

## MEDIA COLUMN

In addition to longer reviews for the Media Column, we invite you to watch for and submit short snippets of instances of women in mathematics in the media (WIMM Watch). Please submit to the Media Column Editors: Sarah J. Greenwald, Appalachian State University, [appalachianawm@appstate.edu](mailto:appalachianawm@appstate.edu) and Alice Silverberg, University of California, Irvine, [asilverb@math.uci.edu](mailto:asilverb@math.uci.edu).

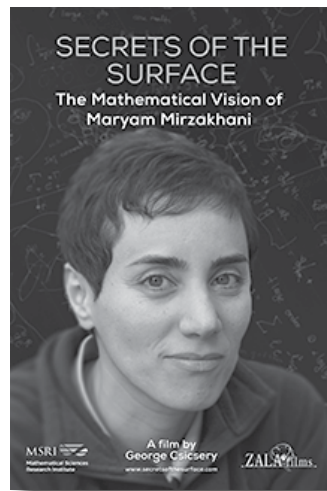
# Review of the Documentary *Secrets of the Surface: The Mathematical Vision of Maryam Mirzakhani*

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When Alice Silverberg and Sarah Greenwald asked me to review *Secrets of the Surface: The Mathematical Vision of Maryam Mirzakhani*, a movie I had seen once before and had enjoyed tremendously, I knew that the task of writing the review would not be just writing a review of a movie about some superstar—Maryam was not just another famous mathematician, and the movie is not just the story of her mathematical ideas. The movie definitely tries, and does a very good job of, explaining Maryam’s mathematical ideas, but more importantly, it paints a portrait of Maryam, the person, and as someone who knew Maryam for a long time I felt that the film was very successful at this, rather intricate, task.

The film, before the credits, opens with a group of Iranian school girls from a high school for gifted students enthusiastically discussing a problem on the board, and I remember Maryam being one of these students back in 1992—and the scene ends with one of the girls saying “There is a very good feeling behind solving the problems ... and I feel Maryam Mirzakhani could show this passion to everyone.” And that’s the sort of thing Maryam would have said too.

The movie then starts in earnest showing photos from Maryam’s childhood in Tehran. The story then progresses through Maryam’s school years, her friendship with Roya



Beheshti, her involvement with math Olympiads, her paper joint with Professor Ebad Mahmoodian while still in high school, her undergraduate years at Sharif University, a tragic bus accident that severely injured her and took the lives of seven of her friends and classmates, her move to Harvard for graduate school, meeting Jan Vondrak, her first academic position at Princeton, meeting Alex Eskin at Princeton and her work on the Magic Wand Theorem, moving to Stanford, fame, motherhood, Fields Medal, cancer, and her untimely death. The DVD contains several extra features which are worth watching:

- Space of all triangles up to similarity, by Grant Sanderson
- Negative curvature
- Pairs of pants
- Pathological foliations
- Math in Iranian architecture
- History of math in Iran.

Maryam’s story is told by her husband Jan Vondrak, her friends (most notably Roya Beheshti, Kia Dalili, and Kasra Rafi), her professors back in Iran, her advisor at Harvard, Curtis McMullen, her students and mentees, and her collaborators. There are also several animation segments narrated by Erica Klarreich throughout the movie that very nicely explain Maryam’s contributions to mathematics. Fortunately, the movie is not all mathematics. By the end of the movie, through the intimate interviews with Maryam’s friends and colleagues, one gets a sense of what a genuinely good person Maryam was, that she was a good friend, that she was funny and goofy, that she was a good mother, that she was full of life, full of energy, that she was kind, the type of person about whom towards the end of the movie Anton Zorich says, “I wish there were more mathematicians, more people like this.”

