

Is the Public Hungry for Math?

At the end of 2007 CNN compiled a list of the top news stories of the year. A third of the stories were about celebrities behaving badly (Anna Nicole Smith's death from a drug overdose, Barry Bond's steroid use, Paris Hilton's drunk driving conviction, Britney Spears's child custody battle, Michael Vick's arrest for dog-fighting, etc.). None of the stories concerned mathematics, of course, or even science or technology. Sadly, the list accurately reflects the choices the news media makes throughout the year in deciding what stories are of interest to the American public.

Call me a starry-eyed optimist, but I beg to differ.

While the director's office at the Institute for Mathematics and its Applications—which has been my headquarters for the last seven years—is admittedly not the best place to gauge the interests of John Q. Public, some of the IMA's activities and some of my own involve public outreach, and in a broad segment of the public I regularly observe curiosity about contemporary math research and how it impacts our world, and a hunger for the sort of intellectual stimulation that comes from exploring mathematics.

The IMA hosts a public lecture series called *Math Matters*. Four times a year I recruit a distinguished mathematician who is also a superb expositor and lay before him or her a daunting challenge: to get across a message about math—how exciting it is and how central a role it plays in understanding our world and shaping our lives—to a very diverse and mostly nonexpert audience ranging from high schoolers to retirees, and to do so in fifty entertaining minutes to boot. The speakers have consistently risen to the challenge and the audience for the series has steadily grown, so that it now numbers several hundred. You can view most of the lectures in the IMA's video library available from our website.

Recently my optimistic thesis received remarkable support from an unlikely source: YouTube. YouTube—for any readers of this column who are completely removed from popular culture—is a Google-owned website at which about a hundred million user-contributed videos can be viewed. In June 2007, a colleague, Jonathan Rogness, and I completed a short mathematical video entitled *Möbius Transformations Revealed* and posted it to YouTube. (You can read more about our video in an article to appear in the November 2008 issue of the *Notices*, including the little-known theorem it demonstrates.) As I write this column, the video has been viewed by about one and a half million people and joined YouTube's "Top Favorites of All Time" category. In comparison, the most popular video about Anna Nicole Smith, a brief segment from Fox News entitled *Anna Nicole Wacked Out Of Her Mind In Clown Makeup!*, was posted five months earlier but has 10% fewer viewers and does not come close in the favorites category. Perhaps the public indeed wants to hear less about naughty celebrities and more about math.

The story of how *Möbius Transformations Revealed* came into being lends further support to my thesis. About a decade ago I prepared some short animations for a graduate class I was teaching to give students a better geometrical sense of Möbius transformations (linear fractional transformations of the complex plane). Then, in January 2007, occurred a confluence of three events. First, I was contacted by a Canadian filmmaker, Jean Bergeron, who had found the old anima-

tion where I had tucked it away on the Web, and asked if I could produce it in higher resolution. He wanted to include it in a documentary he was making for Canadian television about mathematical aspects of the work of Dutch artist M.C. Escher, including Escher's use of Möbius transformations and conformal mapping, but particularly the wonderful story of the mathematical completion of Escher's *Print Gallery* by Hendrik Lenstra, reported in the *Notices* in April 2003. Second, I attended a talk by Jon Rogness on his use of high-end graphics in teaching and began a discussion with him in which he suggested we collaborate on a joint project. Third, the National Science Foundation announced an International Science and Engineering Visualization Challenge.

Jon and I decided to submit a video entry to the NSF contest. Möbius transformations were on my mind thanks to Bergeron's request, and I had recently learned a different and very visual characterization of them that reveals that the inherently 2-dimensional Möbius transformations become simpler when viewed in three dimensions. This result became the basis of *Möbius Transformations Revealed*.

Four months later we sent the completed video to the NSF challenge, where it won an honorable mention. At the same time, we posted it to YouTube, as a simple way to share the video with a few friends and colleagues. While I hoped that some others would stumble upon it and find it interesting, even at my most optimistic I would never have anticipated the response it would generate. As viewers enjoyed the video and posted comments at YouTube and in blogs, the viewing rate rose, peaking at about *three views per second* for several days. More than 4,000 comments left by viewers clearly demonstrate a hunger for math in many quarters.

When we shared the video with Jean Bergeron, the filmmaker who had contacted me five months earlier for his documentary on Escher, he was interested in incorporating part of it in his film, but it was difficult, because the film production was just about complete. He needed us to re-render a portion of the video in much higher definition on a very tight schedule. I agreed, but set a price: the U.S. premier of his film should take place at the IMA. We struck a deal.

Bergeron's brilliant documentary film *Achieving the Unachievable* was screened in Minneapolis in November 2007, following by a week its world premier in Montreal. The film was not only beautiful, but also intellectually challenging, as it explored many aspects of the mathematics in Escher's work. We made a big effort to get word about the premier out to the community and drew an audience of 700, ranging from middle school students to math professors to art collectors. They sat rapt throughout the showing, and burst into thunderous applause at the conclusion. They were clearly a public hungry for math.

The American news media certainly does not play to this public interest in mathematics. Unfortunately, for the most part, neither do we mathematicians. Whether it be one-on-one, in discussions with nonmathematicians, or by organizing events like public lectures that reach a larger audience, I hope that some readers will take up the challenge.

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