

NSF Honors ME Faculty

Four mechanical engineering faculty members recently won National Science Foundation (NSF) awards for research that includes biological and biochemical sensing, vaporized nano-emulsions in ultrasound, and control of dynamic and autonomous systems.

Associate Professor Xin Zhang was awarded two NSF grants: the Grant Opportunities for Academic Liaison with Industry (GOALI) Award and the Biosensing Award.

Zhang's GOALI-supported research aims to develop a mass-producible gas micro-detector capable of competing with the performance of laboratory instrumentation, which has applications in chemical analysis in both energy and health care systems. She will use the Biosensing/CBET Award to pursue research in biological/biochemical sensing at cellular and sub-cellular levels by converting a biological response to an electrical signal using micro/nano-systems. The objective of this research is to design and test a multidisciplinary micro/nanosystem for positioning individual cells into an analyzing matrix for real-time monitoring of cell viability and response.

Assistant Professors Sean Andersson and Calin Belta were awarded a three-year grant for their collaboration on "DynSyst_Special_Topics: A formal approach to the control of stochastic dynamic systems."

The research aims to establish theoretical and computational frameworks for the analysis and control of stochastic systems, particularly in mobile robotics. The proposed research will lead to a framework in which an autonomous vehicle—in a loud, noise-filled environment that could potentially disrupt the vehicle's sensors—is successfully deployed and can complete a highly specific task.



Xin Zhang



Sean Andersson



Tyrone Porter



Calin Belta

Assistant Professor Tyrone Porter received the Broadening Participation Research Initiation Grants in Engineering (BRIGE) Award in support of his project, "The Role of Vaporized Perfluorocarbon Nanoemulsions in Enhanced Ultrasound-Induced Lesion Formation for Cancer Therapy."

Porter's research centers on focused ultrasound (FUS), a noninvasive medical procedure for the treatment of localized solid

tumors. While FUS therapy can destroy solid tumors with millimeter precision, the treatment of most clinically relevant solid tumors requires placement of multiple lesions, which can take hours to achieve. Porter hopes to develop a phase-shift nanoemulsion (PSNE), which would reduce the time and acoustic energy required for treatment.

—Jason L. London

Bigio, Dal Negro Win Faculty Awards

College of Engineering Associate Dean for Research and Graduate Programs Selim Ünlü announced Professor Irving Bigio (BME, ECE, Physics, Medicine) as the recipient of the College's Distinguished Lecturer Award and Assistant Professor Luca Dal Negro (ECE) as the recipient of the Early Career Research Excellence Award at the ENG faculty meeting on December 16.

DISTINGUISHED LECTURER AWARD

The annual Distinguished Lecturer Award honors a faculty member engaged in outstanding, high-impact research and provides the recipient with a public forum to discuss and showcase research before the Boston University academic community.

Bigio presented the lecture "Skipping the light fantastic: Detecting cancer, and things that precede cancer, with scattered light" on March 4. Addressing a packed audience at the Photonics Center auditorium, he discussed the origin, development and clinical potential of elastic scattering spectroscopy (ESS), a noninvasive optical method he

pioneered to detect sub-cellular, structural changes in tissue associated with the onset of most major cancers—critical information that pathologists cannot obtain with a microscope.

ESS is a technique that passes a fiber-optic probe through an endoscope or catheter. When the probe's optical fiber shines white light on the colon or another organ of interest, an adjacent optical fiber collects the light scattered back from the tissue. Software then compares the spectrum emitted from the tissue with normal spectral signatures in a stored diagnostic algorithm to pinpoint early signs of cancer.

Bigio's research on minimally invasive diagnostics and therapeutics based on optical technologies is part of a growing effort to reduce health care costs through preventive medicine, early diagnosis, reduced invasiveness of procedures and outpatient procedures. A fellow of the American Institute for Medical and Biological Engineering and the Optical Society of America, Bigio has won three R&D 100 Awards for minimally invasive diagnostics.

Since joining the Boston University community in 2001, Bigio has earned joint appointments in the Departments of Electrical & Computer Engineering, Biomedical Engineering, Physics and Medicine. He currently serves as chair of the annual Photonics "Future of Light" Symposium and organizer of the BME Senior Design Project Conference. Previously, he was a research scientist at the Los Alamos National Laboratory.

EARLY CAREER RESEARCH EXCELLENCE AWARD

The annual Excellence in Research Award celebrates the significant, recent and high-impact research accomplishments of tenure-track faculty less than 10 years removed from their PhD.

Luca Dal Negro joined the College of Engineering in 2006, three years after receiving his PhD from the University of Trento in Italy. Already recognized as a leader in the field of nanophotonics, Dal Negro has published more than 60 journal articles (more than 30 in 2008 and 2009) and received invitations to speak at 26 seminars.

Dal Negro's research centers on the fabrication and optical characterization of novel nano-optical materials and photonic structures. He has made several noteworthy contributions to the study of the optics of metallic nanostructures, and nanoplasmonics; light-emitting silicon nanocrystals; and deterministic aperiodic optical materials.

—Mark Dworzan



Professor Irving Bigio (BME, ECE, Physics, Medicine)



Assistant Professor Luca Dal Negro (ECE)