May 12 Birthday Celebration in Memory of

Maryam Mirzakhani

awarded Fields Medal in Mathematics in 2014

Florence Nightingale

elected to British Royal Statistical Society in 1858

On May 12, Wake Robin will join a worldwide celebration of the birthdays of two notable women mathematicians. Although we can not gather to cut cake, birthday cupcakes will be a dessert choice for residents, and will be provided to staff in recognition of everything they all do, in every department, for our health and well being.

mbruskai@gmail.com

The Fields Medals, considered the highest honor in mathematics, are awarded every four years to four mathematicians under the age of forty. In 2014, **Maryam Mirzakhani** became the first and only woman Fields Medalist. Three years later, at the age of forty, she passed away from breast cancer. Shortly before the 2018 Fields Medals were awarded, a resolution was passed to honor her by establishing May 12 as a Global Celebration of Women in Mathematics. In 2019, the first celebrations were held in

- Iran (her native country), Israel, and Turkey (4 events)
- India (3 events), Indonesia, Nepal, the Philippines, Thailand, and Australia (12 events)
- Seven countries in Africa
- Twelve countries in Europe with 29 separate events
- Canada (8 events), the USA (6 events), and Mexico (5 events)
- Six countries in Central and South America with 24 events, including 12 in Brazil.

A collection of memorial articles in the November, 2018 issue of the *AMS Notices* includes a fascinating account of her education written by Roya Beheshti, a close friend and classmate. Maryam was born in 1977, shortly before the Iranian revolution closed universities and limited women's rights. She began middle school near the end of the Iran-Iraq war. She and Roya attended a special combined middle/high school for gifted female students in Tehran, and participated in summer workshops in mathematics. They were the first women to make the Iranian team in the International Math Olympiad. Roya won a silver medal in 1994; Maryam won a gold medal in 1994 and again in 1995 (with a perfect score).

In 1999, six students from Sharif University went to the U.S. for graduate work in math; Maryam went to Harvard and Roya to MIT. After receiving her PhD from Harvard in 2004 and doing postdoctoral research at Princeton for four years, Maryam became a Professor at Stanford.

Iran has a long tradition of appreciation for higher education. Despite revolution, war, and economic sanctions, there were people in Iran who cared enough about mathematics, science and education to find the resources to nurture Maryam Mirzakhani's extraordinary mathematical talent. Her Fields Medal was front-page news in Iran. When her death was also front-page news, they honored her by using a photo which showed her, as she preferred, without a headscarf.

May 12, 2020 is the bicentennial of the birth of **Florence Nightingale**. She was educated at home by her father, a wealthy landowner, and by tutors. Over the strenuous objections of her mother, Florence's father granted her desire to study mathematics. J.J. Sylvester* was one of her tutors. As a young woman, she taught children arithmetic, geometry and algebra, trying to pique the interest of girls with questions like "How far is [your home] from the Equator? How far do you walk to school? How long would it take you to walk to the Equator?"

The Crimean war gave Florence her longed for opportunity to work in a hospital, where she documented the deplorable conditions that led to 20 times more deaths from disease than from injuries in battle. Upon her return, she began her lifelong quest to reform health care, first in the military and then throughout England.

Although data collection goes back centuries, effective statistical analysis of data did not begin until the mid-nineteenth century, with the work of Adolphe Quetelet in Belgium. In addition to using probability theory to analyze statistics, he advocated the then-controversial idea of using statistics to study and affect social phenomena. Nightingale was profoundly influenced by his work, which provided the tools she needed to analyze the data she had collected.

As one of her biographers wrote "analysis of tabulated facts on sanitation and on the conduct of public affairs were to her a lever for overcoming the inertia of the legislative mind, of smugly buttressed officialdom, and of an amorphous public conscience." However, data and statistics alone were not enough to achieve this. She pioneered the use of colorful graphic tools (such as pie charts and histograms) to represent statistical data. This enabled her to convince Queen Victoria and others of the need for medical reform.

In 1858, her work was recognized by election to fellowship in the British Royal Statistical Society. In 1874, the American Statistical Association elected her an honorary member.

Her work in statistics was not confined to England, or to health care. She worked on sanitary reform in India, was a consultant to the U.S. army during the civil war, and estimated the time required to transport the sick by dog sled in Canada. She also studied the impact of colonialism on indigenous people, and the impact of social class on health.

Florence Nightingale is well-known for founding, and establishing a training program for, the profession of nursing. She is less well-known for her equally important ground-breaking work in the use of statistical analysis to understand and combat the spread of infectious disease.

We really need women like her today. After listening to a political speech, she wrote "I have invented a new system of Logarithms (finding the capacities of arithmetic not sufficiently extensive) to count the number of times *Imperial Majesty* occurs in the speech ...."

---

*When Sylvester was a professor at Johns Hopkins University in the 1980s, he taught and encouraged Christine Ladd-Franklin. In 1882, she became the first woman in the U.S. to publish a doctoral thesis in mathematics. However, Hopkins, which did not formally admit women students, refused to award her a PhD at that time. She continued to do research in logic and later gained prominence for her theory of color in vision. In 1926, at the age of seventy-eight, she received a PhD from Johns Hopkins University for her work done forty-four years earlier.