away, the possibility of India building and orbiting a reasonably heavy satellite with the help of the then Soviet Union was being seriously considered the details being available in the main text of this narration. The political decision was given at the level of Madam Indira Gandhi and President Leonid Brezhnev to go ahead with such collaboration. To further this, the details of the framework for this decision were worked at the level of M. G. K. Menon who had temporarily assumed charge of ISRO after the unforeseen passing away of Vikram Sarabhai and his Soviet counterpart academician Boris Petrov of the Inter-Cosmos Council. When the details of the same were conveyed by Menon to Indira Gandhi, she wanted an estimate of the financial implications within a day, so that the necessary decisions could be given. Menon in turn entrusted this responsibility to Rao who was in-charge of satellite activities and requested him to provide an estimate of the budgetary requirements to be passed on to Indira Gandhi. Taking into account the urgency of this deadline, Rao organized an emergency meeting of all the senior satellite divisional heads and requested them to prepare their portion of the budget estimates, giving them some guideline about the nature of the mission. When the final numbers were submitted by the functionaries, it added up to about Rs 60 lakhs. Rao showed me this estimate and immediately gave his reaction as to how infeasible it is to build a satellite with this budget. He said the issues of space qualified components, costing for infrastructure and testing, expenses towards travel and interaction with Soviet side and many such elements need better estimates. He said considering that there is not much time available to submit the final figures, we could convey to Prime Minister a preliminary estimate of Rs 3 crores (five times the number provided by the engineers), based partially on his experience in US and subsequently in India as well as partly from his own intuition of the scope and corresponding budgetary demands for the activities. What is striking about this exercise is the fact that when we completed this project 36 months after its initiation the final expenditure that we incurred was very close to '3 crores'. This shows his extraordinary acumen about the many facets of the programme, not the least his ability to assess the scope of activities and their budgetary implications. All through the years of my association with him these unique capabilities of making judgments on several matters of a complex programme he always excelled in. At all times, I felt a great excitement and freshness in working with him and never a moment of boredom. I am sure this was so with all my other colleagues. He also took special interest in the career of youngsters who showed promise for future growth I was a special beneficiary of this attitude in him. In a sense, many aspects of my own personal and professional life were shaped in my subsequent career not only in ISRO but also elsewhere thanks to my association with him.

Through this obituary both K.K. and G.J. pay humble tribute to this great personality who strode the space firmament like a colossus for nearly three decades and brought immense prestige not only to the space programme but also to our country making India's voice heard among all the major space-faring nations.

U. R. Rao is survived by his wife (Yashoda), one son (Madan) and a daughter (Mala).

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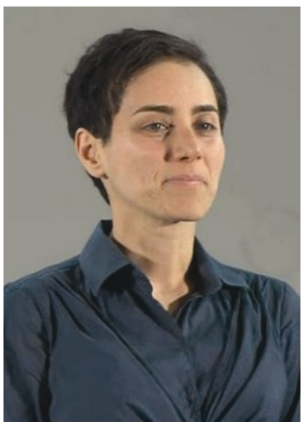
Maryam Mirzakhani (1977–2017)

Stanford mathematics Professor Maryam Mirzakhani, the first and to-date only woman mathematician to win the Fields Medal since its inception in 1936, died in USA on Friday, 14 July 2017, at the age of 40, after a four-year battle with metastatic breast cancer. Prominent mathematicians world-wide reacted to her death as follows: Peter Clive Sarnak, a mathematician at Princeton University and the Institute for Advanced Study said 'her death is a big loss and shock to the mathematical community worldwide. She was in the midst of doing fantastic work. Not only did she solve many problems; in solving problems, she developed tools that are now the bread and butter of people working in the field.' The Stanford University president, Marc Tessier-Lavigne, said 'Mirzakhani's influence would live on in the "thousands of women she inspired" to pursue maths and science.' A memorial service was held in her native Tehran, Iran. Iran's President Hassan Rouhani, who had congratulated her in 2014, released a statement expressing his great grief and sorrow: 'The unparalleled excellence of the creative scientist and humble person that echoed Iran's name in scientific circles around the world,' he further wrote, 'she was a turning point in introducing Iranian women and youth on their way to conquer the summits of pride and various international stages.'



Source: Wikimedia Commons, https://en.wikipedia.org/wiki/Maryam_Mirzakhani#/media/File:Maryam_Mirzakhani_2014.jpg

The Fields Medal is the most prestigious award in mathematics, often described as the mathematician's Nobel Prize. Mirzakhani received it in 2014 during the International Congress of Mathematicians held in Seoul, Korea at the age of 37 for 'her outstanding contributions to the dynamics and geometry of Riemann surfaces and their moduli spaces' (http://www.icm2014.org/). She is the first Iranian and first Muslim to receive the Fields Medal. Her co-recipients are also special in their own way. Artur Avila is the first South American and Manjul Bhargava is the first person of Indian origin to win the Fields Medal[1,2].

