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Inside:

On the cover: 2007 USAMO winners. Photo courtesy of Robert Allen Strawn

Café Scientifique
Mathematics in the Microbrewery: Fermat Meets Fermentation?

By Gene Abrams

Amathematician walks into a bar. (Do you feel a joke coming on?) Almost 200 people are there, waiting to hear what he's got to say about current hot topics in mathematics research. (Ready for the punchline?)

Hey, *no joke!*

It's clear that over the past decade there has been a significant increase in the profile of mathematics and mathematicians in the general media (witness e.g. *Good Will Hunting, A Beautiful Mind, Proof, NUMB3RS*, etc.). So it probably should not have come as a surprise to me that the general public has developed an interest in what we mathematicians do for a living. In what ranks as one of the most satisfying and rewarding opportunities of my career, I had the privilege to share some of what I do with a group of tavern-goers who were thirsting for more than just the local microbrew.

Café Scientifique has its origins in the old French Café Philosophique, a general name for a forum in which the general public would gather over wine to discuss the important philosophical issues of the day. General public gatherings to discuss the important scientific issues of the day have recent genesis in the late 1990s in Leeds, England. The oldest Café Scientifique on this side of the Atlantic started in Denver in 2003, organized by Dr. J.J. Cohen (a professor of immunology at the University of Colorado Health Sciences Center). Since then an impressive number of such monthly gatherings have sprung up throughout the world, including nearly forty active Cafés in the United States alone.

The format of the Cafés is as follows. A scientist chats for 20 to 30 minutes about some current research work in her/his field. No overheads, no Powerpoints, no video clips, just talk. (Presenters are allowed to distribute a one page sheet of pertinent information if they so choose.)

J.J. Cohen introduces a speaker at the Denver Café Scientifique. Photo by Lisa Litzenberger; used with permission.

This overview is followed by a ten minute break (to let the patrons refill their glasses), which is then followed by an hour of question and answer from those assembled.

Not certain that there would be any questions (let alone an hour's worth) from the public about mathematics in general, or about what I do in particular, it was with some trepidation that I accepted Dr. Cohen's invitation to speak about mathematics research in the March 2006 Denver Café Scientifique. The Denver Cafés are held at the Wynkoop Microbrewery in downtown Denver. Just to give some context: the February 2006 Café topic was microbes in the water supply, while the April '06 version dealt with a satellite mission to Pluto.

I decided to break my 30 minute Mathematics Research chat into three pieces: What is it,? What's the Next Big Thing,? and Why Should You Care? For the "What is it?" chunk, I described how mathematics is not unlike other traditional sciences: people do basic mathematics, just as people do basic science, as well as application-driven mathematics, which is analogous to applied science. (I purposefully avoided using the phrases "pure" and "applied" mathematics.) For the "Next Big Thing," I spent ten minutes describing some of the more famous mathematics questions (e.g. Fermat's Last Theorem and the Four Color Problem), as well as the Clay Mathematics Institute Million Dollar Prizes.

And just "Why Should You Care?" Of course we all have our own personal answers to that question. What I shared with this general audience touched first on the artistic/aesthetic side, then on the "because it's there/perseverance" side, and, finally, the "basic science becomes applied science becomes part of your daily life" side. (Here I talked about Fermat's Little Theorem, then Euler's Generalization, then RSA encryption.)

I truly had no idea what to expect when the patrons returned from the ten minute glass-refilling break for the question and

answer portion of the evening. What I got was more than an hour of interesting, well-posed, thoughtful questions from all across the mathematical spectrum. The first question was from an elderly woman who wanted to know how I got interested in mathematics in the first place. [I liked science, but hated the labs.] A middle aged gentleman then asked whether Gödel's incompleteness result affected how I approach my research. [Not really for me personally, but, for example, I have colleagues are working in areas requiring extensions of ZFC.]

