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## Grant Awarded to IWU for Calculus Education Program

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*National Science Foundation*

## **Grant Awarded to IWU for Calculus Education Program**

BLOOMINGTON, Ill.--The National Science Foundation (NSF) has awarded a grant to Illinois Wesleyan University to purchase new computer equipment to spur instruction in undergraduate calculus courses.

The \$34,350 award is from NSF's Division of Undergraduate Education. The grant was based on merit review of a proposal submitted by Melvyn W. Jeter, professor and chairperson of mathematics, and Robin S. Sanders, assistant professor of mathematics, in a national competition under NSF's Instrumentation and Laboratory Equipment Program (ILIP).

Under the grant, which expires on Nov. 30, 1995, IWU is purchasing computer equipment to support mathematics instruction in a three-course sequence, Calculus/Mathematica, using a state-of-the-art computer software package.

"This approach to teaching calculus," Jeter said, "makes calculus closer to a laboratory science."

Last year, more than three-quarters of IWU freshmen were advised to begin their math studies in a calculus course. Calculus is the mathematical study of limits.

### **Changing Math Education Program at IWU**

The NSF grant, Jeter explains, reflects the growth of math education at IWU in recent years. In 1986, about 36 students majored in math and another 18 were majoring in math and computer science. Last spring, about 70 students were math majors.

"Most of our math courses," Jeter said, "concentrate on calculus and above. Our pre-calculus offerings are decreasing. We're trying to approach the teaching of calculus in several ways to make it more attractive."

Jeter credits much of the successful development of the Calculus/Mathematica sequence to Sanders.

In addition to the standard three-course sequence in calculus and a standard one-course survey of calculus, IWU has added a three-course

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sequence, Calculus/Mathematica, and a two-course freshman calculus sequence, Analysis.

The Analysis sequence of courses, according to Jeter, builds on earlier math curriculum revisions, including the adaptation of a Colby College text. It is designed for students who have a very strong mathematical background, which usually includes some high school calculus. The Calculus/Mathematica sequence evolved after purchase of an earlier generation of computers for a math modeling laboratory a few years ago.

"About three summers ago," Jeter recalled, "I was at a meeting in Maine, where an ideal math program was presented--a program very close to what we have developed at IWU. People in the audience were saying it couldn't be done, but I told the panelists that the approach they outlined was close to our program."

Over the years, Jeter and his faculty colleagues have constructed a more flexible math program, emphasizing applications, independent thought, and undergraduate research. They also have launched math modeling teams, a Math Club, and have encouraged students to make presentations at various professional society meetings.

"We want students to buy into the profession while they still are undergraduates," Jeter said, referring to student participation in professional meetings.

The IWU math department also encourages students to double major, combining their mathematical studies with fields like business administration, physics, economics, and psychology.

"I'm proud of what we've done," Jeter said, adding, "it has been a department-wide effort."

### **Approach to Teaching Calculus**

A project abstract, "Computer-Aided Interactive Calculus at Illinois Wesleyan University," explains that IWU's math department is modifying and adapting software developed at the University of Illinois-Urbana/Champaign and Ohio State University to accommodate a different

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audience and IWU's course goals.

Because of this new approach to the teaching and learning of calculus, the abstract says, the keyboard and screen are often replacing pen and paper. All class meetings of Calculus/Mathematica are conducted in the lab, where lectures, homework, and tests are being done with the aid of the computer. The new computers are allowing the mathematics department to continue to reduce the amount of time that the instructor spends lecturing instead of guiding the students to develop the necessary insight needed to master the material."

#### **National Science Foundation Program**

NSF says the ILI program "is very competitive. Only 25 percent of proposals submitted to the program in fiscal 1993 were funded. The broad purpose of the ILI program is to contribute to the nation's goal of fostering excellence in science, mathematics, engineering, and technological education, a key component of U.S. competitiveness."

The ILI program provides two types of awards:

- Instrumentation grants to procure equipment needed for new or improved laboratory courses or experiments.
- Grants for leadership development to support national models for undergraduate laboratory instruction involving fundamental reform and improvement.

ILI grants range from \$5,000 to \$100,000. However, the total cost of instrumentation projects is at least double the NSF grant amount because the agency requires that NSF funds used to buy scientific equipment be matched by at least an equal amount from other sources. Instrumentation grants are made for 30 months, during which equipment must be acquired and matching funds raised.

"The awards," NSF points out, "enable faculty to improve laboratory instruction by obtaining new instrumentation. This benefits not only students planning to pursue careers in science, mathematics, engineering, and technology, but also serves a number of other national goals, such as

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training science and mathematics teachers.

"Another purpose," NSF adds, "is to prepare all students, particularly those who may one day become leaders in business and government, to confront issues in a technologically driven society."

ILI awards are targeted to many fields, including: astronomy, biology, chemistry, geology, physics, psychology, the social sciences, engineering, computer science, mathematics, and interdisciplinary areas.

Awards can be used for activities such as: introductory laboratories; courses for non-science majors; preparation of pre-service teachers; encouraging underrepresented groups' interest in science, mathematics, and engineering; introducing fundamental scientific, mathematical or engineering concepts within technical, professional, or associate programs; honors programs involving research and independent study; and providing student access to computer networks.

### **NSF, IWU Background**

NSF, an independent federal agency established by Congress in 1950, promotes scientific and engineering progress through research and education programs.

IWU, founded in 1850, enrolls about 1,800 students in a College of Liberal Arts, College of Fine Arts, and a four-year professional School of Nursing. For five consecutive years, *U.S. News & World Report* has ranked IWU No. 1 in the Midwest among regional colleges and universities in its annual "America's Best Colleges" edition. *U.S. News* also rated IWU as a "best buy" in higher education in its first survey, "Paying for College," published in October, 1993.

**For more information about the NSF grant, contact: Melvyn Jeter, professor and chairperson of mathematics, at 309/556-3069.**