PRINCETON UNIVERSITY

RECOVERY ACT AWARDS

Introduction
List of Award Winners

AWARDS BY DISCIPLINE

Astrophysics
Atmospheric & Geological Science
Biology & Neuroscience
Chemistry
Computer Science & Electrical Engineering
Engineering
Mathematics
Physics
Politics & Social Science

Engineering

Chemical Engineering

An interdisciplinary team led by Professor **Ilhan Aksay** was awarded $2.9 million from the Air Force Office of Scientific Research to study how the addition of miniscule particles called nanocatalysts to hydrocarbon jet fuels affects fuel performance. Ultimately, the work could lead to the development of superior fuels that allow planes to travel faster while producing less air pollution. Aksay's Princeton collaborators on the project include chemistry professors Annabella Selloni and Roberto Car and mechanical and aerospace engineering professor Fred Dryer. The team also includes scholars from the University of Delaware, Stanford University and the University of Maryland. Read Story

Professor **Christodoulos Floudas**, assistant professsor **Benjamin Garcia** and associate professor **Joshua Rabinowitz** were awarded $1.3 million from the National Science Foundation to develop a computational platform that could eliminate a major bottleneck in the studies of proteins and metabolites produced during cellular processes in living organisms. Mass spectrometry is the leading chemical analysis technique in these rapidly expanding disciplines, allowing quantitative assessment of the complete chemical composition of living systems, but the ability to analyze the data efficiently and yield useful knowledge is lacking. The proposed platform will provide a freely available resource to extract information about chemical compound identities and quantities from raw spectrometry data, thereby tackling the largest barrier preventing these fields from having a transformative effect on biological research.

Mechanical & Aerospace Engineering

Associate professor **Craig Arnold** has received $317,000 from the National Science Foundation to delve deeper into a breakthrough nanolithography technology developed in his lab used to create ultrasmall features on microchips. The technology hinges on the use of a special laser to trap a microscopic bead, which focuses the light from a second powerful laser to burn designs onto a blank chip. In the new research, Arnold and his colleagues will explore the physics at work and expand their study to include a variety of different beads and surface types. In addition to having a profound impact on how nanometer-scale features are created, the research has implications for many other areas of science, including biology, energy research and consumer product development.

Senior scientist **Mikhail Shneider** was granted $95,000 from the National Science Foundation to develop models of puzzling optical phenomena known as blue jets. First discovered in 1994, these narrow cones of blue light arise from the tops of thunderstorms, sometimes extending upwards to the outermost layer of the Earth's atmosphere. Insights into the physical principles that govern the behavior of blue jets may expand the understanding of the global electrical circuit -- the continuous flow of electrical current around Earth and its atmosphere, which dictates the weather.

Professor **Howard Stone** was awarded $239,000 from the National Science Foundation to explore how thin films of fluid flow over rough surfaces. All real surfaces are textured at the microscopic level, whether from abnormalities in the material or the intentional creation of features for particular purposes, such as to improve adhesive properties. Stone and his collaborators will perform experiments and develop theoretical models to investigate flows when the thickness of the fluid is comparable in size to the ultrasmall features on a surface. A heightened understanding of thin-film behavior has critical implications for many industrial applications, including surface coating, cooling, cleaning and drying. Additionally, the research will offer insight into how microscopic surface patterns can be used to alter the formation of droplets when liquid jets are aimed at a surface, which is important for improving fuel combustion processes.