

Playing the Numbers: A BU summer program builds a community of young math lovers

By Bari Walsh

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Summer: long days at the beach, cold lemonade, thick novels—and number theory. At least, that’s what summer means to Professor Glenn Stevens (possibly excepting the beach, the lemonade, and the novels) and the high school students enrolled in BU’s Program in Mathematics for Young Scientists, known as PROMYS.



Professor Glenn Stevens, director of PROMYS

Stevens and his colleagues in the CAS Department of Mathematics and Statistics have run PROMYS (pronounced “promise”) every summer since 1989, inviting motivated math lovers to the BU campus for six weeks and immersing them in creative, rigorous explorations of number theory, advanced algebra and geometry, and other forms of mathematical analysis. Through lectures, group work, and seminars, these students, who already possess a prodigious amount of raw talent, gain a sophisticated understanding of mathematical concepts. They go far beyond where their high school math curricula generally take them.

“All too often,” Stevens says, “students experience mathematics as facts to be memorized and algorithms to be mastered. They practice routine drills and follow rigid sets of rules and techniques to get the ‘right answers’ to problems they often find uninteresting. They rarely experience the delight of exploring new ideas within the realm of mathematics.” Nurturing that delight is what PROMYS is all about.

Stevens recalls the wonder of his own journey from rigid, right-or-wrong math to creative, “beautiful” math: it began during a summer high school program that he enrolled in, run by the late Professor Arnold Ross at Ohio State University. His Mathematics colleagues at BU, professors David Fried and Steve Rosenberg, also went through Ross’s program and now participate in PROMYS, which draws inspiration and methodology from its forerunner.



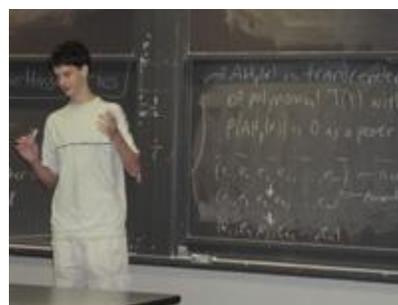
Yes, but can you prove it?

Many of the students who enroll in the program have never been challenged by math before; it has come so easily to them that boredom has set in, and a long struggle with a problem set is an unfamiliar sensation. The intensity of the learning experience at PROMYS can be almost frightening for those students.

Says Stevens, “They’re very, very bright. They’re accustomed to the idea that they’re the brightest around. They’re very good at math, and many of them have developed an interest in it because they’re so good at it. We want to give them reasons for liking mathematics that are a little deeper than that.”

When first-time students arrive on campus, they become part of a community that includes returning students, counselors (who are college-aged former PROMYS students), mentors (professional mathematicians), and professors. Living in Warren Towers, in close proximity to older students and counselors, talented newcomers see, often for the first time, problems that they don’t understand, and people who are more accomplished than they. It’s a situation that Stevens relishes: he knows he isn’t doing his job if he doesn’t challenge students beyond their comfort levels. And part of what makes PROMYS work is the web of resources that surrounds each student; fellow students, older students, and counselors are all available to help out on the tough problem sets Stevens assigns during each morning’s class. (PROMYS offers advanced seminars to keep the program challenging for returning students and counselors.)

Lorelei Larking, an MIT sophomore who is a four-year veteran of PROMYS, is returning this summer as a counselor. She says she “wasn’t that into math” in high school. She was bored by the classes she took, until an encouraging teacher gave her extra problems and pushed her to apply to PROMYS. She remembers the initial jolt of that first summer. “It was sometimes intimidating at first. These are really smart kids. But it’s cool to be with people you fit in with. To sit around and crack stupid math jokes. It’s why I thought I’d enjoy going to MIT. It’s great to be with people who think along the same lines, who see the beauty in math—not to sound too dorky.”



Transcendental? Sure looks that way.

As a counselor, she is assigned several students to look after; she grades their problem sets and helps them find their stride. She describes herself as “not kind” when it

comes to grading. “My favorite line is something my favorite counselor used to say: ‘Can you prove it?’” But the camaraderie of working closely with her students has aided her own work, she says. “It’s been helpful to see how students figure things out. The things they think of first aren’t always the things I’d think of first.”

Sarah Eggleston, a junior preparing to graduate early from Cambridge Rindge and Latin School in Cambridge, Massachusetts, has two PROMYS years under her belt. She found the level of knowledge among her peers “kind of discouraging at first. I felt like, Oh my God, I’ll never be able to do this. But after I got into it, and made friends, I got to work on things with other people. You learn that getting anything done on the problem sets is better than getting nothing done. You learn to look at what you’ve done instead of what you haven’t—because there’s so much more of what you haven’t!”

She describes the work as “intense.” She’d been excited about the math she encountered in high school, but her PROMYS experience was “totally different. There’s math, and then there’s PROMYS math, where you can’t just open a book and look up the answer. You can’t parrot something back. PROMYS wants you to explore on your own.”



A full house for a morning of math

Some students don’t take to the challenge with such enthusiasm, at least not right away. “Occasionally someone will come to me at the end of a summer and say, ‘Wow that was so much work, and it was so discouraging that I couldn’t solve all those problems, and I don’t ever want to do this again,’” Stevens says. “And that’s fine—better they know now if they’d rather do something else. However, very often they go back to their schools and get back to a normal environment where the challenges and the intrigue in the material they’re studying are no longer there.

There’s no mystery. And they get bored. And they remember. Then I’ll get a letter saying, ‘You know, Professor Stevens, actually, that was a really wonderful experience, and I really want to come back again, and would you please let me come back this summer?’”

A remarkable number of students do come back. And Stevens remains in touch with many former students, who often go on to careers in leading technology companies, on Wall Street, or at impressive academic institutions. Sometimes an encounter with a student he hasn’t kept in touch with is even more gratifying. “I actually have people come by my office and say, ‘Hello Professor Stevens, do you remember me? I’m now

a faculty member at SUNY,' for example. We know them from so long ago when they were so young, and we watch them grow up. It's pretty amazing."

For Teachers, Too

Professor Stevens began PROMYS for Teachers (PFT) in 1991 to foster a spirit of open-ended exploration in high school math classes and to revitalize math curricula across Massachusetts.

PFT is an intense two-summer, six-week immersion in number theory and deep mathematics. Twenty teachers are accepted to the program each summer. Instruction continues during the academic year, in the form of five full-day workshops designed by the Education Development Center in Newton, Massachusetts, and the Boston University Department of Mathematics and Statistics. The aim is to ensure that teachers who attend the summer program will transport the PROMYS "culture" of exploration and creativity back to their high schools. The workshops give teachers strategies for applying the mathematics they learned and developing age-appropriate research experiences for their students.

Teachers earn graduate credits and a stipend for each summer of participation; PROMYS recently received a \$50,000 grant from the Massachusetts Board of Higher Education to fund these stipends, with money made available under the federal No Child Left Behind Act of 2001. So far, teachers from thirty-three Massachusetts high schools have taken part, and the program has earned high marks from school professionals across the state. As Edward Joyce, senior program director for the Boston Public Schools, notes, "We are at the beginning of a new generation of math teachers in Boston. It is so important that we have exciting and relevant professional development for these teachers."