2024 MIT Japan Conference

January 23, 2024 8:15 am - 5:30 pm

8:15 AM  Registration

9:00 AM  Welcome & Introduction  
John Roberts  
Executive Director (Interim), MIT Corporate Relations

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.

Steven Palmer  
Director, MIT Corporate Relations

Steven Palmer is a Director within MIT's Office of Corporate Relations. Steven comes to OCR with many years of experience building relationships, advancing diplomacy, and seeking new business initiatives in both the public and private sectors. He has spent his career highlighting and translating technological issues for policy makers, engineers, analysts, and business leaders. Steven has worked in government, industry, and academia in the U.S. and abroad. He is also an Executive Coach at MIT Sloan and Harvard Business School. Steven earned his Bachelor of Science at Northeastern University, and his M.B.A. at MIT Sloan where he was in the Fellows Program for Innovation and Global Leadership.
John Sterman
Director, MIT Sloan Sustainability Initiative
Jay W. Forrester Professor of Management, MIT Sloan School of Management

John Sterman is the Jay W. Forrester Professor of Management at the MIT Sloan School of Management, Professor in MIT’s Institute for Data, Systems and Society, and faculty director of the MIT System Dynamics Group and the MIT Sloan Sustainability Initiative.

Prof. Sterman has published approximately 200 works spanning corporate strategy and operations, energy policy, public health, and climate change. Author of award-winning books and papers, he pioneered the development of interactive “management flight simulators” of corporate and economic systems, which are used by governments, corporations, and universities around the world. These include the ReThink Health initiative and health policy simulator and, through the MIT Climate Pathways Project, in partnership with the non-profit, Climate Interactive, the C-ROADS and En-ROADS climate policy simulations, which have been used by policymakers, negotiators, business and civil society leaders, educators, and the public around the world.

Prof. Sterman is an elected fellow of the American Association for the Advancement of Science, has been recognized for his work with an honorary doctorate, and has been recognized with numerous other honors, including eight awards for teaching excellence at MIT. His work is often featured in the media, from the New York Times, Washington Post, and National Public Radio to China’s CGTN. Prof. Sterman holds an AB in engineering and environmental systems from Dartmouth College and a PhD in system dynamics from MIT.

Bethany Patten
Senior Lecturer & Director of Policy and Engagement at the MIT Sloan Sustainability Initiative
MIT Sloan School of Management

The climate crisis is growing worse even as efforts to replace fossil fuels with clean, renewable energy accelerate. How can the world limit global warming and build a more prosperous, healthy, equitable, and sustainable world? In this interactive session, we’ll use the En-ROADS climate policy simulation model developed by the MIT Sloan Sustainability Initiative and the not-for-profit think tank Climate Interactive. En-ROADS has been used by over 200,000 people in 130 nations, including more than 6500 senior leaders around the world in government, business, investing, and civil society. En-ROADS enables you to try a wide range of policies and actions to cut greenhouse gas emissions and immediately see their likely impacts on global warming, sea level rise, ocean acidification, air pollution, and economic growth. You will have a chance to explore which policies have high potential to cut emissions and limit the harms from climate change, which proposed solutions have low impact, and discuss what we all can do to make a difference in time and create a safer future for ourselves and our children.
Yang Shao-Horn
Keck Professor of Energy, Mechanical Engineering
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Professor Shao-Horn joined the Mechanical Engineering Energy and Transport Division in September 2002 as the Atlantic Richfield Career Development Assistant Professor. Upon graduating from the Michigan Technological University in 1998 with a Ph.D. in Metallurgical and Materials Engineering, she joined Eveready Battery Company as a staff materials scientist in their Advanced Technology and Materials Group. She then worked as an National Science Foundation (NSF) International Research Fellow at the Institute of Condensed Matter Chemistry in Bordeaux, France.

Yang (pronounced Young) conducts research on solving material issues in electrochemical energy storage and conversion systems such as batteries and fuel cells. She focuses on understanding the fundamental physical phenomena that occur in active materials and interfaces during electrochemical reactions, probing critical materials properties that limit the electrochemical performance, designing novel materials, and engineering electrode and system designs. Her research group is working on transition metal oxides for lithium rechargeable batteries and solid oxide fuel cells, and electrode assemblies for oxygen reduction.

Among her awards are the Charles W. Tobias Young Investigator Award of the Electrochemical Society 2008; the Tajima Prize of the International Society of Electrochemistry 2008; the Dupont Young Faculty Award 2006; Office of Naval Research (ONR) Young Investigator Award 2003.

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10:40 AM Networking Break
Kristala Jones Prather is the Arthur D. Little Professor of Chemical Engineering at MIT. She received an S.B. degree from MIT in 1994 and Ph.D. from the University of California, Berkeley (1999), and worked 4 years in BioProcess Research and Development at the Merck Research Labs prior to joining the faculty of MIT.

