2023 MIT Sustainability Conference

September 26, 2023 - September 27, 2023

Day 1 | Tuesday September 26, 2023
John Roberts has been Executive Director of MIT Corporate Relations (Interim) since February 2022. He obtained his Ph.D. in organic chemistry at MIT and returned to the university after a 20-year career in the pharmaceutical industry, joining the MIT Industrial Liaison Program (ILP) in 2013. Prior to his return, John worked at small, medium, and large companies, holding positions that allowed him to exploit his passions in synthetic chemistry, project leadership, and alliance management while growing his responsibilities for managing others, ultimately as a department head. As a program director at MIT, John built a portfolio of ILP member companies, mostly in the pharmaceutical industry and headquartered in Japan, connecting them to engagement opportunities in the MIT community. Soon after returning to MIT, John began to lead a group of program directors with a combined portfolio of 60-80 global companies. In his current role, John oversees MIT Corporate Relations which houses ILP and MIT Startup Exchange.

Todd Glickman
Senior Director, MIT Corporate Relations

Mr. Glickman joined the Industrial Liaison Program in January 2000, serving as the MIT liaison for companies worldwide, and joined the senior management of the office in 2005.

Prior to joining ILP, Todd was Assistant Executive Director of the American Meteorological Society (AMS), the professional society for meteorologists, which is based in Boston. At AMS, Todd's responsibilities included strategic planning for conferences, headquarters' liaison with AMS member boards and committees, support to the AMS Council, and public relations. In addition, Todd was Managing Editor for the AMS Glossary of Meteorology (2nd edition).

From 1979 to 1994, Todd held a variety of positions with WSI Corporation of Billerica, MA, including Manager, New Product Development, Media Marketing Manager, and Manager of the Government Program Office. WSI was a pioneer in the development of real-time weather information, providing value-added information and workstations for clients in media, aviation, industry, academia, and government. Some of Todd's projects included development of the weather data/information infrastructure for The Weather Channel; the introduction of digital satellite and radar imagery for television; planning and implementation of a network of weather briefing systems for the Federal Aviation Administration; and serving as liaison with the National Weather Service and professional organizations. In addition, Todd was instrumental in helping to develop the public-private partnership between the weather information industry and the Federal government.

Concurrently, Todd has a more than 30-year career as a radio meteorologist, and has been heard on dozens of stations nationwide. Today, he can be heard occasionally on all-news WCBS Newsradio-88 in New York City. He has chaired numerous meteorological conferences and symposia, and served on a number of boards and committees for the American Meteorological Society (AMS). He was awarded the AMS Seal of Approval for Radio Weathercasting in 1979, and was elected a Fellow of the AMS in 1997.

Todd's interests include transportation systems of all types, and he is an officer and past-trustee of the Seashore Trolley Museum of Kennebunkport, Maine. At MIT, Todd an officer and trustee of the Technology Broadcasting Corporation, which oversees the campus radio station WMBR-FM. He also volunteers as the academic advisor to a group of MIT freshman.
Invited Keynote: The Impact of National Sustainability Policy on Industry

Tina Bahadori, M.S., B.S. MIT
Executive Director, Division of Engineering and Physical Sciences
The National Academies of Sciences, Engineering, and Medicine
Dr. Jeremy Gregory is Executive Director of the MIT Climate and Sustainability Consortium (MCSC). He has extensive experience in working with industry partners and diverse stakeholders across MIT. Through his research, Dr. Gregory studies the economic and environmental implications of engineering and system design decisions, particularly in the area of materials production and recovery systems. His research topics include product and firm environmental footprinting, manufacturing and life-cycle cost analysis, and characterization of sustainable material systems. He has applied these methods, often with industry partners, to a range of different products and industries including pavements, buildings, automobiles, electronics, consumer goods, and waste treatment and recovery.

In addition, Dr. Gregory has served as a Faculty Fellow within MIT’s Office of Sustainability since 2018. In this role, he has collaborated with administration, faculty, staff, and students across campus to conduct analyses related to strategies for lowering MIT’s environmental footprint, with a focus on scope 3 greenhouse gas emissions.

Prior to joining the MCSC, Dr. Gregory served as Executive Director of the MIT Concrete Sustainability Hub, where he worked directly with industry leaders; drew links between academia, industry, and government; helped define strategy; and coordinated research activities with external collaborators.

Previously, Dr. Gregory was the Education Coordinator for the MIT Portugal Program’s Engineering Design and Advanced Manufacturing Focus Area, where he built education and research activities between MIT, three Portuguese universities, and numerous Portuguese companies.

