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Contact

Melissa Weber, Director of Communications
Phone: 320-589-6414, weberm@morris.umn.edu

Jenna Ray, Editor/Writer
Phone: 320-589-6068, jrray@morris.umn.edu

Chemistry professors awarded National Science Foundation grant

Summary: Nancy Carpenter, Ted Pappenfus, and Tim Soderberg will integrate renewable energy and sustainable chemistry into the curriculum.

(April 22, 2010)-The National Science Foundation has awarded three University of Minnesota, Morris chemistry professors a \$197,146 grant to integrate renewable energy and sustainable chemistry into the undergraduate chemistry curriculum. The University of Minnesota Initiative for Renewable Energy and the Environment also contributed \$22,000 for the project. Nancy Carpenter, Ted Pappenfus, and Tim Soderberg will use the funding to create new courses and add new aspects to existing courses on nuclear, solar, wind, fuel cell, and biofuel energy sources. Morris undergraduate students will be substantially involved in all phases of the project.

The grant project introduces timely topics of global importance and emphasizes an interdisciplinary curriculum for both teaching and research. “The whole area of sustainability and renewability needs an interdisciplinary approach,” says Pappenfus. “Chemistry is already very interdisciplinary. It’s the new norm in science—biochemistry, for example, or my area of photovoltaics, which involves many elements of physics.”

Sustainable energy

Carpenter is developing the Chemistry of Sustainable Energy course that will serve as an elective for both the chemistry and environmental science majors. Topics for the course include: energy basics, fossil fuels, “sustainable” energy sources, biomass, solar cells, hydrogen fuel cells, and nuclear energy. The inaugural course will be offered this fall.

Polymers and photovoltaics

Pappenfus will focus on two areas that affect the environment: polymers and photovoltaics. Polymers, large macromolecules, occur in natural and synthetic materials, but are often associated with plastics. In both the classroom and in the laboratory, Pappenfus and students will investigate the origins of the world’s plastics and also future issues such as disposal and sustainable polymers. The study and research of photovoltaics, or solar cells, will be incorporated into introductory through advanced courses, from making a solar cell, to creating solar cell materials, to sophisticated solar cell measurements.

Biofuels

Soderberg, a bioorganic chemist, explores the role biology plays in the energy crises. He and student research assistants study enzymes for the ability to convert plant by-products—parts not for consumption—to ethanol. The research could eliminate the “fuel versus food” controversy surrounding biofuels such as corn. These biochemical concepts will be incorporated into introductory through advanced chemistry courses.

Both science majors and nonmajors will benefit from the new and enhanced courses. “When they graduate, Morris students will have a good understanding of renewable energy and sustainable chemistry,” states Pappenfus. “Chemists have a huge responsibility for paving the path to the future. Most institutions are on the ‘bandwagon’ but many have not addressed how to incorporate renewability and sustainability into the curriculum. Success at Morris may have

far-reaching impact as other institutions incorporate our curriculum concepts in the future.”

Photo above: Ted Pappenfus, associate professor of chemistry, Nancy Carpenter, professor of chemistry, and Tim Soderberg, associate professor of chemistry

Photo credit: Natalie Johnson '11, Witchita, Kansas

Through personal and academic discovery, the University of Minnesota, Morris provides opportunities for students to grow intellectually, engage in community, experience environmental stewardship and celebrate diversity. A renewable and sustainable educational experience, Morris prepares graduates for careers, for advanced degrees, for lifelong learning, for work world flexibility in the future, and for global citizenship. Learn more about Morris at morris.umn.edu or call 888-866-3382.