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 course, 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. 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; Karen Gleason, associate provost and professor of chemical engineering; Mark Gorenberg, venture investor and member of the MIT Corporation; Paul Jansen, associate vice president of medical device development at Sanofi; and Institute Professor Robert Langer.

Highlights

In academic year 2016, the center continued to see more of its projects move toward commercialization. Since its inception, the Deshpande Center has funded more than 125 projects with more than $15 million in grants. Thirty-two projects have spun out of the center into commercial ventures that have collectively raised more than $600 million in outside financing.

This year the Deshpande Center partnered with the Abdul Latif Jameel World Water and Food Security Lab (J-WAFS) to manage the J-WAFS Solutions program, helping MIT faculty and students commercialize breakthrough technologies and inventions by transforming promising ideas at MIT into innovative products and cutting-edge spinout companies. J-WAFS Solutions projects are required to align with the program's strategic focus around water and food supply; research should be aimed at conceptualizing and developing products and services that will have a significant impact on water and food security, with related economic and societal benefits.

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 15 grants (eight new and seven renewal) in fiscal year 2016 totaling $1,151,000. The awards support a wide range of emerging technologies. In addition, the Masdar Institute and MIT Innovation Program (MMIP) awarded $1,025,000 in grant funding to seven projects, and the J-WAFS Solutions program awarded $300,000 to two projects.

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.

FY2016 Deshpande Center Grant Recipients

Moungi Bawendi: Exceedingly Small Iron Oxide Nanoparticles as T1 MRI Contrast Agents

This project aims to produce a contrast agent with properties similar to those of GBCAs (gadolinium-based contrast agents) but with less toxicity. These new contrast agents will allow patients with impaired kidney function, who are unable to use GBCAs, to receive the diagnostic benefits of contrast-enhanced magnetic resonance imaging (MRI). Ultimately, this research could have a potentially large impact with regard to broadening the use of magnetic resonance images in diagnostics.

Stephen Buchwald and Bradley Pentelute: Novel Approaches to Antibody-Drug Conjugates

Antibody-drug conjugates for cancer therapy are synthesized by attaching cytotoxic small molecule drugs to monoclonal antibodies via chemical linkers. This team is developing novel linkers to attach the drugs to antibodies. These linkers should allow for much more effective cancer therapy.

Kerri Cahoy: The Nanosatellite Optical Downlink Experiment (NODE)

This team will develop a miniature, low-cost, free space optical communications terminal for small satellites such as CubeSats. The system will be laser based and will require only a small ground receiver.

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 will reduce the opportunity for counterfeiting.

Fredo Durand and William Freeman: Color and Motion Magnification

This project has developed an algorithm that reveals small motions of small changes in color within a video. The team plans to develop easy-to-use software allowing doctors, engineers, and scientists to create new forms of "microscopes" that will offer improved information for solving problems.

Elazer Edelman: Drug-Eluting Platform Device to Locally Treat Pancreatic Cancer

Pancreatic cancer is a devastating therapy-resistant disease. By locally delivering a large amount of drugs directly into a tumor mass via devices, we are able to mechanically contain tumor progression. This project offers the best of systemic and palliative care: dramatically enhancing chemotherapeutic efficacy while improving quality of life. The team is focused on designing innovative technologies to alleviate adverse effects and potentially convert more tumors from inoperable to operable.

Ki Goosens: Effective PTSD Therapy

This team has shown that the stress hormone ghrelin plays a key role in posttraumatic stress disorder (PTSD). Their project will focus on identifying a drug that can modulate ghrelin, which would provide a new therapy for stress-related disorders.

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, cost-effective electrochemically controlled process for CO_2 capture.

Angela Koehler: Exploring the Therapeutic Potential of Small Molecules That Modulate the c-Myc Oncoprotein

Controlling the function of overactive transcription factors is an emerging therapeutic strategy in oncology. This team has identified compounds that bind to protein complexes containing the prolific oncoprotein c-Myc and found a subset that modulate Myc-driven functions in cells, including Myc-mediated transcription. They will explore the therapeutic potential of Myc modulation.

Timothy Lu: Platform Device for Non-Invasive Gastrointestinal Disease Monitoring

This device will enable the detection and reporting of gastrointestinal disease biomarkers in a non-invasive and near-real-time fashion, thus providing early detection of inflammatory flares that can then be terminated before they manifest clinically.

Daniela Rus and Dina Katabi: Ubiety

While GPS has revolutionized outdoor positioning, it does not work indoors. This project is developing an indoor positioning platform that is compatible with WiFi-enabled user devices (smartphones, tablets) and easily deployable. It would provide centimeter-scale location accuracy for users.

Chris Schuh: Shape Memory Ceramic Actuators

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

Henry Smith and Paulo Lozano: Sublimedia

Three-dimensional integrated electronic components require the stacking of thin layers of semiconductors. Manufacturing of such devices is very difficult as the layers become thinner. This project is developing a novel approach to handling and placing these thin layers.

Marin Soljacic: Transparent Displays Enabled by Wavelength-Selective Light Scattering

This project is exploring 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.

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.

FY2016 MMIP Grant Recipients

Alfredo Alexander-Katz and Matteo Chiesa: Transparency-Switching Materials for Reactive Sun Tracking: CPV for the Roof-Top Market

Roof-top photovoltaic solar panels lose efficiency if they do not track the sun. This project is developing self-tracking solar concentrators that optimally concentrate the sun's rays as the sun moves. They are based on passive materials with no mechanical components and would increase the amount of energy generated from solar panels.

Mircea Dinca, Clara Dimas, and Farrukh Ahmad: Electrochromic Metal Organic Frameworks for Smart Windows

Electrochromic windows that can change from transparent to dark reduce the amount of energy required to heat and cool buildings. This project is developing low-cost, durable electrochromic materials with tunable optical contrasts, fast responses at low switching power, and long optical memory. These materials could be used in smart windows to reduce energy consumption.

James Kirtley, Mahmoud Rasras, and Hatem Zeineldin: Integrated Optical Sensors for Fault Detection in Smart Distribution Systems

Electrical systems need to rapidly detect current overloads to shut down and isolate transformers and other components. Existing sensing devices can easily become

saturated and inaccurate. This project is developing an optical sensor that would rapidly detect current overloads.

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 bio-electrochemical treatment for the removal of heavy metals, organic contents, and microbes in water.

John Lienhard and Hasan 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 managing different quantities of feed waters and high salinity levels.

Tomas Palacios and Mihai Sanduleanu: GaN High Efficiency Transmitters for Wireless Communications

This project proposes to push the state of the art in radio frequency electronics through a novel, highly integrated GaN digital transmitter solution for wireless communications. The transmitter technology will demonstrate the flexibility of a digital solution by performing multi-standard operations in any type of modulation format.

FY2016 J-WAFS Solutions Grant Recipients

Jeffrey Grossman: Fouling Resistant Nanoporous Membranes

A water treatment plant needs to significantly pretreat feed water before it reaches the fragile separation membranes that remove salt or other unwanted species to provide fresh water, or the membranes will become clogged. This project is developing novel fouling-resistant materials that will significantly reduce the pretreatment requirements and improve the performance of water treatment plants.

Michael Strano and Anthony Sinskey: A Multiplex, Nanosensor Platform for the Real Time Monitoring of Food and Water-Borne Contaminants

Food and water safety requires real-time monitoring of contaminants at the point of use. This project seeks to develop a single integrated platform that can address many important food and water contaminants in a low-cost, widely deployable nanosensor array.

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 15, 2016, 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 2015 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