He holds a bachelor of science in mechanical engineering from Montana State University-Bozeman, and a master of science and PhD in mechanical engineering from MIT.

View full bio

The MIT Climate and Sustainability Consortium (MCSC) fosters deep collaboration with companies across the global economy alongside leading experts at MIT as we all work towards necessary and aggressive climate and sustainability goals. This presentation will provide the latest cross-institute, cross-sector efforts of the MCSC to decarbonize tough transportation sectors, carbon removals, material and product circularity as well as value chain resilience.

Dava Newman
Director, MIT Media Lab

Dava Newman is the director of the MIT Media Lab. She holds the Apollo Program Professor of Astronautics chair at the Massachusetts Institute of Technology (MIT) and is a Harvard–MIT Health, Sciences, and Technology faculty member in Cambridge, Massachusetts. She was named a MacVicar Faculty Fellow (a chair for making significant contributions to undergraduate education); and was the former Director of the Technology and Policy Program at MIT (2003–2015); and Director of the MIT–Portugal Program (2011–2015, 2017-2021). As the Director of MIT’s Technology and Policy Program (TPP), she led this unique multidisciplinary graduate program with over 1,300 alums and faculty advisors from all 5 Schools across the Institute. She has been a faculty leader in Aeronautics and Astronautics and MIT’s School of Engineering for 29 years. She holds a top-secret clearance.
Across the globe, there’s never been greater energy and investment to drastically reduce greenhouse gas emissions in the transportation industry — and leading this charge is the electric vehicle (EV) revolution. Vontier believes in the immense potential of electrification to transform the mobility sector and are proud to have over 40,000 plugs under management across the globe through our Drivz business. Electrification is not enough, however. Reaching both short and long-term decarbonization targets requires a more holistic and multi-energy approach. This is because electrification is only one piece of the larger puzzle, particularly when one looks across all modes of transportation and all geographies. A successful transition to zero-emissions will require multiple technologies and alternative fuels, like renewable natural gas and clean hydrogen. Katie will share Vontier’s unique point of view as a multi-energy solutions providers, including lessons learned and sustainability program implications.
Catarina Madeira joined the Office of Corporate Relations as Program Director of Startup Exchange, in May 2021. She was promoted to Director of Startup Exchange in December 2022.

Catarina has been working with the Cambridge/Boston startup ecosystem for over 10 years and joined Corporate Relations with a solid network in the innovation and entrepreneurial community. Prior to MIT, she was part of the team that designed and launched the startup accelerator IUL MIT Portugal later rebranded to Building Global Innovators. She was based in Lisbon and worked in direct relation with the Cambridge team. She held positions including Operations Coordinator, Program Manager, and Business Developer. The accelerator soon achieved steady growth in large part due to the partnerships that Catarina led with regional and global startup ecosystems. After that, she worked at NECEC, leading a program that connects cleantech startups and industry. In this role, she developed and built a pipeline of startups and forged strong relationships with both domestic and European companies. She has also held positions in Portugal and France including at Saboaria e Perfumaria Confiança and L’Oréal as Technical Director and Pharmacist.

Catarina earned her Bachelor in Chemistry at the University of Porto and her Bachelor in Pharmaceutical Sciences at the University of Coimbra in Portugal. She went on to earn her Master of Engineering for Health and Medicines at University Lyon 1 and EM Lyon in France.
Optimized for Sustainability: Design of Structural and Thermal Systems for the Built Environment

Leslie Norford
Professor of Building Technology, MIT Department of Architecture

Leslie Norford is Professor of Building Technology in the Department of Architecture at MIT. His research focuses on reducing building energy use and associated resource consumption and carbon emissions and his teaching includes project-based efforts to improve schools in developing countries and promote the use of simulation-enhanced building design workflows. He has developed fault detection and optimal control strategies for HVAC equipment and explored design options for low-energy space-conditioning systems based on the use of desiccants and membranes for latent cooling. Working with mechanical and electrical engineering colleagues and students at MIT, he has studied how control of HVAC systems can help electric utilities mitigate the impact of power fluctuations associated with wind and PV systems through provision of such services as power reserves and frequency regulation. Active internationally, he has conducted measurement campaigns and numerical analyses of building energy consumption in Russia, China, Pakistan, the UK and Norway. Work in India focused on indoor and ambient air quality, with emphasis on mitigating the impact of cooking and land-clearing fires in agricultural areas that surround cities. Over a decade of leading a research group in Singapore, under the auspices of the Singapore-MIT Alliance for Research and Technology, and related work with colleagues in Abu Dhabi continues to yield measurements and models of urban microclimates, with a focus on identifying strategies to improve human thermal comfort in outdoor urban areas. With colleagues, current work focuses on computational design of building structures and energy systems to minimize life-cycle carbon emissions while ensuring heat resilience and indoor thermal comfort.

