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 by facilitating collaboration with entrepreneurs, venture capitalists, and innovative businesses. It carries out its mission though several activities, including the Grant Program, the Catalyst Program, and sponsored events. The center's goal is 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. The steering committee that guides the Center includes Hillel Bachrach, founder and managing partner of 20/20 HealthCare Partners; Michael Cima, associate dean for innovation and professor of materials science and engineering; Charles Cooney, professor emeritus; Hemang Dave; Desh Deshpande; Mark Gorenberg, venture investor and member of the MIT Corporation; Helen He, founding partner of New Wheel Capital; Paul Jansen, medical device executive; Robert Langer, Institute Professor; and Lesley Millar-Nicholson, director of the MIT Technology Licensing Office and director of catalysts in the MIT Office of Strategic Alliances and Technology Transfer.

Highlights

Since its inception, the Deshpande Center has funded over 140 projects with more than $19 million in grants. In AY2020, the center continued to see more of its projects move toward commercialization. Forty-two projects have spun out of the center into commercial ventures that have collectively raised over $900 million in outside financing.

In collaboration with the Abdul Latif Jameel Water and Food Systems Lab (J-WAFS), the Deshpande Center managed the J-WAFS Solutions program and helped MIT faculty and students commercialize food- and water-focused technologies and inventions. Teams worked on transforming promising ideas into innovative products and spinout companies. The J-WAFS Solutions program is sponsored by Abdul Latif Jameel Community Initiatives, which is represented on the governing committee of the program. Projects are required to align with the J-WAFS strategic research 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 $150,000. 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 16 grants in FY2020 totaling $870,000. The awards support a wide range of emerging technologies and included 10 new and six renewal grants. The J-WAFS Solutions program awarded $260,000 of grant funding to two projects.

Ignition Grants

Ignition grants target projects focusing on novel, enabling, and potentially useful ideas in all areas of technology. Though it might enable only exploratory actions 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

Innovation grants benefit 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 startup to commercialize the technology or where an existing company might license the technology and develop it.

FY2020 New Grant Recipients

Brian Anthony: Learned control of manufacturing processes

The control of a manufacturing process is critical in maintaining the consistent quality of materials or products. Machine learning, especially deep reinforcement learning, overcomes limitations of other control strategies by adapting to the characteristics of specific production equipment. This project will create a new level of manufacturing system performance using process control methods based on deep learning.

Michael Birnbaum: Combinatorial engineering of chimeric antigen receptors

Chimeric antigen receptor (CAR) T-cell therapies have shown success in treating blood cancers such as lymphomas and leukemias; however, they have not been used successfully with solid tumors. This project will use a unique approach to create hundreds of thousands of CARs and to select for those that show superior activity under physiologically relevant conditions. The hope is to identify CARs capable of extending therapeutic efficacy to other disease implications.

Svetlana Boriskina: Antimicrobial & easy-care SmartPE fabrics

Conventional fabrics absorb body heat and perspiration, providing fertile ground for bacterial growth. Textile production pollutes water with dangerous toxins and 73% of fabrics end up in landfills. This project is developing a lightweight, recyclable, and stain-resistant SmartPE polyethylene textile that passively regulates body temperature via control of radiation, thermal conduction, and evaporation. It also inhibits bacterial growth, saves energy and water during fabrication and usage, and can help to reduce and reuse plastic waste.

Patrick Doyle: Multiplexed measurement of miRNA in tissue sections

Spatially resolved gene expression patterns are emerging as a key component of medical studies, including companion diagnostics, yet technologies for quantification and multiplexing are limited. This project is developing a method to perform spatially resolved and multiplex microRNA measurements directly from formalin-fixed, paraffin-embedded tissue. This technology could be used to quantify the heterogeneities in tissue samples and lead to informed biomarker-based diagnostics.

Paula Hammond: Polymer-drug conjugate for osteoarthritis

Osteoarthritis affects 30 million Americans, but there exists no drug that can slow disease progression. This project is developing a nanomaterial capable of targeted, sustained delivery of drugs to cartilage. By improving drug delivery to cartilage, the project aims to improve drug efficacy and create an osteoarthritis drug that can treat the underlying cause of the disease.