I was nervous that this relatively high-brow question about mathematical logic might stifle additional questions. Just the opposite! This question was followed by a constant stream of inquiries about such topics as:

• what I personally do research-wise [an area called Leavitt path algebras which combines graph theory with algebraic structures]

• whether mathematicians use computers in their research [not me personally, but computers have played a role in many branches of mathematics; I referred back to the Four Color Problem]

• what role math researchers can play in K–12 math education [training of teachers, working directly with K–12 students, and discussion of appropriate curricular topics]

• what Fibonacci numbers are, and where they come up in real life [spirals in nature]

• whether mathematics is discovered or invented [I think the former, but at least a few of my coauthors argue compellingly for the latter]

• what the status of the Poincaré conjecture is [a discussion of Perelman, the Fields Medal, and more about the Clay Mathematics Institute].

By the way, the Poincaré question was asked by a young man who identified himself as a high school student. I would guess there were at least a few dozen kids from this age group in atten-
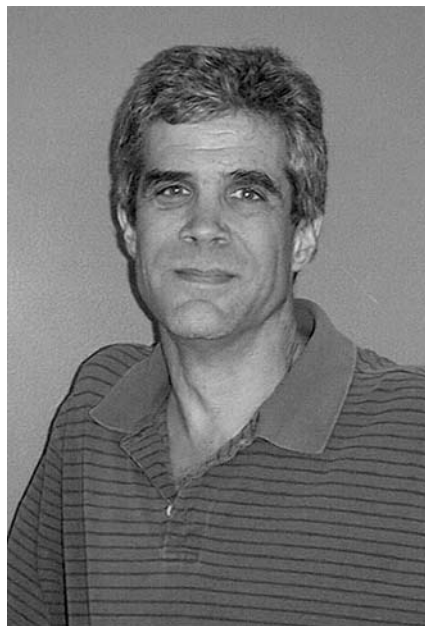
Photo of Gene Abrams used on the Café Scientifique web site to promote his talk.

dance! (Under Colorado law, minors are allowed to be in a tavern as long as there is food served in the establishment as well.) These high school aged students really served as a nice addition to the discussion.

And so it went for nearly 90 minutes. Finally Dr. Cohen had to politely end the session. A few people came up to me afterwards to ask more questions, and to share some of their personal experiences with mathematics in school (some good, some not so good). A beautiful end to the evening came when the previously mentioned elderly woman introduced herself to me, then told me that my passion for mathematics left her wanting to learn more about both mathematics and mathematicians. She then turned to my wife and asked "…is he that much fun at home!?"

As my wife and I drove home that night I had a sense of overwhelming reassurance that the general public is truly interested in what we mathematicians do, and how we go about doing it. Since the Denver presentation I have had the opportunity to do two more Cafés Scientifiques (at the Phantom Canyon Brewery

in Colorado Springs, and at the Redfish Brewery in Boulder). While each of those attracted somewhat fewer participants, the questions asked were of similar depth and interest.

If there is a Café Scientifique (sometimes also called Science on Tap) in your community, I would strongly urge you to contact the local organizer to see whether you might arrange to do a presentation on mathematics research. See http://www.cafescientifique.org/world-links.htm for a list of Café Scientifiques. The Colorado Café homepage is http://CafeSciColorado.org. For those of you with *New York Times* access, see http://www.nytimes.com/2006/02/21/science/21cafe.html for an archived news story about Café Scientifique. (Thanks to the author of that story for the idea which spawned the opening few sentences of this article.)

The sheer pleasure you'll derive from the experience will be well worth your effort!

Gene Abrams is professor of mathematics at the University of Colorado at Colorado Springs. He has been a faculty member at UCCS since 1983. He is the author or coauthor of over thirty research articles in mathematics. In 1996 he earned lifelong designation as a University of Colorado system-wide President's Teaching Scholar. In 2002 he received the annual Burton W. Jones Outstanding Teaching Award from the Rocky Mountain Section of the Mathematical Association of America. He has been married since 1983 to his wife Mickey, who sometimes concedes that he is that much fun at home… They have two children, Ben and Ellen.