Her research interests are centered on the design and assembly of recombinant microorganisms for the production of small molecules, with additional efforts in novel bioprocess design approaches. Prather is the recipient of an Office of Naval Research Young Investigator Award (2005), a Technology Review “TR35” Young Innovator Award (2007), a National Science Foundation CAREER Award (2010), the Biochemical Engineering Journal Young Investigator Award (2011), and the Charles Thom Award of the Society for Industrial Microbiology and Biotechnology (2017).

Additional honors include selection as the Van Ness Lecturer at Rensselaer Polytechnic Institute (2012), and as a Fellow of the Radcliffe Institute for Advanced Study (2014-2015). Prather has been recognized for excellence in teaching with the C. Michael Mohr Outstanding Faculty Award for Undergraduate Teaching in the Dept. of Chemical Engineering (2006, 2016), the MIT School of Engineering Junior Bose Award for Excellence in Teaching (2010), and through appointment as a MacVicar Faculty Fellow (2014), the highest honor given for undergraduate teaching at MIT.

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Biological systems have the potential to produce a wide array of compounds with uses that include fuels, materials, bulk chemicals, and pharmaceuticals. Our group is focused on applying principles from metabolic engineering and biocatalysis toward the design and construction of novel biosynthetic pathways for specified target compounds. This “retro-biosynthetic design” approach is aided by advancements in the development of new tools under the umbrella of synthetic biology that facilitate the re-engineering of biological systems. As new pathways are designed and constructed, typical challenges such as low product yields and titers can hamper the development of commercially relevant processes. The sheer volume of chemicals that ultimately need to be produced also requires the use of a broader range of feedstocks than those traditionally employed in bioprocesses. In this talk, Professor Prather will review her group’s sustained efforts to both produce novel compounds through biological synthesis and develop strategies to address the inherent limitations.
Ariadna Rodenstein is a Program Manager at MIT Startup Exchange. She joined MIT Corporate Relations as an Events Leader in September 2019 and is responsible for designing and executing startup events, including content development, coaching and hosting, and logistics. Ms. Rodenstein works closely with the Industrial Liaison Program (ILP) in promoting collaboration and partnerships between MIT-connected startups and industry, as well as with other areas around the MIT innovation ecosystem and beyond.

Prior to working for MIT Corporate Relations, she worked for over a decade at Credit Suisse Group in New York and London, in a few different roles in event management and as Director of Client Strategy. Ms. Rodenstein has combined her experience in the private sector with work at non-profits as a Consultant and Development Director at New York Immigration Coalition, Immigrant Defense Project, and Americas Society/Council of the Americas. She also served as an Officer on the Board of Directors of the Riverside Clay Tennis Association in New York for several years. Additionally, she earned her B.A. in Political Science and Communications from New York University, with coursework at the Instituto Tecnológico y de Estudios Superiores de Monterrey in Mexico City, and her M.A. in Sociology from the City University of New York.
Yasheng Huang
Associate Dean, International Programs and Action Learning
Professor of Global Economics and Management
MIT Sloan School of Management

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Yasheng Huang is the International Program Professor in Chinese Economy and Business and a Professor of Global Economics and Management at the MIT Sloan School of Management.

Huang founded and runs the China Lab and the India Lab, which aim to help entrepreneurs in those countries improve their management skills. He is an expert source on international business, political economy, and international management. In collaboration with other scholars, Huang is conducting research on human capital formation in China and India, entrepreneurship, and ethnic and labor-intensive foreign direct investment (FDI). Prior to MIT Sloan, he held faculty positions at the University of Michigan and at Harvard Business School. Huang also served as a consultant to the World Bank.

His research has been profiled in many publications, including The Wall Street Journal, The Economist, Businessworld, Le Monde, the Economic Times, and in numerous Chinese publications. He has contributed to The Financial Times, The New York Times, and Foreign Policy. Huang's published books include Inflation and Investment Controls in China (1996), FDI in China (1998), Selling China (2003), and Financial Reform in China (2005, co-edited with Tony Saich and Edward Steinfeld). His most recent book, Capitalism with Chinese Characteristics (2008), is based on detailed archival and quantitative evidence spanning three decades of reforms. Huang shows that private entrepreneurship, facilitated by financial liberalization and microeconomic flexibility, played a central role in China's economic miracle.

Huang has held or received prestigious fellowships, such as the National Fellowship at Stanford University and the Social Science Research Council-MacArthur Fellowship. He is a member of the Trust Center for MIT Entrepreneurship, a Fellow at the Center for Chinese Economic Research and the Center for China in the World Economy at Tsinghua University, a Fellow at the William Davidson Institute at Michigan Business School, and a World Economic Forum Fellow.

Huang holds a B.A. in government from Harvard College and a Ph.D. in government from Harvard University. He was appointed a full professor on July 1, 2009.

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Jeremiah Johnson is a professor of Natural Product Chemistry at the MIT Department of Chemistry.

