Louisiana EPSCoR
EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH VOL.5 NO.7 JULY 2008

"The Highest Form of Pure Thought...." Plato

Roger Bacon called it "the door and key to the sciences." Carl Sagan dubbed it "the only truly universal language."

It is a creative discipline that transcends cultural boundaries and is indispensable in such diverse scientific fields as medicine, computer sciences, biology, ecology, space exploration, chemistry, physics, engineering and psychology.

It is mathematics. Yet in an ACT survey in which members of the nationwide high school class of 2006 indicated their intended college major, only 0.39 percent selected mathematics; in Louisiana, just 0.29 percent. Given the intense national focus on increasing the number of U.S. scientists and engineers, this is bad news.

To help counteract that trend, a five year, $3.7 million grant *to increase the number of well-prepared U.S. citizens, nationals, and permanent residents who pursue careers in the mathematical sciences* has been awarded to the Louisiana State University Department of Mathematics by the National Science Foundation's Division of Mathematics.

The intent of the NSF *Vertical Integration of Research and Education (VIGRE)* grant is to stimulate and implement permanent positive changes in education and training within the mathematical sciences, with a focus on the educational experience of students and postdoctoral associates.

"Our goal in submitting a proposal to NSF was to develop a best-practice model on the national level for incorporating undergraduate research in an efficient and practical manner," say VIGRE Principal Investigators Gestur Olafsson, the Hubert Butts Professor of Mathematics, and Lawrence Smolinsky, Department Chair.

To assist in preparing a proposal to NSF, Drs. Olafsson and Smolinsky applied for a Louisiana NSF EPSCoR *Preliminary Planning Grant for Major Initiatives*. The competitive peer-reviewed grant provides seed funds for research teams in the process of developing a proposal to a federal agency for a large-scale research and/or education program.

"The financial support provided by the EPSCoR award allowed us to travel to three universities with successful VIGRE sites, where we visited with faculty, students and staff involved in the program," says Dr. Olafsson. "It helped us better organize our thoughts and focus on how we could change the mathematical culture by increasing interaction among undergraduate and graduate students, postdoctoral associates and faculty, as well as student participation in research."

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Research Crews

"Mathematicians don't have laboratories, but we do engage in research projects and study topics with many aspects. Research Crews composed of faculty, postdoctoral associates, and undergraduate and graduate students will be our main vehicle for creating activities that combine research and education," adds Dr. Smolinsky.

Similar to a science research/teaching laboratory, each of the scientists and students are contributors and each crew is led by a faculty member. The goal is to provide directed research opportunities for junior members, who are mentored by senior faculty members, and incorporate participation and professional development for all.

Referring to it as "an educational and intellectual infrastructure that serves both education and research," Dr. Olafsson says that while each Research Crew will engage in an overall coherent study, subgroups may work on specific problems or engage in research.

Shown above are, left to right, Julius Esunge, graduate student and the first VIGRE trainee; Drs. Lawrence Smolinsky and Gestur Olafsson, NSF VIGRE grant Co-PIs; and graduate students/GEAUX program organizers, Moshe Cohen and Amber Russel. Ms. Russell is a VIGRE trainee/2009.

GEAUX Math

Already introduced in 2007, GEAUX Math is a two-week educational program for incoming graduate students. Held just prior to the start of fall classes, it provides a bridge curricula to the challenging first

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Adding Summer to the Equation

One impediment to attracting more mathematics majors is that many Louisiana high school students don't even consider majoring in mathematics.

"That low interest is likely the lack of mathematics enrichment at our state high school level," says Dr. Lawrence Smolinsky, Chair, LSU Department of Mathematics.

To help counteract that, two new VIGRE programs—a Math Circuit and a tri-state summer school program—have been established.

Mathematics Circuit
Beginning in 2009, a faculty member accompanied by a graduate student will be visiting Louisiana high schools in Alexandria, Lafayette, Lake Charles, Natchitoches, and Shreveport. The primary purpose is to encourage students to enter mathematics when they attend college.

The faculty will give interesting and fun mathematical presentations that encourage students to get involved in follow-up discussions. Students will discuss their undergraduate and graduate student experiences, job prospects and interests.

VIGRE Summer Program
Tri-State Consortium Beginning in Summer 2009, undergraduates from math departments of a newly formed consortium of state and historically black colleges and universities from Louisiana, Alabama and Mississippi will attend a five-week summer program at LSU.

Each participating institution will be invited to send one student plus one other from an underrepresented group, including women. LSU and consortium faculty will serve as program mentors.

The students will also serve as mentors for one of the following two LSU Research Experience for Undergraduate (REU) programs:

- LSU MathCircle: A three-week summer enrichment program for advanced high school students interested in investigating concepts in math, engineering, and physics not usually introduced in high school.
- ACT Test Prep Academy: An initiative focusing on ACT preparation and content review with a special emphasis on math as well as English and reading. Under VIGRE, the sessions will be extended and mathematical enrichment activities added.

LSU math faculty, supported by consortium students, will also serve as mentors for the Master of Natural Science Teacher program for in-service and recently graduated mathematics teachers. The program takes just over two years, includes three summers, and leads to a Master of Natural Science.

"There is uniform agreement among the principal investigators of the above programs that working with both undergraduate REU students and high school students engaged in advanced study and mathematical enrichment activity is valuable professional development." says Dr. Smolinsky.

Noting that "we probably would not have gotten so far without the Louisiana EPSCoR planning grant," Dr. Smolinsky adds: "The opportunity for high school students to work on their projects along with college students could help inspire them to consider a major and/or career in mathematics."

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year graduate program, and begins the process of peer mentoring among graduate students. Lectures, social events and a campus tour are included in the agenda.

Two new programs aimed at positively affecting the attitudes of high school students toward math are also being introduced. *(See above article.)*

"There is a positive feeling among faculty and graduate students that began with a major transformation of the math department in 2003 and is fueled by the strong financial support of LSU, and the VIGRE grant, which includes funding for students to attend conferences and internships in research institutions outside mathematics and industry.

"The VIGRE grant will be a catalyst for transforming the math culture among grad students and motivating them to apply for research positions after graduation.

"It will strengthen student research and scientific productivity and, in the long run, build strong research connections with other universities and industry," concludes Dr. Olafsson.

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