

*Michael Dorff is MAA president and a professor of mathematics at Brigham Young University in Utah (mdorff@math.byu.edu). Nancy Neudauer is professor of mathematics at Pacific University in Oregon and a member of the AIMS-Cameroon Advisory Council. Angel Pineda is GRAID secretary and an associate professor of mathematics at Manhattan College in New York.*

## Talithia Williams Named Pólya Lecturer

**The MAA is pleased to announce that** Dr. Talithia Williams will be a Pólya Lecturer for 2020–2021.

Dr. Williams is Associate Dean for Faculty Development and Diversity and Associate Professor of Mathematics at Harvey Mudd College, where she develops statistical models which emphasize the spatial and temporal structure of data, applying them to real world problems. She hosts *NOVA Wonders*, a PBS mini-series that explores the biggest questions on the frontiers of science.

Described by audiences as engaging, relevant, funny, accessible, and a joy to work with, Dr. Williams captivates and inspires with her contagious enthusiasm for STEM in general and math in particular. She takes sophisticated numerical concepts and makes them understandable to a wide audience, debunking perceptions with an energizing call to "show me the data!"

For more information about having Dr. Williams lecture at your section meeting, visit maa.org/PolyaSections.