IMPACT OF WOMEN MATHEMATICIANS ON RESEARCH AND EDUCATION IN MATHEMATICS (18W2034)

Lillian Beltaos (Nikola Tesla Historical Society of Alberta),
Amenda Chow (York University)

March 16 – 18, 2018

1 Overview of the Field

It is well known that women in mathematics have historically been unrecognized and under represented in their significance to the field. The extent of this social and historical oversight came to light at this workshop. The eminent women mathematicians are not well known even among those who teach the material that is directly related to their work and are unaware of this failing to credit them appropriately. The purpose of this workshop was to bring forward the lives and research of some – a small number – of these women and to encourage the participants to engage in initiatives that would correct the history by giving these women a prominence in curriculum and associated courses on the topic of women in mathematics.

2 Recent Developments and Open Problems

The workshops three working groups provided an opportunity for exploring recent developments and open problems. One working group addressed the need to introduce courses that focus on women in mathematics, either through already existing history of mathematics courses or developing specific courses on women in mathematics. Finally, reaching out to history and science departments and collaborating with those departments to highlight and include the women in mathematics in appropriate courses.

Another working group focused on mentorship and collaboration in research. To this end, a new collaborative research model in mathematics, mostly geared to younger women mathematicians who are taking a leave of a year or two to raise children, to enable them to carry out ongoing research without interruption, has emerged. This new model is now being considered for implementation. It also recognized that a formal support from organizations that have access to funding beyond local levels, should be explored to further access to women in mathematics and introduce associated programs and infrastructure.

The third working group focused on promoting women in mathematics through art based activities such as role playing, music composing and creative writing including poetry and comics. Discussions on how to incorporate such an approach to traditional mathematics courses such as calculus, statistics and algebra were explored.

3 Presentation Highlights

The program included broad topics in mathematics, covering algebra, number theory, calculus, topography, statistics, math biology, physics, cryptology, graph theory and education. It highlighted, repeatedly, the challenges and opportunities that these women had to achieve to gain productive and distinguished status, at times many years later as the social fabric of the past did not open the educational opportunities for women in general. The sample of these scientists, each having their own story, clearly brings out strong and determined individuals who refused to be stopped by the blockages to their education and employment. Some used men's names to break through with their research. Some opposed their family stigmas of "girls not needing to be educated". Some experienced rejection for employment based on their gender, and were not granted degrees that they earned, for many years after completion of the program.

4 Scientific Progress Made

This workshop acknowledges the need to recognize the contributions of women in mathematics and other science-related disciplines. Some ways to do this are: developing mentorships and collaboration networks and/or designing a history of women in mathematics courses. The networking opportunities with new professional links created has been invaluable to participants for furthering research and developments.

5 Outcome of the Meeting

The workshop highlighted a need to examine, not just the past circumstances of the challenges that women have had pursuing mathematics, but also, recognizing that even today, women are underrepresented in higher education institutions as researchers and professors of mathematics. To this end, the workshop delivered a powerful message of engagement into carrying on with what has been started at the workshop by considering organizing a similar workshop in two years and assessing the impact of the workshop with identification of projects and research initiatives that will take place over this period.

References

[1] J. Fagone, *The Women Who Smashed Codes*, Harper Collins Publishers, New York, New York, 2017.

[2] K. W. Johnson, *The Neglected Giant Agnes Meyer Driscoll, National Security Agency*, Center for Cryptologic History, Ft. George G. Meade, MD, 2015.

[3] M. Dossey, *Barbara Florence Nightingale: Mystic, Visionary, Healer.* F.A. Davis Company, Philadelphia, 2010.

[4] C.A. Hobbs, *Florence Nightingale*, Twayne Publishers, New York, 1997.

[5] D.R. Cox. and N. Reid, Parameter Orthogonality and Approximate Conditional Inference, *Journal of the Royal Statistical Society*. Series B (Methodological), **49**(1) (1987), 1-39.

[6] L. Riddle, Nancy Reid, Biographies of Women Mathematicians, Agnes Scott College, Decatur, Georgia Kopell, Nancy (Interview), *Trends in Neurosciences*. **36**(6), 2013.

[7] E. Wasserman, *The Door in the Dream: Conversations with Eminent Women in Science*, National Academy of Sciences, Washington, D. C., 2000.

[8] www.simonsfoundation.org/2014/02/12/margaret-wright/

[9] Y.M. Bamberger, Encouraging girls into science and technology with feminine role model: Does this work?, *Journal of Science Education and Technology*, **23**(4) (2014), 549-561.

[10] D.E. Betz, and D. Sekaquaptewa: My fair physicist? Feminine math and science role models demotivate young girls, *Social Psychological and Personality Science*, **3**(6) (2012): 738-746.

[11] J. Berry and S. H. Picker, Your pupils' images of mathematicians and mathematics, *Mathematics in school*, **29**(2) (2000), 24-26.

[12] C. Henrion, *Women in mathematics: The addition of difference*, Indiana University Press, 1997.

[13] P. Davis, R. Hersh, and E.A. Marchisotto, *The mathematical experience*, Springer Science & Business Media, 2011.

[14] K. Piatek-Jimenez, Images of mathematicians: a new perspective on the shortage of women in mathematical careers, *ZDM*, **40**(4) (2008), 633-646.

[15] S.H. Picker and J. S. Berry, Investigating pupils' images of mathematicians, *Educational Studies in Mathematics* **43**(1) (2000), 65-94.

[16] B.A. Case and A.M. Leggett, *Complexities: Women in mathematics*, Princeton, N.J: Princeton University Press, 2005.

[17] C. Henrion, *Women in mathematics: The addition of difference*, Bloomington: Indiana University Press, 1997.

[18] P.C. Kenschaft, *Marjorie Lee Browne: In memoriam*, The Association for Women in Mathematics Newsletter, 10(5), 8-11, 1980.

[19] P.C. Kenschaft, *Black women in mathematics in the United States*, The American Mathematical Monthly, 88(8), 592-604, 1981.

[20] E.H. Luchins, and M.A. McLoughlin, *In memoriam: Olga Taussky-Todd*, Notices of the American Mathematical Society, 43(8), 838-847, 1996.

[21] J. Mendaglio, *Remembering Maryam Mirzakhani*, Gazette: Ontario Association of Mathematics, 56(2), 22-23, 2017.

[22] M. Mirzakhani, *Interview with research fellow Maryam Mirzakhani*, In Annual Report 2008 (pp. 11-13). Cambridge, MA: Clay Mathematics Institute, 2008.

[23] M.A. Murray, *Women becoming mathematicians: Creating a professional identity in post-World War II America*, Cambridge, Mass, MIT Press, 2000.

[24] O. Taussky-Todd, *An autobiographical essay: The truth, nothing but the truth but not all the truth.* In D.J. Albers and G.L Alexanderson, (Eds.), Mathematical People (pp. 310-336). Boston: Birkhaeuser, 1985.