I met Maryam briefly in 1992 as a freshman in college through an introduction by Professor Ebad Mahmoodian. At the time Maryam was in 10th grade, but she and her friend Roya Beheshti already had a reputation of being very smart. Tehran is a large city, but somehow everyone knows everyone, and I kept hearing stories about this or that problem that Maryam and Roya had solved. Not surprisingly Maryam and Roya joined the math Olympiad team in 11th grade and my friends and I, as former math Olympiad team members, became their coaches. Much of what is shown in the movie, with rare exceptions, is the story of a generation of Iranian mathematicians: math Olympiad, Sharif, coaching the math Olympiad team, college math competitions, grad school

in the US or Canada, and finding jobs somewhere in the West. Maryam was the most successful of her generation, but she was not by any means an isolated case—and this is something the movie does a very good job at capturing. The movie shows that there is an actual culture of mathematics in Iran, students are excited about mathematics and young people of all genders and all socioeconomic backgrounds study it. This culture did not exist half a century ago, and many of the people who are interviewed for the movie, people like Siavash Shahshahani, Yahya Tabesh, Omid Karamzadeh, Ebad Mahmoodian, Ali Rejali, and some others, who are not featured in the movie, are responsible for creating it.

An important point that is highlighted in the movie is that, according to Roya Beheshti, professor of mathematics at WUSTL and Maryam's best friend until her death, while they were growing up in Iran there was never any negative perception about women in mathematics or science, and that she and Maryam never got any impression that math was an unfeminine profession. This is further emphasized by Cumrun Vafa (of Harvard) who says that the idea that in Iran women are on par with men in terms of abilities is not a new concept. Furthermore, Yahya Tabesh (of Sharif University in Tehran) states that more than 50% of all college students in Iran, and more than 40% of all students at Sharif University, an elite school of science and engineer-

ing in Tehran, are women. Now compare this with the following story. Six weeks into her first grade my daughter, who is now 13, told me she was not good at math. I asked her why. She said "Because I'm a girl." "What does that mean?" I asked her. She said "Girls are not good at math." I asked where she had heard that. She said "that's what everybody says." At the time I explained to her that that was not true, and told her about Maryam and Roya and the other brilliant women mathematicians I knew. Watching the movie one sees that Maryam was not the only woman in her cohort who was doing good work: throughout the movie one sees high school girls arguing over a math problem, girls winning math Olympiad medals, women being present in college math classes at Sharif, arguably the best math department in Iran, etc. It is important that this movie is shown to school girls in this country so that they see that there is at least one large country somewhere in the world where people don't think that girls are bad at math.

In the movie Hossein Masoumi Hamedani mentions in passing that Iranian women are not a privileged group, so they have had to work hard to overcome the systemic oppression imposed upon them. It is true that Maryam was perhaps subjected to less oppression because of the particular family she grew up in and the fact that her talent was discovered early on, but it might have been good if the

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## CALL FOR NOMINATIONS

### The 2022 AWM-Sadosky Research Prize in Analysis

The Executive Committee of the Association for Women in Mathematics established the AWM-Sadosky Research Prize in Analysis. First presented in 2014, the prize will be awarded every other year. The purpose of the award is to highlight exceptional research in analysis by women early in their careers. Candidates should be women based at US institutions who are within 10 years of receiving their PhD, or having not yet received tenure, at the nomination deadline.

The AWM-Sadosky Research Prize serves to highlight to the community outstanding contributions by women in the field and to advance the careers of the prize recipients. The award is named for Cora Sadosky, a former president of AWM, and made possible by generous contributions from Cora's husband Daniel J. Goldstein, daughter Cora Sol Goldstein, and friends Judy and Paul S. Green and Concepción Ballester.