Martin Hairer is the first Austrian to be awarded the Fields Medal. During the Seoul Congress, Subhash Khot (again of Indian origin) was awarded the 2014 Rolf Nevanlinna Prize by the International Mathematical Union, for his work related to the Unique Games Conjecture, as well as for posing the conjecture itself. This was the second time that the Nevanlinna Prize was awarded to an Indian; Madhusudan had won the Prize in 2002. Mirzakhani attended the International Congress of Mathematicians held during 19–27 August 2010 at Hyderabad, India[3–5].

As a youngster, Mirzakhani wanted to become a writer. When in high school, she developed keen interest in solving mathematical problems and finding alternate proofs. She attended an all-girls high school in Tehran. As a teenager, Mirzakhani gained major international recognition by winning gold medals at the International Mathematics Olympiads held in Hong Kong (1994) and then at Toronto (1995). In the Toronto Olympiad, she notched a perfect score and another gold medal (https://www.imo-official.org/). In February 1998, a competition was held in the western city of Ahwaz, which brought together the mathematics community of the region. The bus transporting the participants from the Sharif University, Tehran, Iran, went turtle and crashed into the ravines. The crash resulted in the deaths of two bus drivers along with seven award-winning mathematicians. Providentially, the survivors included Maryam Mirzakhani! In 1999, Mirzakhani received her B S degree from the Sharif University of Technology, Tehran. Then she moved to Harvard University, USA to pursue her Ph D under the guidance of the world-renowned Fields Medalist, Curtis Tracy McMullen. Her stay at Harvard was marked by her extraordinary determination and relentless questioning. She had a serious language barrier, but that did not deter her from asking professors numerous questions in English. She noted the responses of her professors in native language Farsi (Persian). Mirzakhani obtained her Ph D in 2004. She had an Erdős number of three.

Mirzakhani was an exceedingly original mathematician, who made a host of striking contributions to geometry and dynamical systems. Her work connects several mathematical disciplines including hyperbolic geometry, complex analysis, topology and dynamics. She gained widespread recognition for her early results in hyperbolic geometry, particularly on a problem known as the prime number theorem for simple closed geodesics. Her approach led to a new proof of a conjecture that had been made by string theorist Edward Witten (1990 Fields Medalist). Witten's conjecture is a crucial result in string theory and first proved in 1992 by Maxim Lvovich Kontsevich (Institut des Hautes Études Scientifiques, Paris, France). Kontsevich was awarded the Fields Medal in 1998, in part for this proof. Mirzakhani provided a new proof of Witten's conjecture using an unexpected mathematical machinery. This led her to the study of dynamical systems associated with spaces of Riemann surfaces. It is also in this field, where she and her collaborators made fundamental breakthroughs.

Mirzakhani's Ph D thesis was a masterpiece, in which she solved two long-standing problems. 'Either solution would have been newsworthy in its own right', according to Benson Stanley Farb, a mathematician at the University of Chicago, but then Mirzakhani connected the two into a thesis described as 'truly spectacular'. This thesis resulted in three single-author papers published in the three top journals of mathematics[6–8]. The majority of mathematicians will never produce something as good, Farb said 'and that's what she did in her thesis.'

Mirzakhani's more recent work (with Alex Eskin and Amir Mohammadi) constitutes one of the most sought-after advances in the area known as Teichmüller dynamics[9]. The rigidity theorems that she proved have numerous and far-reaching applications. Mirzakhani was a Clay Mathematics Institute Research Fellow and an assistant professor at Princeton University from 2004 to 2008. In 2008, she joined the faculty of Stanford University, as a professor of mathematics and held this position until her death. According to experts, her achievements 'combined superb problem-solving ability, ambitious mathematical vision and fluency in many disciplines, which is unusual in the modern era, when considerable specialization is often required to reach the frontier'. Her honours include the 2009 Blumenthal Award for the Advancement of Research in Pure Mathematics and the 2013 Satter Prize of the American Mathematical Society. Stanford University is scheduled to organize a memorial service and an academic symposium in her honour; many other institutions are expected to hold similar functions. Mirzakhani did not live long enough to collect other awards. Six of the 18 Abel Prize laureates are Fields Medalists (http://www.abelprize.no/). Five of the ten King Faisal International Prize winners in mathematics are Fields Medalists (http://kfip.org/; see Khan[10] for details). Unlike the Fields Medal, both of these prizes do not have any age limit.

Mirzakhani's contributions inspired thousands of women to pursue mathematics and science. Her legacy will continue to inspire young girls and boys from all walks of life the world over. She is survived by her husband, daughter, parents and siblings.

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