Deshpande Center for Technological Innovation

The Deshpande Center for Technological Innovation serves as a catalyst for innovation and entrepreneurship by supporting the research of MIT faculty and students and facilitating collaboration with entrepreneurs, venture capitalists, and innovative businesses. It carries out its mission though several activities, including the Grant Program, the Catalyst Program, the Innovation Teams subject, and sponsored events. The center's goal is to be able to accelerate the movement of technology from the laboratories at MIT into the commercial marketplace, where the technology can have an impact.

The Deshpande Center was founded in 2002 through a generous gift of $20 million from Jaishree and Gururaj "Desh" Deshpande, cofounder and chairman of Sycamore Networks Inc. The center depends on the generous support of industry, the entrepreneurial community, and the MIT alumni communities to sustain its programs.

Executive Director Leon Sandler spearheads the Deshpande Center's efforts along with Professor Timothy M. Swager, faculty director. Professor Swager, the John D. McArthur Professor of Chemistry, succeeded Charles L. Cooney as the center's faculty director on May 1, 2014. Guidance is provided by a steering committee that includes Vladimir Bulović, associate dean for innovation and professor of emerging technology; Charles Cooney, professor emeritus; Hemang Dave; Desh Deshpande; Mark Gorenberg of Zetta Venture Partners; Robert Langer, Institute Professor; and Martin Schmidt, Provost.

Highlights

In academic year 2015, the center continued to see more of its projects move toward commercialization. Since its inception, the Deshpande Center has funded more than 110 projects with more than $14 million in grants. Thirty projects have spun out of the center into commercial ventures that have collectively raised more than $500 million in outside financing.

This year the Deshpande Center partnered with the Masdar Institute to support four projects being run jointly by MIT and Masdar faculty through the Masdar Institute and MIT Innovation Program (MMIP). The $400,000 in funding for these projects comes from the Masdar Institute.

Deshpande Grant Program Awards

The Grant Program provides research funds that permit MIT faculty and students to create and investigate new technologies and support the transfer of new knowledge and technologies from the Institute to young companies. The Grant Program consists of two types of awards: Ignition Grants of up to $50,000 and Innovation Grants of up to $250,000. Multiple experts in academia and industry review each application in two stages: pre-proposal and full proposal. The center announces awards annually.

The Deshpande Center awarded 14 grants (nine new and five renewal) in fiscal year 2015 totaling $976,000. The awards support a wide range of emerging technologies. In addition, MMIP awarded $400,000 in grant funding to the four projects mentioned above.

Ignition Grants

Ignition Grants target projects focusing on novel, enabling, and potentially useful ideas in all areas of technology. Although it might enable only exploratory experiments to establish proof of concept, an Ignition Grant can position projects to receive further funding, such as an Innovation Grant, to take a concept to full development.

Innovation Grants

An Innovation Grant benefits projects that have established proof of concept and identified a research and development path and intellectual property strategy. Each grant helps a project advance its technology and reduce technical and market risk. The goal is to reach a point where investors would invest in a start-up to commercialize the technology or where an existing company might license the technology and develop it.

FY2015 Deshpande Center Grant Recipients

Marc Baldo: Broadband Omnidirectional Antireflection Coating for Silicon Solar Cells Using Guaranteed Global Optimization of Thin Film Optical Coatings. The design of thin film optical interference coatings remains more art than science. This project is developing the first algorithm that can guarantee that a global solution to a design problem in this class has been found. To demonstrate the algorithm's potential, the most efficient broadband omnidirectional antireflection coating for silicon solar cells is designed and experimentally demonstrated.

Moungi Bawendi: Exceedingly Small Iron Oxide Nanoparticles as T1 MRI Contrast Agents. This project aims to produce a contrast agent with similar properties to GBCA (gadolinium-based contrast agents) but with less toxicity. These new contrast agents will allow patients with impaired kidney function, who are unable to use GBCA, to receive the diagnostic benefits of contrast-enhanced magnetic resonance imaging. Ultimately, this research could have a potentially large impact with regard to broadening the use of magnetic resonance images in diagnostics.