The Johnson Laboratory seeks creative, macromolecular solutions to problems at the interface of chemistry, medicine, biology, and materials science. Materials synthesis is approached in an analogous manner to natural-products synthesis; an interesting target structure is chosen and a synthetic scheme is designed to access that structure as efficiently as possible. The targets are designed de novo from careful consideration of the specific needs of a given application and with a particular emphasis on function. The tools of traditional organic and organometallic synthesis, synthetic polymer chemistry, photochemistry, surface science, and biopolymer engineering are combined to realize the designs.
Dr. Qin (Maggie) Qi is the James R. Mares '24 Career Development Chair Assistant Professor in Chemical Engineering at the Massachusetts Institute of Technology. Her research applies fluid mechanics and transport principles to engineer soft materials for medical applications. She received her Ph.D. in chemical engineering with Prof. Eric Shaqfeh at Stanford University in 2018, where she won the T.S. Lo Fellowship and Stanford Graduate Fellowship. There, she also collaborated with the Royal College of Surgeons and BD Biosciences to develop a diagnostic device for various bleeding disorders. She then conducted postdoctoral research with Prof. Samir Mitragotri at the Wyss Institute of Biologically Inspired Engineering at Harvard University, where she developed a subcutaneous-tissue-on-a-chip model for pharmacokinetic testing (licensed to Sanofi). She was elected to the inaugural class of MIT Rising Stars in Chemical Engineering. She recently received the FY23 MIT research support committee award and was named a Science Influencer Mentor sponsored by the FDA.

Microscopic flows in a biological environment play a remarkable role in regulating human health, from disease causes to driving forces behind diagnostics and therapeutics. Its influence on other living organisms also has far-reaching impact in energy and environment. Such flow-induced dynamic effects, however, are often overlooked in engineering designs due to limitations in existing research toolsets. As a result, conventional biological and medical research face various challenges in accuracy, cost and translational success. In this talk, I will present our group’s work on applying fluid mechanics principles to design biomaterials, cell therapies and pharmacological models. We develop both experimental (in vitro) and computational tools mimicking a dynamic biological flow environment. The combination of these new tools enables us to reduce the use of animal models and shorten the preclinical research timeline while achieving tailor-made design outcomes towards precision medicine.
Real-world, large-scale deployment of autonomous systems in GNSS-denied environments demands efficient sensing, planning, and control under uncertainty. While vision-based data is a valuable source of information, perceptual uncertainties and constraints—such as limited fields-of-view and onboard computational/communication limits — need careful algorithmic consideration. In this talk, we present strategies to address these issues in control, planning, and localization. First, we present an efficient way to train fast vision-based neural networks for control via imitation learning and data augmentation. Our method uses Neural Radiance Fields to generate extra training data, and properties of a robust controller to guide the selection of extra data that account for uncertainties. Second, we present PUMA, an imitation learning-based uncertainty- and perception-aware multi-agent trajectory planner. PUMA accounts for the uncertainty arising from state estimation drifts caused by onboard sensing systems and from imperfect onboard detections of surrounding dynamic obstacles. Finally, we discuss a simultaneous mapping and localization (SLAM) approach that leverages local graphs of landmarks to build both a local and global map. We employ an image segmentation-based pipeline that provides sparse representation of the environment, enabling computationally and communication-efficient re-localization by one or multiple agents. We evaluate these algorithms on both real and simulated aerial vehicles, including a novel insect-scale soft robot.
Evaporation is a ubiquitous phenomenon in nature, yet our understanding on evaporation is surprisingly insufficient. For example, large temperature discontinuities across liquid-vapor interfaces had been reported experimentally, which have defied modeling efforts so far. We established a set of interfacial conditions to determine the interfacial temperature, density, and pressure drop across a liquid-vapor interface, which lead to modeling results in reasonable agreement with experimental data. Our model shows when evaporation or condensation happens, an intrinsic temperature difference develops across the liquid-vapor interface, due to the mismatch of the enthalpy carried by vapor at the interface and the bulk region. We predict that when the liquid layer is very thin, most of the applied temperature difference between the solid wall and the vapor phase happens at the liquid-vapor interface, leading to saturation of the evaporation and the condensation rates and the corresponding heat transfer rate. This result contradicts the current belief that the evaporation and condensation rates are inversely proportional to the liquid film thickness. Our approach also provides a clear explanation for the paradoxical prediction by the kinetic theory of the existence of an inverted vapor temperature profile for the problem of evaporation and condensation between two parallel plates. Along a different direction, our experiments, as well as by many others, have reported that evaporation under sunlight from hydrogel and other porous materials can exceed the thermal evaporation limit by several times. We hypothesize that photons can directly cleave off water clusters at the liquid-vapor interface in a way similar to the photoelectric effect, which we call the photomolecular effect. We use several independent experiments in porous hydrogels and at a single water-air interface to support this hypothesis.