Newsletter

The purpose of the Association for Women in Mathematics is

• to encourage women and girls to study and to have active careers in the mathematical sciences, and
• to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences.

IN THIS ISSUE

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, greenwaldsj@appstate.edu *and Alice Silverberg, University of California, Irvine,* asilverb@math.uci.edu.

Navajo Math Circles

Judith V. Grabiner, Flora Sanborn Pitzer Professor of Mathematics, Pitzer College, Claremont, CA 91711

Navajo Math Circles: A film by George Csicsery. Zala Films, with support from the Mathematical Sciences Research Institute, the Simons Foundation, Vision Maker Media, and the Corporation for Public Broadcasting. Personal-use home video $24.95; for colleges and libraries, including performance rights, $149.00. Available at www.navajomathcirclesfilm.com or from Zala Films, PO Box 22833, Oakland, CA 94609, USA.

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, greenwaldsj@appstate.edu *and Alice Silverberg, University of California, Irvine,* asilverb@math.uci.edu.

Navajo Math Circles

Judith V. Grabiner, Flora Sanborn Pitzer Professor of Mathematics, Pitzer College, Claremont, CA 91711

Navajo Math Circles: A film by George Csicsery. Zala Films, with support from the Mathematical Sciences Research Institute, the Simons Foundation, Vision Maker Media, and the Corporation for Public Broadcasting. Personal-use home video $24.95; for colleges and libraries, including performance rights, $149.00. Available at www.navajomathcirclesfilm.com or from Zala Films, PO Box 22833, Oakland, CA 94609, USA.

Navajo Math Circles beautifully and sensitively portrays the "Math Circles" approach to teaching mathematics to Navajo students in the American Southwest. The film opens with views of the spectacular landscape of Navajo country, and then focuses on a Navajo woman silhouetted there, while Dr. Henry Fowler, a Navajo who teaches mathematics at Diné College, talks about his mother and how she inspired him. Then we see her weaving Navajo geometrical patterns into a blanket, measuring with her hands. These opening scenes embody key themes of the film: that mathematics is much more than computation, that it arises from what people see and touch and value, that its patterns have beauty, and that the relationship between mathematics and Navajo culture is rich and meaningful.

As the film progresses, we see vignettes of *Math Circles*, with students working in groups, excitedly presenting solutions to problems on the board. We see the kinds of open-ended problems characteristic of Math Circle pedagogy. Here, one problem gives rise to extensions and other problems; routine computation gives way to powerful ideas and fruitful techniques; working together leads, in the words of one Navajo girl, to "bonding with each other"; and it becomes clear that there is more than one way to do things. We also see vignettes of reservation life, marked by a sense of place and a pride in Navajo culture and history. All this is conveyed by letting the people involved speak for themselves. The students, their parents, the teachers in the Math Circles, all let us know what these experiences mean to the participants.

Henry Fowler tells us on-screen how he started teaching when he had no textbooks to use. Eventually a meeting between him and Tatiana Shubin, a mathematician at San Jose State who has long been involved in Math Circles, led them to start the program for Navajo students. The film highlights not only Dr. Shubin's role in the Navajo program, but what brought her to it, including her upbringing in the former Soviet Union, her having lived in Kazakhstan and having worked with the indigenous population there, and her consequent passion for effective pedagogy and her interest in helping students with few resources become interested and successful in mathematical thinking. Near the end of the film, several Navajo students speak about how she inspired them. She has also organized Math Circles for Navajo mathematics teachers.

Besides being a compelling documentary about an unusual topic, the film has the potential to inspire many audiences. Teachers of mathematics can learn much from the scenes of the Math Circles interactive classes. Such Math Circles began in Eastern Europe in the 1930s, but now exist in Europe, Asia, and the Americas. They bring committed teachers together with students looking for new challenges and deeper understanding of mathematics. A main activity is problem solving, not by recipe but by learning to think mathematically. There is a National Association of Math Circles (see http://www.mathcircles.org/) which can help readers set up a Circle and make it work in their own communities, just as mathematics teachers in Navajo schools and mathematicians from elsewhere in the US collaborated to organize Math Circles in Navajo country, adapting the approach to benefit from and enhance the Navajo way of life.

The film is also valuable for those interested in learning more about Native Americans and their heritage. The voices of the parents and the students, and the camera's focus on the people within their homes and landscapes, embed us in their society. We watch students, whom we've already met talking about their educational goals and solving problems in geometry, engaged in day-to-day activities like running through the countryside on local paths or herding sheep. A student recites a piece of poetry, "I walk in harmony with the spirit of math."

Those working with students or adult populations of Native Americans or other ethnic or religious communities should also find the film interesting and inspiring. It lets viewers see how one can succeed at mathematics—real mathematics—without losing one's own cultural heritage. As one of the Navajo students says in the film, "You don't have to go 'somewhere' to be important. You are important where you are."

If you buy the video, you also get five very short films as bonus material: "Running in the early morning" featuring a young Navajo woman; Henry Fowler's personal obstacle-

filled story of going away to college and his mother's valedictory charge to him upon his entering Northern Arizona University; "Exile and return" about a Navajo student going to boarding school; "Language" about Diné and English and mathematics; and a nice biographical tribute to Tatiana Shubin, tracing her ideas and commitment from a school in Siberia founded by the famous Russian mathematician A. N. Kolmogorov to promoting the Navajo students' excitement as they discover mathematics.

Of special interest to AWM members is something that is never mentioned explicitly but nonetheless is obvious to viewers of the film: equal representation with respect to gender. Male and female students, fathers and mothers, male and female teachers, both Navajo and from outside universities, have equal roles in the classroom, in the wider Navajo society, and in speaking to us on camera. A Navajo teacher relates teaching shapes to young children. First they would draw a square, then draw a half circle on top of it. And then they spontaneously said, "My grandmother's hogan." The teacher then showed the way the logs, where two walls meet, come together by lacing his fingers together, and added that the nine visible fingers also symbolize the nine months of pregnancy, thus linking geometry, numbers, and mothers and grandmothers. Finally, as AWM members we should be especially proud of the role played by Tatiana Shubin in *Math Circles* in general and in the Navajo Math Circle in particular. She deserves attention and praise; some colleague should nominate her for some appropriate honor in the AWM or for the MAA's Dolciani Award.

Currently I am teaching a course called "Mathematics in Many Cultures," and when the film came to me for review, I asked for, and received, permission from the film-maker to show it to my students and a couple of colleagues. One colleague, who teaches at an Indian school in California, told me that he is going to buy the film to show his students. And my own students' comments make clear how valuable this film would be for courses in the history of mathematics. For instance, one student wrote, "I liked how much the focus was on the students, hearing their stories and how they learn. What a stark contrast there is between the open-ended questions in the math circles/camp and the regimented system of public education. Integration of culture is key, and I loved learning about the cultural context and the traditions and sayings that related most to the students. Thank you for this film."

Navajo Math Circles is suitable and instructive for a wide variety of potential audiences. It deserves to be seen and appreciated by our members, students, and colleagues.