View full bio

The environmental footprint of buildings includes energy use and carbon emissions associated with materials and construction as well as building operation. Design is most sustainable when it simultaneously accounts for structural and thermal performance of buildings and interactions of buildings with the urban environment. This presentation will share component and system designs produced by simulation workflows that capture these interactions: lightweight, thermally activated concrete floor systems that substantially reduce embodied carbon while achieving modest operational savings; rejection of heat by radiation to the night sky, night-flush ventilation or seasonal storage in the ground, in lieu of the use of conventional vapor-compression cooling systems; and 3D-printing of clay blocks that provide both thermal resistance and thermal storage.
Panel: Innovation in the Water Sector: Focus on Industry-Academic Collaboration

Renee Robins
Executive Director, Abdul Jameel Water and Food Systems Lab

Renee J. Robins is the Executive Director of the Abdul Latif Jameel Water and Food Systems Lab at MIT. Renee works closely with faculty director John Lienhard to develop and manage the lab’s activities, priorities, and strategy, including new funding opportunities and international collaborations.

Since 1998, Renee has worked on the conception, launch, and development of a number of large interdisciplinary, international, and partnership-based research and education collaborations at MIT and elsewhere. MIT programs she has worked on since she joined the staff in 1998 include the Cambridge MIT Institute (Associate Director for Graduate Programs), the MIT Portugal Program (Director for Program Integration), the Mexico City Program (Program Coordinator), and the Program on Emerging Technologies (Program Manager). From 2000-2011, she also served as Director of Special Projects for the Technology and Policy Program, where she was responsible for the development of a number of academic initiatives and major events. Before joining J-WAFS as executive director, she managed a $15M research program at the Harvard Graduate School of Education as it scaled from implementation in one public school district to 59 schools in seven districts across North Carolina.

Outside of MIT, Renee’s experience includes serving on the Board of Trustees for the International Honors Program (IHP) – a comparative multi-site study abroad program – and independent consulting work for the International Atomic Energy Agency in Vienna and program design and strategy consulting for Université Mohammed VI Polytechnique (UM6P), a new university in Morocco. For IHP, she conceived, initiated, and developed the “Cities in the 21st Century” program, which began in 1998 and is one of IHP’s most popular offerings with over 1000 alumni. She is herself an alumna of IHP, having studied comparative culture and anthropology in seven countries around the world, and also studied at the Sorbonne in Paris.

Renee’s holds two undergraduate degrees from MIT (biology and humanities/anthropology), and a masters degree in public policy from Carnegie Mellon University.

Carol Walczyk
Vice President, Process Efficiency Analysis
Veolia Corporation

Jeff Lopes
Manager, University Partnerships & Programs
Xylem

Rohit Karnik
Professor of Mechanical Engineering, Microfluidics & Nanofluidics Research Laboratory

Rohit Karnik is Professor of Mechanical Engineering at the Massachusetts Institute of Technology, where he leads the Microfluidics and Nanofluidics Research Group. He obtained his B. Tech. degree from the Indian Institute of Technology at Bombay in 2002, and his PhD from the University of California at Berkeley in 2006 under the guidance of Prof. Arun Majumdar. After postdoctoral work with Prof. Robert Langer at MIT, he joined the Department of Mechanical Engineering at MIT in 2007. His research focuses on the physics of micro- and nanofluidic flows and design of micro- and nanofluidic devices for applications in healthcare, energy systems, and biochemical separation and analysis. Among other honors, he is a recipient of the Institute Silver Medal (IIT Bombay, 2002), NSF Career Award (2010), DOE Early Career Award (2012), and IIT Bombay Young Alumni Achiever Award (2014).
Sarah Meyers leads interdisciplinary environment and sustainability education programs at MIT Environmental Solutions Initiative (ESI). Working with both faculty and students, she focuses on ideas that serve those most deeply engaged in global issues, as well as those embedding sustainability in their “mainstream” practice. Along with managing the Environment and Sustainability Minor, she has motivated the “infusion” of sustainability in MIT’s GIRs and introductory subjects, the development of First-Year Discovery and Experiential Learning subjects, and the creation of the MIT Fall Career Fair Sustainability Initiative with associated career development curricular materials. Sarah has over ten years of experience in public and private high schools as a math teacher, and has degrees in mathematics (BA, Barnard College) and business (MBA, MIT Sloan School of Business).

