

7-5-2016

National Scientists

University of Dayton

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Recommended Citation

University of Dayton. "National Scientists" (2016). http://wayback.archive-it.org/4727/20160920155948/https://www.udayton.edu/news/articles/2016/07/national_science_foundation_grants.php

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NEWS

Tuesday July 5, 2016

National Scientists

University of Dayton researchers are part of a select group of organizations awarded funding for prestigious National Science Foundation research and project grants.

Only about a quarter of the nearly 42,000 proposals submitted annually to the NSF receive funding. Even with those slim odds, more than 20 University of Dayton researchers are currently working on 14 National Science Foundation projects worth about \$4 million.

"The breadth of expertise of our researchers, especially in STEM disciplines, makes the University of Dayton appealing to organizations like the National Science Foundation," said John Leland, University of Dayton vice president for research. "We have researchers from nine different units involved in our work with the NSF."

Tarek Taha and Keigo Hirakawa, both in electrical and computer engineering, are leading a total of three National Science Foundation projects.

Taha hopes to make new brain-inspired computer chips that can be up to a million times more efficient than present-day computer chips. It's an offshoot of recently completed NSF work to implement brain-like algorithms for computers. Taha's research holds such promise that the NSF kickstarted his research with a CAREER award that goes to junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within their organizations.

One of Hirakawa's projects, with electro-optics professor Andrew Sarangan, involves developing multi-spectral imaging sensors that analyze light content beyond what people see in color. Those sensors can be used in food and water safety efforts, geological surveys, biomedical imaging and more. In another project, Hirakawa is pushing the limits of low-light imaging — "how dark can a scene be and a camera still get a good image." This could improve consumer and medical imaging, which could allow for lower radiation dosages for patients.

Other National Science Foundation projects focus on improving how others teach and learn.

Margie Pinnell, a School of Engineering associate dean for faculty and staff development, is helping K-12 STEM teachers bring project-based, hands-on STEM learning into their classrooms. The goal is to increase the pool of students excited about STEM disciplines who can meet the demand for high-tech workers in the region. In conjunction with this project, Pinnell has an NSF grant that supports undergraduate engineering students engaging in advanced manufacturing and materials research.

Chief Information Officer Tom Skill and his group just finished building a high-performance research network that provides connections to other research institutions via state and national high capacity networks. The network will enable scientists and engineers to better share data regardless of its size or complexity. Researchers also will be able to remotely access and control instruments at other locations, like electron microscopes at the Ohio State Center for Electron Microscopy and Analysis.

Kim Bigelow, director of the Engineering Wellness through Biomechanics Lab, has an NSF project to focus on how individuals with disabilities can live more independent lives. Her grant allows engineering students to design therapeutic devices for patients with limited mobility in Kettering Health Network's NeuroRehab and Balance Center. In addition to this project, four students in Bigelow's lab won NSF Graduate Research Fellowship Program grants, which provide three years of support for graduate school.

And the list goes on.

Bigelow's colleagues in mechanical engineering, Drew Murray and David Myszka, want to help manufacturers reduce production costs and time with more versatile techniques for manufacturing plastic parts.

Mikhail Vorontsov and Thomas Weyrauch in the Intelligent Optics Laboratory are developing better lasers for material processing in the automotive, aerospace and energy industries.

In the Research Institute, researchers with NSF grants are examining how to manipulate materials to make solar power more affordable, water cleaner and medicine more effective; create building materials that morph, depending on the structure's surroundings, to be more environmentally friendly; and develop high-powered microscopes to get a closer look at the physical and chemical properties of molecules.

"Even though the types of research we perform vary greatly from one project to the next, you'll see a single theme emerge: problem solving," Leland said. "Our researchers are constantly searching for solutions that will improve society and create an economic impact that leads to more jobs."

The National Science Foundation grants aren't limited to engineers.

In the College of Arts and Sciences, biologist Ryan McEwan is looking at how the introduction of organisms and changes in environmental conditions affect modern ecosystems, and paleontologist Dan Goldman is studying ancient environments and ecosystems in order to better understand the effects of present-day climate change on marine life.

Through the highly competitive NSF EAGER program, another group of biologists is looking at how insects smell in an effort to create better sensors that can sniff out explosives or cancer. This is the University's first EAGER award,

which are early-concept grants for exploratory research.

And they aren't limited to faculty.

"National Science Foundation grants also allow hundreds of students opportunities to be involved in research deemed significant on a national level," Provost Paul Benson said. "Hands-on learning is an important part of a University of Dayton education. We take pride in being able to provide our students opportunities on this level, which will add to their qualifications for graduate school or employment."

Biology professor Karolyn Hansen, who is working on the better "smelling" sensors, agrees.

"We want the students in the laboratory," she said. "It's such a rich experience to have those different levels of research. The adviser, the mentor, is the driver and the focus of the lab. The grad students come in and learn from the mentor and choose really challenging projects, and the undergrads come in and learn from the graduate students. We foster that at a very high level."

Approximately 240 students are engaged in sponsored research at the University. Several hundred more participate in the University's annual Stander Symposium where students present research projects.

"Stander forces you to really know your data and be able to talk about it at an intelligent level with faculty and undergrads," said biology graduate student Eric Camino. "Can you discuss it with people in your field as well as with people in other studies? Can you explain why it's relevant?"

The University also has many other government and industry research sponsors. According to the National Science Foundation, the University ranks 34th among all U.S. colleges and universities in sponsored engineering research and development. It ranks 21st for federally sponsored engineering research and development, including second in federally sponsored materials research.

For more information on research at the University of Dayton, contact Shawn Robinson, associate director of media relations, at 937-229-3391 or srobinson1@udayton.edu or Pamela Gregg, University of Dayton Research Institute communication administrator, at 937-229-3268 or pgregg1@udayton.edu.