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$124,000 National Science Foundation Grant Awarded to Illinois Wesleyan Chemist

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BLOOMINGTON, Ill.&emdash;A $124,000 National Science Foundation (NSF) grant has been awarded to an Illinois Wesleyan University chemist to develop new environmentally friendly compounds using bismuth, a metal whose various compounds are found in pharmaceuticals, including antacids and the popular diarrhea treatment, Pepto-Bismol.

Assistant Professor of Chemistry Ram Mohan will conduct research under the three-year grant, beginning on Sept. 1. This fall the project also will involve research by a half-dozen IWU chemistry majors, who are sophomores, juniors, and seniors.

"It's exciting" to win an NSF grant, Mohan said, "because the process is very competitive and it's more common for faculty at large universities to get these grants.

"Only 15-25 percent of applications for these type of grants get funded," Mohan added. "It's a great feeling to receive one of these grants because experts in the field are validating your work."

Goals, Possible Outcomes

"Our goal," Mohan explained, "is to develop new applications for bismuth compounds. The attraction of these compounds is that they are relatively safe, non-toxic, and inexpensive."

A possible outcome of the research Mohan and his students will conduct is discovery of cost-saving industrial applications for synthesis of pharmaceuticals. For example, adoption of less toxic compounds would cut disposal and clean-up costs.

IWU Student Researchers

Two IWU seniors will be among Mohan's team of investigators: Michael Pulia from Westchester, Ill., and Steven Tymonko of Champaign, Ill. Pulia previously assisted Mohan on a two-year study into agents found in the environment that trigger lung and colon cancer. This research was funded under a $25,000 grant from the Petroleum Research Fund, which was administered by the Washington, D.C.-based American Chemical Society (ACS).

Other IWU students participating in the research project are:

o Bryce Nattier, a junior from Flora, Ill.

o Laura Wieland, a junior from Freeport, Ill.

o Nick Leonard, a junior from Des Plaines, Ill.

o Herbert Zerth, a sophomore from Mokena, Ill.

Mohan sees several key reasons for involving undergraduates in NSF-level research projects.

"True learning happens in the laboratory," he said, "when the students discover things for themselves. It's far more effective than classroom instruction. Research experience also has helped students get internships in the pharmaceutical industry."

The students will carry out organic transformations using various bismuth compounds.

Looking for Safer Alternatives

"The idea," Mohan explained, "is to see if we can replace more toxic reagents with safer alternatives, as well as finding new applications for bismuth compounds that could be used by the pharmaceutical industry."

As part of the research project, the students will join Mohan in writing articles chronicling their research for various peer-reviewed journals and presenting their findings at meetings of scientific organizations. This August, Mohan will take four students to the national meeting of the American Chemical Society in Washington, D.C., where three of the students will present preliminary findings on bismuth research.

Generally speaking, molecules obtained through organic synthesis, a technique employed in Mohan's research, have resulted in many lifesaving drugs, the IWU chemist said.

Research into the "green" or environmentally friendly chemistry was spurred by the Pollution Prevention Act, federal legislation passed in 1990 calling for pollution prevention through proper waste disposal, waste treatment, and other measures.

"Because of this act," Mohan said, "there is increased awareness of the environment. This is causing chemists to reconsider their approaches to synthetic organic chemistry."

Why Bismuth?

Bismuth is an element ripe for environmentally responsible research because it's relatively inexpensive and while it is rare in the Earth's crust, it is available in large quantities as a byproduct of the refining process for lead and copper.

The low toxicity of bismuth compounds has made them fairly common in pharmaceutical products, ranging from antacids and diarrhea treatments to dressings for wounds.

Synthetic organic chemistry is fascinating, according to Mohan, because through this field of work new molecules are made in the laboratory that could lead to life-saving drugs. Synthetic

organic chemistry is a discipline where complex molecules are organized from simpler starting materials that contain carbon.

Mohan applied for the NSF grant last January and received the award four months later. In crafting the proposal, extensive background research was done, as well as testing some preliminary ideas in the laboratory&emdash;an effort that involved IWU students.

Mohan believes that this type of research experience for students is particularly important in a liberal-arts university environment.

"I've always believed," he said, "that there should be only one kind of research&emdash;cutting-edge research. At smaller universities, we may compromise on the quantity of research done, but I don't see why we should compromise on the quality of the research conducted by undergraduate students."

Mohan's Background

Mohan was born in New Delhi, India.

He received a bachelor of science degree (with honors) in chemistry from Hansraj College in Delhi, India, in 1985; a master of science degree in organic chemistry from the University of Delhi, India, in 1987; and a doctorate in chemistry from the University of Maryland, Baltimore, in 1992.

Mohan was a post-doctoral research associate at the University of Illinois, Urbana-Champaign in 1992-94, and a visiting assistant professor of chemistry at Coker College, Hartsville, S.C., in 1994-96.

Mohan joined the IWU faculty in 1996.

He is a member of the American Chemical Society (ACS) and the American Society of Pharmacognosy.

Mohan, who has won a half dozen research grants from IWU and

ACS , also is the co-author of 15 research publications and has made scientific presentations at meetings of professional organizations such as the American Chemical Society.

National Science Foundation

The National Science Foundation is an independent U.S. government agency responsible for promoting science and engineering through programs that invest money in research and education projects.

About IWU

IWU, founded in 1850, enrolls about 2,070 students in a College of Liberal Arts, and individual schools of Music, Theatre Arts, Art, and Nursing. Since 1994, these facilities have been added to the IWU campus: a $15 million athletics and recreation center, a $25 million science center, a $6.8 million residence hall, a $5.1 million Center for Liberal Arts, and a $1.65 million baseball stadium. A $26 million library and a $6 million student center are under construction. Kiplinger's Personal Finance Magazine ranks Illinois Wesleyan University 12th among the nation's top 1,600 private colleges in providing a top-quality education at an affordable cost. Also sharing IWU's rank are Princeton and Dartmouth.

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