

WOMEN IN MATHEMATICS IN LATIN AMERICA

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1 Introduction

The workshop “Women in Mathematics in Latin America: Barriers, Advancements and New Perspectives” took place 21–26 August 2016 at the Mexican affiliate of the Banff International Research Station. The event was supported by BIRS-Oaxaca, CONACYT (the Mexican equivalent of NSF), the Mexican Mathematical Society (MMS), the Kovalevskaia Fund, and several other organizations. The workshop was the initiative of Dr. Lilliam Alvarez, head of the Kovalevskaia Prize Committee and the Commission on Women of the Cuban Academy of Sciences. Cosigners of the grant application to BIRS-Oaxaca were Dr. Alvarez, Dr. Gabriela Araujo (who is head of the Commission on Equity and Gender (CEG) of the MMS), Neal Koblitz, and Ann Hibner Koblitz. The Kovalevskaia Fund paid for the air tickets of the two Cuban and three Peruvian participants, BIRS-Oaxaca financed all local expenses, and the MMS, CONACYT, and the International Mathematical Union’s Committee for Women in Mathematics financed travel for most other attendees.

The forty-five participants came from Argentina, Brazil, Chile, Colombia, Cuba, Dominican Republic, Mexico, Paraguay, Peru, and the U.S. The majority were Mexican, and an effort was made to ensure a preponderance of younger women. The language of the workshop was Spanish. This was a first for BIRS-Oaxaca since the language of all other events has been English, but we thought that using Spanish was absolutely crucial for fostering open discussion. Although many of the participants are used to attending math talks in English, several of them remarked on how relieved they were to be able to converse in their own language about topics where the English vocabulary might have been unfamiliar. Many of those present, especially the younger women mathematicians, had never before talked about gender issues in mathematics, and they confessed that they would have found seminars and discussions in English uncomfortable and taxing at best.

The workshop followed a general plan of having technical talks in the morning and seminars and roundtables on gender issues in the afternoon. Speakers had been encouraged to make their morning presentations as accessible as possible. Most of them did this, and most included at least some biographical information or description of their outreach activities. Participants ate all meals together, so generally we were engaged in the subject of the workshop from about 7:30 in the morning until after 9PM. The week was absolutely exhausting but extremely stimulating, and both the CEG organizers (which included Natalia García-Colín, currently Vice President of the MMS), and the BIRS-Oaxaca staff did a wonderful job of keeping things running smoothly.

2 Presentation Highlights

We won't attempt to describe the contents of each of the thirty talks; rather, we'll be selective in our summary.

2.1 Multidisciplinary collaboration and mathematical modeling

A fascinating aspect of the conference was how many of the speakers were involved in interdisciplinary collaborations. Roxana López-Cruz, María Teresa Martín, Lucero de Teresa, Mariel Vásquez, and Victoria Hernández, among others, work with teams of biologists, medical personnel, statisticians, and physicists in mathematical modeling projects of various sorts. A consistent theme in their presentations concerned the difficulties of finding a shared language with specialists in other fields. As Dr. Hernández noted, the first order of business for an interdisciplinary group is agreeing upon a clear statement of the problem and a common understanding of the available tools and approaches. Many mathematicians expect that at least with physicists they would have few difficulties; however, even in that case speakers reported that it can be time-consuming to work out a common language. Dr. López-Cruz noted that the initial obstacles in her collaboration with epidemiologists and other health professionals were quite formidable. They wanted her to model possible scenarios for the spread of ebola and zika to Peru, and they were chagrined when she could not immediately tell them what the rate of infection would be. It took a great deal of patience on her part (and theirs) to elicit from each other the necessary information to create some plausible models. Other speakers recounted similar tales.

One potential problem that the organizers of the workshop were nervous about concerned the diversity of fields of mathematics of the participants. The fear was that, despite our request for accessible talks, people would make their presentations too technical to be intelligible to the majority of the listeners. However, there were several reasons why our worries turned out to be unnecessary. First, virtually all of the presenters gave clear, polished, down-to-earth talks with well-prepared PowerPoint slides or other visual aids (including some wonderful videos by Dr. Vásquez of knot reductions in DNA sequencing). Second, most participants were involved in some area of mathematical modeling, and the gist of such work is often relatively simple to explain, even if the math underlying the model is complicated. Finally, although participants came from a broad range of mathematical subspecialties and worked on a large variety of different problems, there were clusters of people who had long histories of joint work. Drs. Alvarez, Martín, and Vampa have coauthored papers on applications of Daubechies wavelets for more than a decade, and Drs. Vásquez and Takane have worked together on applications of knot theory to RNA and DNA. Moreover, judging from the conversations overheard at breaks and meals, some of the participants were in the process of forming the ties that could lead to further research collaboration.

2.2 Gender and mathematics

On Monday and Tuesday afternoons, Drs. Marta Ferreyra and Sara Montiel gave workshops on various aspects of gender as a part of culture. Since many of the participants had never participated in discussions on gender before, these sessions began with very basic notions of the relationship of gender stereotypes to culture in general. Among the points made were that gender is complex and contains biological, psychological, and social components. The presenters emphasized that gender is a relational rather than a fixed concept; notions of appropriate behaviors vary widely from place to place and over time.