Sangeeta Bhatia: Ultrasensitive Noninvasive Disease Monitoring Platform. This project will leverage advances in nanotechnology to allow disease-specific enzymes to generate highly predictive "synthetic biomarkers" that appear in the urine of patients for easy analysis. The approach dramatically broadens the number of diseases that can be detected and monitored by urinalysis and increases detection sensitivity and specificity.

Patrick Doyle: Covert and Robust Micron-Scale Tags for Anti-Counterfeiting. This project will develop new methods to covertly encode objects such as pharmaceutical packaging, currency, and electronics using smartphone-readable encoded particles that have a combination of spectral and spatial codes and are able to withstand extreme environments. This would reduce the opportunity for counterfeiting.

Elazer Edelman: Drug-eluting Platform Device to Locally Treat Pancreatic Cancer. Pancreatic cancer is a devastating therapy-resistant disease. This project will focus on significantly improving patients' quality of life using a drug-eluting stent. By delivering the drug directly within the tumor mass, this stent will relieve the malignant obstructions, control local tumor progression, and reduce the need for frequent device replacement.

Jeff Grossman: Nanoporous Thin Films for Water Desalination and Purification. This project focuses on the development of graphene nanoporous thin films, which promise significant value for the fields of water desalination and filtration. In the next phase of this research, the team will develop a next-generation filtration and desalination membrane and continue to identify and optimize specifications for commercial applications with a global impact.

T. Alan Hatton: Electrochemically-Mediated Carbon Dioxide Capture. Current CO_2 capture technology is energy intensive, expensive, and difficult to integrate with existing infrastructure. This project will develop a novel plug and play, cost-effective electrochemically controlled process for CO_2 capture.

Jeffrey Karp and Martha Gray: A Drug Delivery Platform for Sustained Treatment of Inflammatory Arthritis. This project will create a delivery system for the treatment of inflammatory diseases such as arthritis. The system will release a measured amount of drug in response to level of inflammation, resulting in both increased and sustained comfort for patients and lower systemic toxicity than conventional treatments.

Bradley Pentelute and Klavs Jensen: Fast Flow Peptides. Peptides are an important and growing area of therapeutics. The development of peptide-based pharmaceuticals requires the synthesis of custom peptide sequences made on demand. With current batch systems, these sequences can take weeks to synthesize. This project is developing a flow system that greatly accelerates the rate of production and reduces overall synthesis time to minutes.

Chris Schuh: Shape Memory Ceramic Actuators. Shape memory materials are solid-state actuators that can produce both large forces and displacements, making them ideal materials for actuation applications in areas such as robotics, electronics, and haptics. This project is developing a new class of actuator materials.

Marin Soljacic: Transparent Displays Enabled by Wavelength-Selective Light Scattering. This project explores a new type of transparent display based on the wavelength-selective scattering of light from nanostructures. The advantages of this approach include a wide viewing angle, low cost, scalability to large areas, compatibility with existing commercial projectors, and ease of application to glass surfaces.

Yogesh Surendranath: Fluorinated Non-Stick Coatings for High Performance Electrodes. This project will develop a novel passivation method for high surface carbon electrodes using fluorocarbon film. The proposed coating can be applied during the late stages of device fabrication and reduces the likelihood of premature device failure.

Kripa Varanasi: Waterproof & Smart Fabrics Using Symmetry-Breaking Surfaces. The current solutions for waterproof textiles are based on hydrophobic membranes or modifiers and are environmentally unfriendly. This project addresses the significant and growing need for non-wetting and breathable fabrics with a novel approach to waterproofing and the development of smart fabrics.

Michael Watts: Scalable Photonic Links for Ethernet Systems. Network limitations can have an adverse effect on the performance of large-scale computing systems such as data centers. This project will integrate laser sources with silicon photonics to create versatile and scalable photonic links for Ethernet systems that will enable unprecedented performance and scalability.