Jacquin Niles: Rapid, target-directed antimalarial drug discovery

Malaria remains a major global human health problem. With no efficacious vaccine available, the disease is treated using antimalarial drugs, to which resistance is emerging and spreading. This project focuses on establishing a novel strategy for prioritizing antimalarial targets and accelerating discovery of small molecules that interfere with these targeted functions. The goal is the discovery of novel targets and lead compounds for future antimalarial drug development efforts.

Zachary Smith: Polymer membranes with exceptional performance and stability

The development of polymeric materials for commercial membrane-based gas separations has stagnated for a quarter of a century. This project is developing an approach to make processable polymers featuring a flexible backbone connected to tunable, rigid, pore-generating side chains. With record stabilities under aggressive feeds, these polymers are a promising platform of materials to replace current gas separation membranes.

Choon Tan: Acoustic fluid level detection for wells

Over-pumping is a key cause of oil well failures in the United States. Over-pumping also generates millions of tons of CO_2 due to vented and flared natural gas. This project is developing novel acoustic fluid level sensors to continuously detect the amount of liquid in a wellbore, to allow real-time control of wells and prevent over-pumping.

Krystyn Van Vliet: Artificial axons as a myelination assay for drug screening in neurological diseases

Finding cures for neurological diseases is challenging. Most drug candidates fail in clinical trials, in part due to the lack of adequate *in vitro* drug-screening platforms that credibly represent the neural tissue environment. This project aims to develop Artificial Axons, a novel drug-screening platform that mimics biological and mechanical properties of neuronal axons. By providing a better representation of neural tissue, this platform will allow for more predictive *in vitro* drug development, accelerating the identification of cures for neurological diseases.

Xuanhe Zhao: High-strength tape for surgical sealing

The removal of diseased tissue and the reconnection of the remaining healthy tissues (anastomosis) are cornerstones of surgery. Rates of tissue breakdown and anastomotic leakage are high, and inflict substantial health and economic burdens upon patients and society. This project is developing a tissue tape that provides an instant, high-strength, and air- and liquid-tight tissue seal that will prevent anastomotic leakage.

J-WAFS Solutions Grants

Karen Gleason: Early detection system for crop pathosystems

Huanglongbing (HLB), or citrus greening disease, is incurable and threatens the survival of the US citrus industry. Current detection strategies are costly, time-intensive, and inaccurate. Early detection would allow for mitigation strategies that would save orchards. This project is developing a systemic detection system that senses concentration changes of volatile organic compounds during the early stages of HLB, when trees are asymptomatic.

Jeffrey Ravel and Susan Murcott: Producing E. coli *test kits in Nepal*

E. coli is a bacterium indicating fecal contamination in water that causes life-threatening diarrhea and dehydration in millions of people worldwide. In 2008, MIT D-Lab lecturer Susan Murcott developed low-cost water quality testing kits designed to signal the presence of *E. coli*. These kits have been used in the field in Nepal. This project will scale the production and marketing of these kits in Nepal and other emerging economies.

Catalyst Mentors

Volunteers from the business community, called "catalysts," 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 provide assistance proactively 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 guidelines document and agree to abide by the Deshpande Center's volunteer guidelines for managing privileged information and conflicts 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

On May 13 and 14, the Deshpande Center held its annual IdeaStream symposium, connecting MIT researchers with the entrepreneurial community. Due to the coronavirus pandemic, IdeaStream was held for the first time as a virtual event. It drew audience members from as far away as Australia, Ireland, India, and Brazil. The symposium included presentations highlighting the research of each team, along with breakout sessions in which participants engaged in Q&A (questions and answers) with each presenter. More than 600 people attended each day, including entrepreneurs, industry executives, and MIT researchers. IdeaStream 2020 had the generous support of four 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 round to the general public. It is an opportunity for the grant recipient teams and catalysts to meet and mingle with each other, as well as with staff and other volunteers. All new grant recipients are also asked to give a brief "elevator pitch" of their project.

Innovation Showcase and Open House

The Deshpande Center hosted its premier fall event, the Innovation Showcase and Open House, in December 2019 at the MIT Media Lab. Grant project teams each exhibited a poster and shared their research findings with attendees. Nearly 200 members of the Deshpande Center community gathered for an evening of camaraderie and networking.

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, the MT Sandbox, and numerous student organizations.

Leon Sandler
Executive Director