Anyone can be a nominator, whether or not they are AWM members. Self-nominations are permitted. Nominations of members of underrepresented minorities are especially welcome. The nomination should include: 1) a one to three page letter of nomination highlighting the exceptional contributions of the candidate, 2) a curriculum vitae of the candidate not to exceed three pages, and 3) three letters supporting the nomination (submitted independently). Nomination materials should be submitted online at MathPrograms.org. The submission link will be available 45 days prior to the nomination deadline. Review of candidates will begin in mid-February. For full consideration, nominations should be submitted by **February 1, 2021**. If you have any questions, phone 401-455-4042, email [awm@awm-math.org](mailto:awm@awm-math.org) or see <https://awm-math.org/awards/awm-sadosky-research-prize/>

movie had explored the lives of Iranian women further. For example, it might have been appropriate to mention that even though children with Iranian fathers automatically receive Iranian citizenship, until October of 2019 her daughter Anahita was not considered an Iranian citizen. (Finally in October of 2019 a law was passed in Iran to allow Iranian mothers married to non-Iranians to pass on citizenship to their children—it is believed that the law was enacted specifically to address Anahita's case.) The Iranian society is far from utopia when it comes to equality of rights for women, and there are some places in the movie where this lack of equality is tacitly alluded to, e.g., Maryam wanting to play soccer with the boys, but I'm afraid that for the uninitiated these hints might be too subtle. Given that the DVD has an option for Persian captions, there is a chance that the director might have wanted the movie to be suitable for viewing in Iran and for it to pass through the Iranian regime's censorship machine, and that might be the reason the movie stays away from political and social issues.

The movie is extremely well-made. I am so glad that George Csicsery actually traveled to Iran to conduct the interviews. The interviewees all seemed at ease, and it felt that they trusted the director. I don't know why Maryam's parents and brothers were not interviewed, but it would have been nice if they were included. The mathematical explanations by Alex Eskin, Erica Klarreich, and Curt McMullen and the animations were very nice, and even though they were directed at the general public, they still felt accurate. The

editing was for the most part very good; only at a couple of points, for example the transition from the bus accident to applying to grad school, the transition between topics was rather hurried. The background music was the sort of instrumental Iranian music that Maryam would have enjoyed. Of the extra features, the bit about history is woefully incomplete. It feels like this segment was the parts of the interview with Hossein Masoumi Hamedani that were not used in the body of the movie. Including this segment neither does justice to the history of math in Iran, nor to Professor Masoumi Hamedani as a distinguished scholar. I was pleased to see that the movie had Persian captions, but at several points, especially during mathematical explanations, the captions could have used some editing.

I very highly recommend this movie to anyone who has an interest, even tangential, in mathematics and science. Last semester we had a viewing of the movie at UIC which was very well-received. I think this movie should be shown to high school and college students everywhere for several reasons: First, it shatters the stereotypes of women's weakness in math. Second, it is the perfect antidote to the anti-immigrant and xenophobic sentiments spewed by the White House, not only because Maryam was an immigrant but also because many of the American scientists who are interviewed in the movie are immigrants (Roya Beheshti, Alex Eskin, Peter Sarnak, Cumrun Vafa, Jan Vondrak, etc.). Finally, it reminds people that it is wrong to equate a nation like Iran with its diverse populations and complex history and culture with its government, much the same way that it is wrong to equate a country like the US with its current administration.

## **NSF-AWM Mentoring Travel Grants for Women**

**Mathematics Mentoring Grants.** The objective of the NSF-AWM Mathematics Mentoring Travel Grants is to help junior women to develop long-term working and mentoring relationships with senior mathematicians. This relationship should help the junior mathematicians to establish their research programs and eventually receive tenure. Each grant funds travel, accommodations, and other required expenses for an untenured woman mathematician to travel to an institute or a department to do research with a specified individual for one month. The applicant's and mentor's research must be in a field which is supported by the Division of Mathematical Sciences of the National Science Foundation.

**Selection Procedure.** All awards will be determined on a competitive basis by a selection panel consisting of distinguished mathematicians appointed by the AWM. A maximum of \$5000 per award will be funded.

**Eligibility and Applications.** Please see the website (<https://awm-math.org/awards/awm-grants/travel-grants/>) for details on eligibility and do not hesitate to contact us at [awm@awm-math.org](mailto:awm@awm-math.org) or 401-455-4042 for guidance. Applications from members of underrepresented minorities are especially welcome.

**Deadline.** There is one award period per year. Applications are due **February 1**.