Education is a driver when we consider societal evolution and growth, and that is no different with topics of sustainability and climate change. As such, the intersection of sustainability with education is rich in growth, opportunity, and student engagement. This presentation will situate sustainability education and provide a brief overview of how students are currently educated on topics of climate change and sustainability, and what that means for you and your organization.
Chris Hill is a principal research engineer in the Department of Earth, Atmospheric and Planetary Sciences at MIT. Hill specializes in Earth and planetary computational science, with a focus on applying large-scale computation to oceanography and climate. His work has included multi-physics, multi-scale models of fluid problems that have relevance to improved modeling of flows in inhomogeneous porous media. Hill co-leads the research, education, and outreach committee of the Massachusetts Green High Performance Computing Center (MGHPCC).

In this talk, I will describe the latest generation high-performance computing, storage, and networking facility that MIT operates in the town of Holyoke, MA. This facility is the latest in MIT’s 60+ year history of deploying data center facilities to support every growing computing and data needs to researchers across MIT. The Holyoke facility is designed to be energy efficient, using a variety of techniques to reduce its power consumption. The facility also has robust cooling systems to ensure that the computers are kept within environmental limits. I will talk about the design, energy landscape, and operations of the facility, and will give an in-depth example of how the facility is used to study the role of the ocean in climate research.
If you mix cement, carbon black with water, the magic of chemistry generates an electron conductive volumetric wire, which permeates a load-bearing cement-based matrix. Herein we show, how this magic of chemistry can be used to build a scalable supercapacitor technology for energy storage, which everyone can build into their homes and roads. Possible applications include the energy autarkic home, self-charging roads (by electromagnetic induction) and intermittent energy storage for wind energy and tidal waves. Availability of cement and carbon black makes this technology a good candidate the urgently needed energy transition from fossil fuel to renewable energies.
Opening Remarks

Invited Keynote: The Impact of Massachusetts Energy And Environmental Policy on Industry
Rebecca Tepper
Massachusetts Secretary
Executive Office of Energy and Environmental Affairs

Sustainability for National Defense
Deborah Campbell
Senior Staff: Climate Change Initiative Lead-Humanitarian Assistance and Disaster Relief Group, MIT Lincoln Laboratory

Dr. Deborah Campbell co-leads MIT Lincoln Laboratory’s Climate Change Initiative, which is growing the Laboratory’s investments in climate change R&D and increasing its collaborations within the U.S. and around the world to innovate new systems and solutions. This work brings together the Laboratory’s multidisciplinary expertise in areas including systems analysis, sensing and sensing architectures, artificial intelligence, and decision support to contribute to the global response to this challenge.

Campbell co-leads and serves as the executive director of the Climate Resilience Early Warning System Network, one of MIT’s five flagship Climate Grand Challenges projects. She served on MIT’s Climate Action Advisory Committee during the development of “Fast Forward: MIT’s Climate Action Plan for the Decade,” and was a member of the MIT campus–Lincoln Laboratory team that designed and built the MIT Covid-19 Response System. As a senior staff scientist in the Laboratory’s Humanitarian Assistance and Disaster Relief Systems (HADR) Group, Campbell works at the nexus of climate change, health, and environmental equity.

Prior to joining the HADR Group, Campbell served as an associate technology officer in the Laboratory’s Director’s Office. In her earlier work at the Laboratory, she applied her analytical chemistry expertise to chemical and biological threat detection and to forensics and attribution, and led a significant portfolio of programs in these areas. Campbell earned a BS degree in chemistry from Bates College and a PhD degree in chemistry from the University of Wisconsin-Madison.

Networking Break
Bio-Inspired Technologies for Sustainability and Clean Energy
Ariel L. Furst
Paul M. Cook Career Development Professor, MIT Department of Chemical Engineering

Ariel L. Furst is the Paul M. Cook Career Development Assistant Professor of Chemical Engineering at MIT. Her work centers on inventing technologies to improve human and environmental health by making access to resources more equitable. Her lab develops transformative technologies to solve important problems related to healthcare and sustainability by harnessing the inherent capabilities of biological molecules and cells. She is also a co-founder of the regenerative agriculture company, Seia Bio. She completed her Ph.D. at Caltech developing non-invasive diagnostics for colorectal cancer and was then an A. O. Beckman Postdoctoral Fellow at UC Berkeley, where she developed sensors to monitor environmental pollutants. She is a 2023 Marion Milligan Mason Awardee, a CIFAR Azrieli Global Scholar for Bio-Inspired Solar Energy, and an ARO Early Career Grantee. She was recently awarded the MIT UROP Outstanding Faculty Mentor Award for her work with undergraduate researchers. She is passionate about STEM outreach and increasing participation of underrepresented groups in engineering.

