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CMI Outreach

As part of its mission to increase and disseminate mathematical knowledge, and to encourage gifted students to pursue mathematical careers, CMI partners with the established outreach programs PROMYS at Boston University, Ross Program at Ohio State and PRIMES at MIT.

In addition to maintaining the existing support for these programs, CMI is looking to build on it. By providing funding to extend the international reach of the programs CMI already supports and by identifying new partners, CMI is seeking to make available funding where it will make a real difference (see articles about PROMYS International Alliance and Modern Mathematics on the following pages).

To further the Institute's mission, the CMI Outreach Committee was established in 2013. Members David Bresoud (MacAlester), Frances Kirwan (Oxford), Marcus du Sautoy (Oxford), Günther M. Ziegler (FU Berlin) and Nick Woodhouse (CMI) will evaluate and give weight to proposals for outreach activities that may be taken to CMI's Scientific Advisory Board. The Committee welcomes proposals for new programs or the expansion of existing ones.



CMI-PROMYS International Alliance

by Glenn Stevens

The CMI-PROMYS International Alliance launched in 2013 with a successful summer program that extended and strengthened the longstanding partnership of the Clay Mathematics Institute and the Program in Mathematics for Young Scientists (PROMYS). The goals of the first year were to build a bridge from PROMYS at Boston University to the Oxford Masterclasses in the UK, and to establish the foundations on which to create, in Europe, a sister program to PROMYS. To this end, we actively recruited European students to participate in both the US and UK programs as CMI-PROMYS International Alliance Scholars.

Thanks to strong support from established European programs and an energetic group of PROMYS alumni in Europe, we were able to overcome the challenges of a short recruitment period, receiving 90 exceptionally

strong applications from 15 European countries. Twelve talented high school students were invited to the program with full support from CMI, 11 of whom were able to attend. The inaugural group of CMI-PROMYS International Alliance Scholars represented Germany, Greece, the Netherlands, Poland, Romania, Spain, Turkey and the United Kingdom. These young scholars participated in PROMYS at Boston University before travelling to the UK for an additional week at the Oxford Masterclasses in Combinatorics at Wadham College, University of Oxford.



PROMYS Oxford

PHOTO COURTESY OF WADHAM COLLEGE

PROMYS is a six-week residential summer program for mathematically gifted high school students. Since its beginnings in 1989, PROMYS has been sustained and enriched by two guiding principles: (1) an emphasis on mathematical habits of mind that support independence and creativity in facing unfamiliar mathematical challenges and (2) a belief that mathematics is a deeply human activity best experienced within a richly interacting and mutually supportive community of learners, including high school students, undergraduate and graduate students, teachers, and experienced mathematical researchers. PROMYS aims to create an authentic experience of doing mathematics within a community of mathematicians having various levels of experience and expertise, every one of whom is actively engaged in significant mathematical activity appropriate to his or her individual level of expertise.



PHOTO COURTESY OF BOSTON UNIVERSITY

PROMYS Boston

In Boston, the International Alliance Scholars joined a group of 47 other first-year PROMYS participants, 25 returning participants, 24 counsellors (undergraduates in top mathematics programs), seven university faculty, six research mentors, and numerous visiting mathematicians and alumni. For six weeks they wrestled with significant mathematics through individual and collective efforts on the daily number theory problem sets. Most joined an exploration lab of their choosing to work on more open-ended problems, and presented their results to the rest of the program during the last week. Depending on experience and interest, many participated in an advanced seminar on *Representation Theory, Geometry and Symmetry* or *Wavelet Transformations* offered by PROMYS faculty. The Scholars worked closely with one another and formed good working relationships with many of the non-CMI participants. For many of these talented individuals, this was the first time in their lives that they found themselves tackling mathematics that was beyond their immediate grasp, were held to exacting standards of rigor and precision, met others with the same level of talent and passion, and worked side by side with other, more experienced, individuals who were actively engaged in developing their own careers as research mathematicians and scientists.

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two short lectures each day were followed by problems sets concerning the material. The students worked in pairs to prepare short presentations on topics such as *The Four Colour Theorem* and *The Regularity Lemma* for the final afternoon of the program. In addition, three PROMYS counsellors who accompanied the students helped them throughout the week with their problem sets and projects; the counsellors were invaluable in helping to maintain a close continuity between the two programs. Jet lag aside, the students and counsellors moved easily from the PROMYS environment in Boston to the Masterclasses setting in Oxford, suggesting that a program like PROMYS could, with proper care, take root and flourish there.

Our experience this year has led us to believe in the possibility of creating a new program at Oxford and doing this in a way that will lead to the existence of two programs, one in Oxford and one in Boston, each of which is at least as strong as the current program in Boston. The very successful nature of the recruitment efforts proves that there is significant demand for an immersion-based program like PROMYS in Europe. The Scholars themselves indicated that they would like to help achieve these goals, with a number voicing interest in returning as advanced students and counsellors.

- > *I've had an amazing summer in Boston and Oxford and really like the idea of a PROMYS-like program in Europe. Can I come back?*
- > *It gives you a whole new way of looking at math and approaching problems. Also, it made me discover that I can actually do those problems. I wouldn't have thought that I could do that before PROMYS.*
- > *I'm sure I want to study mathematics Th[ese] two experiences developed my research skills and made me think deeply on each topic. I think this is the difference between real mathematics and mathematics learnt in school.*
- > *I know a lot of people who want to participate in this kind of summer program. A European PROMYS would be perfect!*

Over the years, we have come to appreciate the crucial role played by PROMYS alumni in the long-term success of the program. Feedback from the first cohort of CMI-PROMYS Scholars suggests that the seeds of a similarly active alum community in Europe have already been planted, thus promising a vital resource for the future success of a European PROMYS.

