Mathematics Programs that Make a Difference

Each year, the AMS Committee on the Profession (CoProf) selects two or more outstanding mathematics department programs to be designated as *Mathematics Programs that Make a Difference*. For 2008 the honored programs are the SUMMER UNDERGRADUATE MATHEMATICAL SCIENCE RESEARCH INSTITUTE (SUMSRI) at Miami University (Ohio), and the MATHEMATICS SUMMER PROGRAM IN RESEARCH AND LEARNING (MATH SPIRAL) at the University of Maryland, College Park.

CoProf created the Mathematics Programs that Make a Difference designation in 2005 as a way to bring recognition to outstanding programs that successfully address the issue of underrepresented groups in mathematics. Each year CoProf identifies two exemplary programs that:

1. aim to bring more individuals from underrepresented minority backgrounds into some portion of the pipeline beginning at the undergraduate level and leading to an advanced degree in mathematics, or retain them in the pipeline;

2. have achieved documentable success in doing so; and

3. are replicable models.

Previously designated Mathematics Programs that Make a Difference are: the graduate program at the University of Iowa and the Summer Institute in Mathematics for Undergraduates/Research Experience for Undergraduates at Universidad de Puerto Rico, Humacao (2006); and Enhancing Diversity in Graduate Education (EDGE) and the Mathematical Theoretical Biology Institute (MTBI) (2007).

The 2008 CoProf Subcommittee on Mathematics Programs that Make a Difference consisted of: Sylvia Bozeman, Rhonda Hughes, Kimberly Pearson (chair), and Francis Su.

Below is CoProf's citation, followed by brief descriptions of the programs prepared by *Notices* staff.

Citation

This year, the subcommittee recommends that the AMS recognize the Summer Undergraduate Mathematical Science Research Institute (SUMSRI) at Miami University (Ohio) and the Mathematics Summer Program in Research and Learning (Math SPIRAL) at the University of Maryland.

The main goals of SUMSRI include 1) addressing the shortage of minority mathematical scientists by encouraging minority students and women to become mathematical research scientists, 2) to provide the students with a research environment and improve their research abilities, 3) to improve the students' ability to work in groups and give them a long term support group, and 4) to provide professional role models. The Institute is especially interested in, but not limited to, African Americans and other underrepresented minorities and women. SUMSRI describes itself as a "mixed format" REU for rising juniors and seniors, emphasizing lecture classes the first three weeks and group research the last four weeks.

Of 114 program graduates to date, forty-six have either received a master's degree or passed their Ph.D. qualifying exams and another thirty-five have started their graduate programs (70 percent); three have received their Ph.D.s. Another twenty-one are still undergraduates. Fifty-six program graduates are from underrepresented ethnic groups; of the forty-three of those who have completed college, 88 percent are either in a graduate program or have received a graduate degree.

Math SPIRAL is a six-week program (primarily for rising juniors) that seeks to enrich the mathematical education of outstanding students from underrepresented groups, and to inspire them to pursue advanced mathematics. The model is unique in that a large research university (Maryland) has partnered with eight "affiliate" institutions, including several historically black colleges and universities. SPIRAL's student participants are recruited from these affiliates, and SPIRAL directors annually meet with affiliate liaisons and communicate regularly through the year. SPIRAL operates under the umbrella of STAND (Science & Technology: Addressing the Need for Diversity) at the University of Maryland.

Since its inception in 2003, a total of seventy-three students have participated. Sixty-nine are African American or foreign students of African heritage. One has completed a master's degree in operations research, eight are enrolled in doctoral programs, and five are enrolled in master's degree programs in various mathematical sciences; all of these students are African American with the

exception of one African student and one Caucasian.

Both SUMSRI and SPIRAL have program models and recruitment strategies that are clearly replicable. SUMSRI is supported by Miami University (Ohio), the National Security Agency, and the National Science Foundation. SPIRAL is supported by the NSA, the NSF, and the Mark & Catherine Winkler Foundation.

Program Description: SUMSRI

SUMSRI, conducted under the guidance of Miami University's Department of Mathematics and Statistics, is aimed at talented undergraduate students in the mathematical sciences who are interested in pursuing advanced degrees. Because of the shortage of minority and women mathematical scientists, the program is especially focused on, but not limited to, African Americans and other underrepresented minorities and women.

The main goals of SUMSRI are to encourage minority students and women to become mathematical research scientists, and to help the students improve their research abilities. In addition, SUMSRI aims to foster the students' ability to work in groups, to give them a long-term support group, and to provide them with professional role models. In the program, students increase their technical writing skills and are given an opportunity to write a technical research paper and present a talk at a mathematics conference. They also receive information about available financial aid, opportunities for graduate school, and career opportunities in the mathematical sciences.

SUMSRI runs for seven weeks on Miami University's campus in Oxford, Ohio. During that time, students participate in problem seminars in mathematics or statistics. The program also includes a technical writing seminar, a GRE preparation workshop, two short courses on algebra and real analysis, and colloquium talks given by well-known mathematical scientists. In addition, there are panel discussions about graduate school and career opportunities. SUMSRI pays for participants' travel, room, board, and supplies and provides each student with a stipend. Funds are available for travel and support to selected national meetings.

The ideal candidate for SUMSRI is a sophomore or junior student who has completed with distinction the calculus series and at least one proof-based mathematics or statistics course. All SUMSRI students return to their home institutions as undergraduates after participating in the program.

Program Directors: Dennis Davenport and Vasant Waikar

Website: `http://www.units.muohio.edu/sumsri/`.

Program Description: Math SPIRAL

Math SPIRAL, a multi-year summer program funded by the National Science Foundation (NSF) and the National Security Agency (NSA), brings gifted rising sophomores and juniors to the University of Maryland, College Park, for a six-week intensive program to help prepare them for graduate study in the mathematical sciences. Math SPIRAL was developed in close coordination with a group of nine affiliated minority-serving colleges and universities; this network is a central strength of the program.

Math SPIRAL has three core components: academics, research, and professional development. Students are enrolled in a 3-credit summer course consisting of two parallel sub-courses. The first focuses on combinatorics and a strategic analysis of winning strategies for a variety of games, while the second emphasizes the core methods of mathematical reasoning and proof. In addition to solving problems, students must accurately communicate their solutions both in writing and verbally. Formal public presentations of the academic and the research results are a key part of the SPIRAL program.

The research program has focused on the analysis of games, an area that provides a genuine research experience without requiring knowledge of higher-level mathematics courses. Research teams of three or four students carry out the investigations. Teams meet frequently with a graduate student mentor and a faculty advisor and make weekly oral presentations of their progress. The highlight of the program is the final formal presentations by the students.

Professional development activities comprise field trips, colloquia, and panel discussions. Past field trip destinations have included Booz Allen Hamilton, GEICO, the National Institute of Standards and Technology, the National Security Agency, and Northrup Grumman. Colloquia are given by established figures from academia, government, and industry to offer personal insights. The panel discussions provide advice on preparing for and succeeding in graduate school as well as on how to obtain financial support.

The founding program director was Dan Rudolph, who is now at the University of Colorado. Brian Hunt (UMCP) took the reins when Rudolph left for Colorado, and Ken Berg (UMCP) became director in the fall of 2007.

Program Director: Ken Berg

Associate Directors: Marshall Cohen (Morgan State University); Bill Gasarch (UMCP); Leon Woodson (Morgan State University)

Program Coordinator: Cyntrica Eaton

Website: `http://www.math.umd.edu/undergraduate/spiral/`.