PROMYS at Boston University

http://math.bu.edu/people/promys

Since 1999, the Clay Mathematics Institute has sponsored a variety of advanced seminars and research projects for returning students enrolled in the Program in Mathematics for Young Scientists (PROMYS) at Boston University.

Now in its nineteenth year, PROMYS is a six-week summer program that was developed by BU Professor Glenn Stevens with the aim of engaging ambitious high school students in intensive mathematics research. Young students who excel in math are invited to explore the creative world of mathematics in a supportive community of peers, counselors, research mathematicians, and visiting scientists.

Students are selected from around the United States based on their interest and ability in mathematics. PROMYS moves well beyond the high school curriculum by offering students the opportunity to participate in the process of scientific research. First-year participants engage in intensive problem solving in elementary number theory. Returning participants study more advanced topics. These participants are divided into "lab groups" of two to four students. Each group works together on open-ended exploratory projects that they will present to other PROMYS participants at the end of the program. Throughout the summer, several research mathematicians serve as mentors to the advanced students. Mentors pose new research problems at the start of each summer and provide guidance for the students. Their assistance includes hints for getting started and references to the pertinent literature.

Behind the scenes, a group of counselors, who are also participants in the program, maintain an intensive level of interaction with the high school participants. Counselors are undergraduate math majors recruited from the country's top universities, who live and work alongside the younger participants, aiding them in their research. "It is no exaggeration to say that the success of PROMYS depends primarily on the dedication and expertise of the counselor staff. They bring an enthusiastic attitude to PROMYS that is easily transmitted to the participants. They are the main channel by which the *esprit de corps*, so vital to PROMY's success, is conveyed," says Glenn Stevens. Counselors share their knowledge and expertise with the high school participants by grading their daily homework, engaging in informal discussions, and offering mini-courses on themes of their choosing.

To ensure that returning students and counselors find their experience intellectually stimulating, the CMI/PROMYS's partnership offers a variety of advanced seminars and research projects each summer. Past seminars have included V*alues of the Riemann zeta function, Hyperbolic Geometry; Random Walks on Groups, Dirichlet Series, Mathematics of Computer Graphics, Graphs and Knots*, and *The Mathematics of Algorithms*. This year, PROMYS and the Clay Mathematics Institute are offering advanced seminars in *Geometry and Symmetry, Modular Forms,* and *Abstract Algebra*.

In 2006, three research mathematicians — Jonathan Kanke (Duke University), Kiran Kedlaya (MIT), and Paul Gunnells (University of Massachusetts at Amherst) — were invited to serve as mentors to work with students on advanced research projects. Topics for their research projects in the summer of 2006 were: *Quaternion Algebras*, proposed by Jonathan Hanke; *Combinators*, proposed by Ira Gessel; *Quadratic Forms and Quadratic Fields*, proposed by Jonathan Hanke; *Finiteness Theorems for Quadratic Forms*, proposed by Jonathan Hanke; and *Purely Periodic Continued Fractions*, proposed by Kiran Kedlaya.

Since 1989, Glenn Stevens has directed Boston University's Program in Mathematics for Young Scientists (PROMYS). Professor Stevens is a Professor of Mathematics at Boston University, where he has taught and conducted research since 1984.