4-b-3) Undergraduate and graduate student research, including publications and presentations.

September 19, 2008

Undergraduate Research

In a typical year, four or five undergraduates write honors theses in the mathematics department; in 2008-09, the number has jumped to ten, probably due to activity in an NSF CSUMS grant to the department. A faculty committee reviews each student's honors thesis and oral presentation, and awards "honors," "high honors," or "highest honors." The department's goals for honors theses are clear: in order to award "highest honors," the faculty committee must be convinced that the student's work is ready for publication in a refereed professional journal. Consequently, not all students receive "highest honors".

Almost every summer since 1990, the National Science Foundation (NSF) has funded an REU-Site award to the mathematics department[1] Typically seven or eight students are chosen from a national pool to come to William and Mary and work on open mathematical problems in an essentially one-to-one way with a faculty mentor. Although other faculty members have from time to time been the PI for these NSF grants[2], in recent years Professor Charles Johnson has been the main organizer of this activity. NSF has made it clear that these site grants are not designed to support primarily William and Mary students. Consequently, William and Mary students are typically less than 25% of our summer REU students.

Many members of the department support undergraduate researchers from their own NSF grants, some during the summer and others during the academic year. During the 2007-08 academic year, Professor Johnson was a subcontractor on an NSF grant to BYU that sought to experiment with academic-year REU opportunities.

During the last five or six years, department members have been deeply involved with interdisciplinary grants from NSF and the Hughes Foundation that created opportunities for undergraduate research in mathematical biology. A series of three Hughes Foundation grants to the College has brought two net-new positions to the department and has created funding opportunities for both faculty and undergraduates. Professor George Rublein has been the department's representative on the committee that created the Hughes grant proposals and supervises the operation of the program. In addition to the Hughes grants, the department shared an NSF-UBM grant with the College's biology department to build the undergraduate program (including undergraduate research) in mathematical biology. Funds from these mathematical biology grants have allowed William and Mary faculty to take their undergraduate research students to mathematical biology conferences in the U.S. and in England. Department faculty currently involved with the UBM grant are Professors Day, Shi, and Tian.

Starting in the 2007-08 academic year, members of the departments of mathematics, computer science, and applied science received an NSF-CSUMS grant whose goal was to introduce computational issues (broadly defined) into the undergraduate curriculum and to foster undergraduate research in computational topics. This CSUMS grant provides financial support for students both during the academic year and during summers, and includes substantial travel money that will enable faculty members to take undergraduate research students to participate in conferences and research-interactions abroad. In spring 2008, CSUMS faculty taught a special Math 410 (Topics) course designed to get students interested in topics suitable for undergraduate research in computational topics. Mathematics faculty associated with the CSUMS grant are Professors Day. Lewis, Li, Phillips, and Shi.

[1]For example, summer 2008 was an exception – NSF did not notify us of funding of Professor Johnson's NSF-REU grant until late spring, making recruiting for summer 2008 impossible.

[2]The directorship of the NSF-REU site grant rotates slowly among department members. Johnson is the current director, preceded by Lutzer, Stanford, and Kincaid.

The website *http://www.wm.edu/mathematics/documents/udres.html* contains a list of refereed papers that grew out of undergraduate research at William and Mary.

Graduate Research

Department members supervise both masters and doctoral students, and these programs always involve a student research component.

The department's Computational Operations Research (COR) master's program is technically part of the computer science department, even though it is staffed primarily by members of our department. At the end of the COR program, students must complete a model and analysis of a real-world system, sponsored by a regional business or agency, or by one of the military services. Recent projects include: front-end staffing at a local grocery store; drive-up service at a local fast-food restaurant; optimal inventory control at a Coast Guard aircraft and supply center; car-line optimization at a local private school; virtual waiting for tours at Colonial Williamsburg; optimal overbooking levels at a Colonial Williamsburg tavern; queuing at the Newport News DMV center; and call center staffing optimization. While not publishable research, these projects have a research-like flavor for the graduate students who carry them out.

Department members also participate in Ph.D. advising through the Applied Science department and students in this program are expected to complete publishable research in their discipline. The list below shows the name, adviser, degree year, and thesis area of our Ph.D. students during the last ten years. Our program is best described as a "research apprentice" program: students who enter the program must already have completed a master's degree and be ready, after one or two semesters of study, to take their doctoral qualifying examinations here. They typically spend two more years working with their doctoral advisers on research problems. Research in this doctoral program is expected to make fundamental contributions to the world's knowledge in the mathematical sciences and to be published in a refereed professional journal. In one case, the joint work of two students and their advisers won a national professional prize [3].

William and Mary Mathematics Ph.D. Students Since 1998

Student	Adviser(s)	Year	Thesis Area
Andrew Glen	Leemis and Drew	1998	Operations research
Shaun Fallat	Johnson	1999	Matrix analysis
Diane Evans	Leemis and Drew	2001	Operations research
Tom Milligan	Li	2004	Matrix analysis
Scott Billie	Kincaid	anticipated 2009	Operations research
William Kaczynski	Leemis	anticipated 2009	Operations research
Shala Nasserasr	Johnson	anticipated 2010	Matrix analysis

Finally, some department members participate in doctoral research supervision at other universities. The following table shows graduate student, adviser at William and Mary, degree year, and the other university granting the student's Ph.D. during the last five years.

Doctoral Students at Other Universities Supervised by William and Mary Faculty

Student	Adviser	Degree Year	University Awarding Ph.D.
Carlos Santiago	Charles Johnson	2004	Lisbon
Raymond Sze	Chi-Kwong Li	2005	Hong Kong
Aneta Konieczna	Charles Johnson	anticipated 2009	Adam Micewicz Univ, Poznan

[3] In 2006, INFORMS (the professional organization in operations research) awarded the "ICS Prize for Research Excellence in the Interface between Operations Research and Computer Science" to John Drew, Diane Evans, Andrew Glen, and Larry Leemis.