Dr. Julia Taguëña of CONACYT noted that the organization is (finally) beginning to think in terms of “equity as well as formal equality.” Recently, CONACYT changed one of the conditions for its prize for young scientists to reflect gendered differences in life courses and responsibilities (pregnancy, child care, and elder care, for example). The maximum age for women applicants is now 43 as opposed to 40 for men—a distinction that Dr. Taguëña termed “equity rather than [formal] equality.” She also noted that there is beginning to be more cognizance in Mexico of gender differences in medical conditions and accident rates. For example, women develop more lesions

in the top third of their intestinal tract while men tend to develop lesions in the bottom third. Yet sigmoidoscopy (the less invasive, more routine diagnostic tool) only probes the bottom third. Dr. Taguëña also said that CONACYT is now offering graduate stipends for indigenous women as well as women with children.

Dr. Alvarez reminded people of a comment English-speaking feminists sometimes make about being relegated to the “Triple-A League” (as in baseball): Assistant Dean, Associate Provost, Advisor to the President, and so on. Latin American professional women, she noted, are in the “Triple-V League”: Vice Dean, Vice Director, Vice-President. And indeed, several participants gave examples of that sort of discrimination (sometimes called “the glass ceiling”) based on their own experiences.

Speakers from country after country outlined the situation of women in math in their homelands, and the picture was fairly similar: women make up about 20–45% of most math-related majors, with the percentage steadily declining as one moves up the ranks; and women receive only between 5% and 15% of available research monies in those countries with established grant-giving entities. Moreover, often national and international conferences have no women invited speakers at all, even when there are prominent women in the given specialty.

3 Outcome of the Meeting

This is not to say that the workshop participants felt discouraged and depressed, or that they portrayed themselves as downtrodden victims. To the contrary, the mood was upbeat. The women professors and students at the workshop take great pleasure in mathematics, and were extremely happy to meet others who share the same passion for their field. There is no question, however, that women mathematicians and their allies need to remain vigilant, and there was a consensus that some sort of network of women mathematicians in Latin America and the Caribbean would be a good idea. Such an organization can act as the conscience of the mathematical profession: gathering statistics by gender at all levels, ensuring that eminent women are not passed over for promotion or honors, doing outreach to bring more racial, economic, and regional as well as gender diversity to the mathematical community in future generations.

One of the pleasant surprises of this meeting was learning how much outreach is being done to attract young women into math. Speakers from Argentina, Brazil, Chile, Colombia, Mexico and the U.S. described some amazing outreach programs, and interested participants shared videos, tutorials, and lesson plans (see links below). Some of the programs are specifically aimed at young women, while others are less targeted. But all feature the enthusiastic participation of prominent women mathematicians and their students. To give just one example: the Festival of Mathematics sponsored by the Institute of Mathematics of the National Autonomous University of Mexico (UNAM) in 2015 drew 45,000 visitors in three days, and half of those were female. Moreover, 77% of the hundreds of graduate volunteers for the event were women, a fact which certainly helps put to rest the notion of math as an all-male field.

Toward the end of the week proposals for future activities and actions were discussed. As noted above, a collaborative network will certainly be formed. Other suggestions included:

- forming permanent women in math commissions in those countries that do not yet have one;
- ensuring that there is at least one session on women/gender at all national and international math meetings;
- maintaining a Facebook page;
- collecting statistics;
- having a second meeting, possibly in Chile;
- supporting the development of mathematics in the Dominican Republic;
- writing a manifesto condemning sexual harassment (especially by professors) and sexual violence between students, both of which are widespread problems in our institutions.

4 Conclusion

In sum, the organizers are extremely satisfied with the workshop, and we thank BIRS-Oaxaca for providing us with such a pleasant venue for our activities. We realize that our workshop was somewhat of a departure for BIRS-Oaxaca. First, the language of the workshop was Spanish. As noted above, this was crucial for creating the proper atmosphere to discuss issues of gender and mathematics. Second, the discussions concerned social issues related to equity in the mathematical community. Even those presenters who gave largely technical talks often mentioned their outreach activities; and many of the participants belong to institutional, regional, national, or international organizations that promote women's participation in the mathematical sciences and work to improve the gender, racial, ethnic, and economic diversity of their professional communities.

In the third place, participants were almost all women. Although we do not know the data on the proportions of women participants in past workshops, anecdotal information suggests that typically fewer than 20% of the participants have been women. We believe that a desirable short-term goal for BIRS could be to increase that to 30%, which is approximately the proportion of PhD's in the mathematical sciences granted to women in the U.S., Canada, and Mexico.

5 Useful Links

<http://www.mathunion.org/cwm/>
<http://www.birs.ca/events/2016/5-day-workshops/16w5003/videos>
<http://www.comisiondeequidadygenero.org/>
<http://www.europeanwomeninmaths.org/>
<http://africanwomeninmath.org/>

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