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NSF grant promotes study in math and life sciences

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"Civilization is on the brink of a new industrial order. The big winners in the increasingly fierce global scramble for supremacy will not be those who simply make commodities faster and cheaper than the competition. They will be those who develop talent, techniques and tools so advanced that there is no competition."

The President's Council of Advisors on Science and Technology.
Report on Information Technology Manufacturing and Competitiveness, January 2004.

University of Missouri is doing its part to develop advanced talent thanks to a grant it recently received for a mathematical life sciences program. The grant is funded by Proactive Recruitment in Introductory Science and Mathematics (PRISM) of the National Science Foundation (NSF). The grant, over \$2 million, will be funded for five years and will focus on freshman and sophomore students who have an aptitude for mathematics and life sciences. The goal of the program is to attract students who will consider a major study in mathematics and life sciences and to encourage those students to complete those degrees.

For decades, the United States' advantages in the marketplace have begun to erode because of widespread technical knowledge and the readily available low-cost labor overseas. PRISM's goal is to strengthen the nation's scientific competitiveness by increasing the numbers of well-prepared, successful U.S. undergraduate majors and minors in science and mathematics. This program will fund innovative partnerships between mathematical sciences and other science disciplines that widen the cross section of the mathematical sciences to which freshman and sophomore students are exposed and that provide these students increased opportunities for research experiences involving the mathematical sciences.

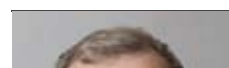
Dix Pettey, professor in the **Department of Mathematics** and principal investigator for the grant, thought a program that combined mathematics and life sciences was long overdue.

"I have been reading journals, attending conferences, and talking to colleagues at other universities about programs like this for years," says Pettey. "When [department chair] Glen Himmelberg asked last August if anyone was interested in writing a proposal for this grant, I jumped at the opportunity. I felt like this was what I was waiting for."

Frank Schmidt, professor of biochemistry and co-principal investigator, agreed it was time for this.



Dix Pettey



"Biologists have to understand trends and common features of things that look separate on the surface, and to do that, you need math. Some parts of life sciences have always had strong mathematical traditions, but this trend is expanding into areas like gene regulation, where we have massive amounts of data that have to be analyzed mathematically."



Frank Schmidt

PRISM received 62 proposals from colleges and universities, but awarded only four grants. Pettey says their ability to take advantage of two existing MU programs, the freshman interest groups (FIGs) and the Life Science Undergraduate Research Opportunity Program (LS-UROP) helped them secure the grant. Beginning in fall 2010, a new Mathematics in Life Sciences (MLS) FIG with 20 entering freshman (MLS scholars) per year will be established. The similar curriculum, in addition to a weekly seminar and other FIG activities, will create a learning community encompassing both faculty and scholars. Building on that learning community, students will pair with faculty for a mentored independent undergraduate research project that will start in the summer after their freshman year and will continue through both semesters of their sophomore year.

"This program is very different because students will be able to begin conducting research very early in their college careers," says Pettey. "The students will conduct original research and may even have papers published. This was a selling point for the NSF."

Schmidt says, "We know that research experience benefits students, even if their careers don't take them into full-time research occupations. That training teaches them to think and to understand how knowledge comes about."

The MLS scholars will participate in weekly lectures where alternating professors will teach a subject for two to three weeks. "This is not a lecture where students come in, listen to a professor, and take notes. The students will be expected to contribute in discussions and to complete projects."

Marty Patton, associate professor in the Department of English, designed a class specifically for the MLS students to fulfill the humanities credit and the FIG requirement. The class will be science-focused and will study three biologists – Darwin, Watson, and Gould – and one mathematician, Hadamard. The class will explore what the scientists say about their discoveries and how they use language to develop, justify, and translate their findings.

Part of the funds from the grant will be used to recruit students for the program. Pettey says he and the co-principal investigators will be visiting high schools throughout the state. They will ask teachers and counselors for possible candidates who show an aptitude for math and science.

"By identifying these students in their junior and senior years of high school, we will be able to guide them to take certain courses in their last few years of high school so they will be prepared for the program as freshman," says Pettey.

Several departments and faculty members contributed to the proposal. Other co-principal investigators include: **Rainer Glaser**, professor in the Department of Chemistry; **Jeni Hart**, associate professor in Educational Leadership and Policy Analysis; and **George Smith**, Curators Professor in the Division of Biological Sciences.

"This grant could not have happened with just one person," says Pettey.

"This program has been supported across the whole campus, and we have received positive response and encouragement and will need to continue that kind of support to have the program be successful. Mathematics professors **Carmen Chicone**, **Jan Segert**, **Stephen Montgomery-Smith**, and biological sciences professor **Miriam Golomb** have all made significant contributions. **Alex Iosevich**, professor of mathematics, played an important role in helping to launch the project, and we got great support from the chairs, Glen Himmelberg (mathematics) and **John David** (biological sciences)."

Schmidt adds, "It's a sign of MU's interactive culture that this grant was awarded because we were able to demonstrate to the NSF that their investment would pay off. That couldn't have happened if a bunch of us had just gotten together to write the grant. We are building on that strength here, and the reviewers saw that."

Links:

[Math Faculty](#) (Petthey, et al), [Department of Mathematics](#)
[Frank Schmidt](#), [Department of Biochemistry](#)
[Marty Patton](#), [Department of English](#)
[Rainer Glaser](#), [Department of Chemistry](#)
[Jeni Hart](#), [Educational Leadership and Policy Analysis](#)
[George Smith](#), [Division of Biological Sciences](#)

[Freshman Interest Groups](#) (FIGS)
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