



UD's Antoniewicz receives NSF Career Award

2:22 p.m., Jan. 18, 2011----Maciek R. Antoniewicz, DuPont Young Professor in the Department of Chemical Engineering at the University of Delaware, has been awarded a prestigious National Science Foundation (NSF) Faculty Early Career Development Award to study the role of metabolism in cellular behavior.

The NSF Career Award, which includes a \$400,000 grant, will support Antoniewicz's research and education program at UD on metabolic engineering and systems biology.

"I am honored to receive this award. It is very gratifying to be selected for this honor by my peers," says Antoniewicz. According to NSF, less than 20 percent of those submitted each year are selected for funding.

The NSF Faculty Early Career Development program recognizes junior faculty for their role as teacher-scholars and for integrating education and research within the context of their organization's mission. Proposals are reviewed by colleagues in the field and the highly competitive award is bestowed on those scientists and engineers deemed most likely to become the academic leaders of the 21st century.

"My long-term research goal is to improve our understanding of cellular regulation to permit purposeful manipulation of metabolic pathways and cell phenotypes," explains Antoniewicz. "By developing a better understanding of how cells communicate with each other and how they respond to their environment, we hope to produce cheaper biofuels and develop improved drugs for treating diseases like diabetes and cancer."

Current knowledge of the role metabolism plays in cell behavior is limited due to difficulties in measuring metabolic fluxes precisely and accurately, says Antoniewicz. Metabolic fluxes are key parameters that describe the overall cellular physiology. In the past decade, metabolic flux analysis (MFA) has become a key tool in metabolic engineering, biotechnology and systems biology.

Antoniewicz's research proposes to quantify the metabolic state of cells using a novel measurement technique called tandem mass spectrometry. A powerful tool for obtaining structural information of molecules, tandem mass spectrometry has previously been used to reveal the structure of a variety of small to medium sized molecules, including organic molecules, lipids and fatty acids, peptides, carbohydrates, as well as DNA and RNA adducts.

Antoniewicz intends to develop a new and universal framework for using tandem mass spectrometry and stable-isotope tracer experiments for elucidating complex biological network models and estimating metabolic fluxes. He hopes this work will provide the groundwork needed to advance applications such as engineering organisms to make alternative fuels and developing next generation drugs to treat metabolic diseases.

If successful, his work will introduce a new method of MFA, provide improved techniques for validating flux results and improve basic knowledge on metabolic network operations of two important microorganisms, *E. coli* and yeast.

Under the grant, he also hopes to incorporate quantitative systems biology principles as an integral part of chemical engineering education at UD and increase the participation of underrepresented student groups in research, which he says will "contribute to the training of a new generation of engineers and scientists needed to drive the emerging field of systems biology and its biological applications."

"The project provides unique opportunities to train and educate students in an interdisciplinary environment," explains Antoniewicz. "Infusion of state-of-the-art research into a classroom firmly based in biological principles will better prepare students to make intelligent and effective decisions in their future careers in biotechnology and related fields."

Specific action items to achieve this goal include developing new course material and a capstone laboratory course on biological protein production, and providing hands-on summer research opportunities to minority undergraduate students. Antoniewicz will welcome undergraduate students from Delaware State University to his UD lab to take part in research at the front lines of discovery in science and engineering in his Metabolic Engineering and Systems Biology laboratory.

Antoniewicz earned his bachelor's and master's degrees in chemical engineering, with a minor in biotechnology, from Delft University of Technology in The Netherlands. He earned his doctorate in chemical engineering from Massachusetts Institute of Technology, with a minor in human physiology. Before joining UD in 2007, he conducted postdoctoral research with DuPont in Central Research and Development.

Antoniewicz has won a number of international honors and awards, including the 2008 DuPont Young Professor Grant and the 2008 James E. Bailey Young Investigator Award in Metabolic Engineering.

Article by Karen B. Roberts

Photo by Evan Krape



Maciek Antoniewicz has been named a recipient of the prestigious National Science Foundation Early Career Development Award.

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