FY2015 MMIP Grant Recipients

Anurandha Agarwal and Prashanth Marpu: Low Cost Rapid Algal Bloom Sensing Device. Harmful algal blooms (HABs) occur when algae grow rapidly due to a combination of warm water temperatures, high levels of nutrients such as phosphorus and nitrogen, and sunlight. HABs contain toxins that can foul coastlines, kill fish, and pose health risks to humans. Algal blooms also present a major problem for many desalination plants. This project uses novel low-cost on-chip sensing devices for continuous water monitoring, enabling early warning of algal blooms.

Jing Kong and Shadi Hasan: Wastewater Treatment: Integration of Electro-technologies and Nanowire Filtration. This project will focus on the development of a novel wastewater treatment system that combines nanowire filtration and bioelectrochemical treatment for the removal of heavy metals, organic contents, and microbes in water.

John Lienhard and Hassan Arafat: Novel Module Configurations for High Efficiency Membrane Distillation. Focused on highly energy-efficient water desalination, this project will develop a novel approach to membrane distillation capable of handling different quantities of feed waters and high salinity levels. This novel membrane distillation configuration will be a scalable and renewable energy–driven technology.

Tomas Palacios and Mihai Sanduleanu: GaN High Efficiency Transmitters for Wireless Communication. This project proposes to push the state of the art in radio frequency electronics through a novel highly integrated GaN digital transmitter solution with a record combination of efficiency and linearity for wireless communications. The transmitter technology will demonstrate the flexibility of a digital solution by performing multistandard operations with any type of modulation format. The chip will considerably reduce the footprint and power consumption in wireless radios.

Catalyst Program

Volunteers from the business community are integral to the Deshpande Center's mission of helping MIT innovators achieve market impact.

Catalysts are a highly vetted group of individuals with experience relevant to innovation, technology commercialization, and entrepreneurship. They provide individual contributions to the center and do not represent any company interests in their role as catalysts.

Catalysts are chosen based on the following qualifications:

- Experience in commercializing early-stage technologies and/or mentoring researchers and entrepreneurs as well as industry expertise
- Willingness to proactively provide assistance to MIT research teams
- Willingness to abide by time commitment, confidentiality, and conflict of interest guidelines
- Commitment to the interests of MIT researchers and the Deshpande Center

All catalysts must sign a catalyst guidelines document and agree to abide by the Deshpande Center's volunteer guidelines for managing privileged information and conflict of interest.

Deshpande Center Events

Through its sponsored events, the Deshpande Center seeks to bring together the components needed for MIT technologies to reach commercialization. These events connect faculty and students with members of the emerging technology industry.

IdeaStream Symposium

On April 8, 2015, the Deshpande Center held its annual IdeaStream Symposium aimed at connecting MIT researchers with the entrepreneurial community. The symposium included presentations and posters highlighting grantees whose work is at different stages, from new grant recipient to spin-off. Roughly 200 entrepreneurs, industry executives, venture capitalists, and MIT researchers attended the conference, which had the generous support of eight corporate sponsors.

Catalyst Events

Near the start of each semester, the Deshpande Center arranges a small reception to celebrate the latest grant recipients. This event is held in advance of announcing the grant awards to the general public. It is an opportunity for the grant recipient teams and catalysts to meet and mingle with each other and with staff and other volunteers. All new grant recipients are also asked to give a brief "elevator pitch" of their project.

Open House

The Deshpande Center hosted its premier fall event, the open house, in December 2014 at the Media Lab. This event offered an evening of camaraderie and networking and the opportunity for grant project teams to present a poster and share their research findings. Nearly 200 members of the Deshpande Center community attended.

Other Collaborations

The Deshpande Center met with delegates from many national and international universities and organizations to discuss the center's and MIT's approach to innovation and technology commercialization. Deshpande Center staff also spoke at numerous forums, conferences, and events. The center is seen as an internationally renowned model for stimulating technological innovation.

Within the MIT community, the Deshpande Center actively collaborates with other members of MIT's innovation ecosystem, including the Technology Licensing Office, the Martin Trust Center for MIT Entrepreneurship, the Venture Mentoring Service, the Industrial Liaison Program, and numerous student organizations.

Leon Sandler
Executive Director