Significant effort has been devoted to developing technologies that effectively mimic biological processes, but these methods often fail to replicate the efficiency and selectivity of native systems. We have found that, by combining chemistry with the inherent activity of biomolecules and microbes, we can improve upon conventional technologies for clean energy and sustainability. Specifically, by combining biomolecular assembly with conventional electrocatalysis, we have improved the specificity and efficiency of electrocatalytic CO₂ reduction. Additionally, we have engineered bio-derived microbial coatings to enable their delivery to depleted soil. Finally, by combining electroactive microbes with engineered enzymes, we have developed a platform to degrade and electrochemically detect environmental contaminants. Through these technologies, we have consistently found that the combination of chemistry and biomolecular engineering affords advantages beyond the capabilities of either technology alone.

MIT Energy & Climate Club Launchpad Program
Charlotte Ross
Co-founder
MITEC Launchpad

Trent Weiss
Co-founder
MITEC Launchpad

Jim Owens
Co-founder and Vice President External Relations
MITEC Launchpad

The MITEC Launchpad is an initiative within the MIT Energy and Climate Club to provide MIT students with the opportunity to solve real-world climate and energy problems with leading professionals in the industry. Partner companies work with MITEC Launchpad to scope out project milestones and deliverables, where each project consists of a graduate student team lead and three to five undergraduate students. Over the course of the 6-10 week project, company personnel have the opportunity to engage with MIT students and to benefit from their technical contributions. Each team meets with their partner company on a weekly basis and provides a final deliverable at the end of the semester. Example of past projects include 1) Developing machine learning models to augment renewables project development; and 2) Building a policy-informed tool to identify key entry markets for a new energy technology.
Dr. David Babson is the Executive Director of the Massachusetts Institute of Technology’s Climate Grand Challenges Initiative, which develops and manages focused challenges that seed research aimed at developing impactful solutions for climate change mitigation and adaptation. Prior to leading MIT’s CGC, David served as a Program Director for the Advanced Research Projects Agency – Energy (ARPA-E) at the U.S. Department of Energy where he focused on biotechnology, innovations for agriculture system carbon drawdown, and carbon removal and management. Before joining ARPA-E he was the Senior Advisor for Renewable Energy, Natural Resources, and the Environment in the Office of the Chief Scientist at the U.S. Department of Agriculture. David detailed in his USDA role from the Bioenergy Technologies Office (BETO) at the U.S. Department of Energy (DOE) where he was a Technology Manager. At USDA, David led R&D coordination efforts on carbon management, climate change mitigation, sustainability, and agricultural systems innovation. At BETO David oversaw projects for its Conversion Program and worked to understand how to leverage new technologies to advance the emerging bioeconomy and address global energy and climate challenges. Before joining DOE he worked as the Senior Fuels Engineer at the Union of Concerned Scientists and as an American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellow at the U.S. Environmental Protection Agency. David completed post-docs at the University of Minnesota’s Biotechnology Institute and the U.S. Naval Research Laboratory. David has a PhD in Chemical and Biochemical Engineering from Rutgers University and a BS in Chemical Engineering from the University of Massachusetts Amherst.

Yet-Ming Chiang
MIT Climate Grand Challenges, Center for Electrification and Decarbonization of Industry

Yet-Ming Chiang is the Kyocera Professor of Ceramics and a Professor of Materials Science and Engineering. He earned a BS in materials science and engineering from MIT in 1980 and a doctorate in ceramics from MIT in 1985. Today, his laboratory’s work ranges from basic research to process and prototype development. He has brought several laboratory discoveries to commercialization, including high-power lithium iron phosphate batteries, more efficient lithium-ion battery manufacturing processes, batteries for long-duration grid storage, and electrochemical cement production. He co-directs a flagship project under MIT Climate Grand Challenges on the decarbonization of industrial materials production.

Miho Mazereeuw
MIT Climate Grand Challenges, Preparing for a New World of Weather and Climate Extremes

Miho Mazereeuw taught at the Graduate School of Design at Harvard University and the University of Toronto prior to joining the faculty at Massachusetts Institute of Technology. As an Arthur W. Wheelwright Fellow, she is completing her forthcoming book entitled Of the Regions, Cities and Urban Spaces to Increase the Resilience of Local Communities. In the Urban Risk Lab multi-disciplinary groups of researchers work to innovate on scales, the Lab develops methods to embed risk reduction and preparedness into the design experience, Mazereeuw is known for her work in disaster resilience.
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