Profile

Bold and calculating

Dr. Jonathan Farley's bid to teach Hollywood about math

Jennifer Rohn 22 October 2005

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Jonathan Farley is not just a mathematician specializing in lattice theory. He also works on counter-terrorism, writes for newspapers and magazines, appears as a pundit on television and radio, and has even done a bit of stand-up comedy on the side. And most interestingly for us, he also happens to be a passionate champion of the accurate depiction of math and science in cinema.
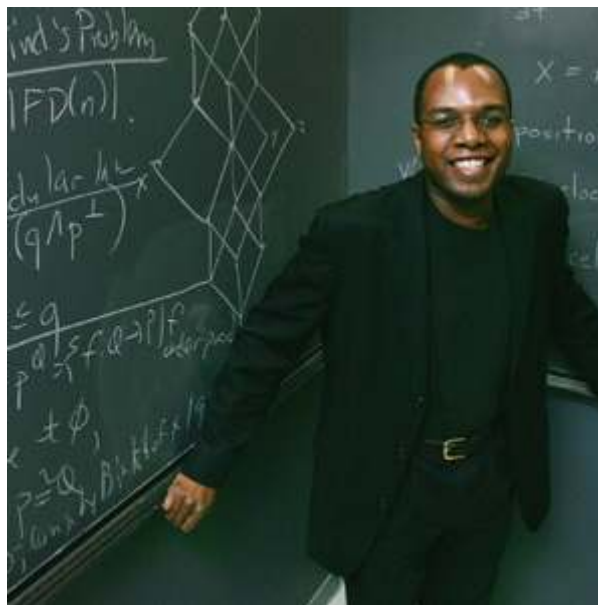
Farley has just migrated to California to take up the post of Science Fellow at Stanford's Center for International Security, after serving as a professor of mathematics at MIT. The city of Cambridge, Massachusetts may well mourn his departure. After all, it named an entire day after him last year in honor of his mathematical achievements (March 19, since you ask).

I first heard of Farley as one of the founders of Hollywood Math and Science Film Consulting (HMSFC), a company that advises screenwriters on how to incorporate realistic science into films and television drama. (His co-founder is Dr Lizzie Burns of Oxford; read LabLit**.com**'s interview here).

Farley believes that even small details enter into the equation of realistic science on screen

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HMSFC has scientists on hand to advise not only on the scientific integrity of the plot, but also on minor but still all-important details of verisimilitude: the equations scribbled in a character's notebook, say, or the dress and mannerisms of a typical professor. But the company's mission statement makes it very clear that it's possible to do this without destroying the fantasy of the story or undermining its plot. Burns says, "If you were making a period drama you'd want to make the details credible, and so a good scriptwriter should also want their science to ring true. Even non-scientists can often sense when the science isn't believable."

Obviously others agree, as HMSFC consulted for a few episodes of *Numb3rs*, the American hit television drama about an FBI agent whose mathematician brother helps him solve crimes. Farley was proactive in securing the gig, contacting the producers before the show even aired to offer his services.

"All of our suggestions went through the show's researcher, Andy Black," explains Farley. Although the program also employed another consultant, and the writers had veto power, Farley says there are hints that a few HMSFC ideas may have made the cut, even though with the way various suggestions were pooled with the other

consultant's, it is not possible to know for sure.

His accounts of these interactions serve as a fascinating insight into the fluid nature of the two-way consultation involved in tweaking a television script. For example, Black asked Farley to come up with mathematics to support a plot involving a criminal whose whereabouts were only known at certain locations and times thanks to security cameras. On another occasion, HMSFC was asked for help in sharpening some of the technical dialogue in one episode so that the character sounded more like an applied mathematician.

HMSFC also commented when certain details didn't seem right; for instance, a draft script described a professor planning to ask his student for a date, which in real life would not occur as the professor would be immediately fired. HMSFC also suggested story ideas, some of which may have influenced future episodes, such as the kidnapping of a mathematician by terrorists to help the criminals break a bank code.

There is no doubt that math is appearing more and more in films. In fact, *Math in the Movies*, a comprehensive website, lists over eighty movies with at least some math content. The site makes it clear that mathematical content and characterization of mathematicians, though prevalent on the silver screen, varies wildly in quality: "Lots of scrawled equations do not a math movie make", one reviewer comments about *A Beautiful Mind*; "To be a female mathematician you have to be ugly, neurotic, and a bad mother" is the lesson imparted by *A Hill on the Dark Side of the Moon*; "The math jokes aren't great but it's fun to hear two waves of laughter: from the people who get them immediately and those that have to wait for the playwright's explanation" observes another reviewer about the film *Proof*.

Farley isn't too impressed with the current quality of mathematicians in the movies. "None of them has been realistic," he says. "No one is like the MIT professor in *Good Will Hunting*, the younger math professor in *Proof* inaccurately described what goes on in math conferences, and *A Beautiful Mind*'s portrayal of the math world was also wrong."

I ask him about *Numb3rs*, and he replies that the string theorist character, Larry, does a good job portraying the quirkiness of mathematicians.

And why this multiplication of math on screen? Farley has speculated that all this is due to the increasing importance of numbers in our life, from PINs to identification numbers to secure encryption of our bank details. Mathematics "is what keeps us safe".

HMSFC doesn't just deal with math, as the 'S' (for science) in its name suggests. "Any project involving math or science is of interest to us," he says. "We were even contacted by someone who wanted to choreograph a dance based on the hypercube. Our first project – before we got started – involved a screenplay about the human genome, so it was in fact biology, not math."

Farley got involved with mathematics at an early age. "When I was small, my father taught me mathematics," he says. "I remember going through books (which I still have) converting from Roman numerals to [modern] numerals and vice versa. I loved doing that. But it wasn't until I was 14 that I realized I wanted to do mathematics for life."

How did this come about? "I had this epiphany when I was in school, sitting in my English literature class," he

explains. "I love literature, but that day we were filling out a questionnaire which, when we were finished, would purportedly reveal to us our ideal vocation. I answered the questions, and the results indicated that I ought to become a 'mathematician/statistician'. At the time, I (wrongly) believed that statistics was boring, so I thought of becoming a mathematician. Since my father and mother are professors (of economics and of African-American history, respectively), it never occurred to me to do anything except go into academia."

I ask Farley if he was a nerd at school. "Yes, I was nerdy," he confesses, "but not as bad as most!"

"So you think there *is* truth in the scientist-as-geek stereotype?" I want to know. "If so, might it be worse for math than for other sciences?"

"Yes, most scientists today in the United States are geeks," he replies, "at least when they are still students, and it is worse in mathematics – oh, is it worse."

Burns doesn't agree that Farley is a geek, at least in adulthood. "Well, not compared to most mathematicians I've met. He's definitely a Renaissance man! When I first met him in Oxford, he was really interested in films, TV and theatre, and I must confess to being quite surprised when he told me he was a mathematician."

This multidimensionality comes through when I ask Farley to tell me his one if his heroes. He replies, "Frantz Fanon is one of the greatest figures of the twentieth century: a revolutionary psychiatrist, an intellectual with an incisive, penetrating mind, a writer whose prose sings, even in translation, and a man of tremendous personal courage." Farley is also on record as admiring Che Guevara and Hannibal.

And then there's the stand-up comedy, which I can't resist asking about. "I have performed stand-up comedy professionally under the name 'The Notorious Ph.D.'…in London and Boston," he confirms. Is it all math-based? "I don't have mathematics jokes," he says. "Some would say I don't have jokes, which is why I retired along with the cast of *Friends*. I'm nothing compared to such talents as Silky in Oxford, Rick Jenkins of The Comedy Studio, or the ventriloquist Carla Rhodes."

After graduating with highest honors from Harvard, Farley obtained a doctorate from Oxford, did post-doctoral research at Berkeley then ultimately became a professor at MIT, with stints as a Fulbright Distinguished Scholar at Oxford and a Visiting Scholar at Harvard. I want to know more about Farley's academic relationship with math, so I ask him about his published solutions to several decades-old math problems. Were they one long slog or were there moments of pure epiphany?

"Sometimes they take years to solve; sometimes you do it in a week," he replies. "Professor Richard Stanley of MIT posed a mathematics problem in 1981. I solved this problem (my solution was published in 2005), but I worked on it for at least three years. The respected universal algebraist George Gratzer posed a problem in 1964 that I worked on for a term without success, then, two and a half years later, suddenly I saw what to do and I solved it in a week. So did the problem take me one week, or two years, with my subconscious working all the while?"

Farley is now focusing his academic efforts on countering terrorism using his mathematical specialty, lattice theory – which sounds as if it would make a splendid basis for a film.

"I started a company, Phoenix Mathematical Systems Modeling, Inc. with Stefan Schmidt," he says. "We were joined by Tony Harkin, who at the time was at Harvard. The company develops mathematical solutions to homeland security problems [in America]."

I ask if they are being taken seriously by the government. "It's hard to say," he replies. "I have been approached by program managers from the Office of Naval Research and Department of Defense, I've answered questions for people from the Naval Postgraduate School, and I was invited to speak at the Institute for Defense Analyses by Admiral Dennis Blair. We've also gotten some quite exciting media coverage."

As the interview draws to a close, I ask him how it's going with HMSFC after the initial rush of consulting for *Numb3rs*.

"Quite well," Farley says. "We can't keep up with the mail, with so many reporters wishing to interview us or people wishing to work for us. While *Numb3rs* does have its own researcher and primary consultant, most filmmakers find consultants on an ad hoc basis. The consultant for *A Beautiful Mind* was discovered after he wrote a review of the play *Proof* for an academic publication; the consultant for *Good Will Hunting* was the brother-in-law of the Harvard professor whom Matt Damon and Ben Affleck had originally approached. HMSFC has changed this way of working (I was almost going to say "shifted the paradigm," which would have required me to do penance) by providing one place Hollywood – or television – can come to for scientific consulting. We will sit back and let our reputation continue to grow."

I have two final questions. First, who is his favorite scientist character in a novel or fictional film and why? "I suppose it must be Hari Seldon, the mathematician from Isaac Asimov's *Foundation* series. He invents a science called 'psychohistory' which enables him to predict the course of human events the way a physicist can predict the results of an experiment, and he uses it to save the Galaxy."

And finally, what is the one mathematical concept he thinks every man, woman and child should appreciate?

"That 1 is not equal to 0, but if you can prove to me that it's not, I can prove to you that it is. In that lies the deepest truth of twentieth century mathematics."

Related links and information

Other publicity about Hollywood Math and Science Consulting can be found here.

Learn more about how math can fight terrorism here.

Numb3rs has finally arrived in Britain! It premiered on ITV1 at 11:00 PM on Monday, 17 October.

Jennifer Rohn is the editor of Lablit.com