

MIT Industrial Liaison Program Faculty Knowledgebase Report

2024 MIT Japan Conference

January 23, 2024 8:15 am - 7:00 pm



8:15 AM

Registration

9:00 AM

Welcome & Introduction
Steven Palmer
Senior Director, [MIT Corporate Relations](#)



Steven Palmer
Senior Director
[MIT Corporate Relations](#)

Steve Palmer is a Senior 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.

9:20 AM

Solving the Climate Crisis: The En-ROADS Interactive Climate Policy Simulator

John Sterman

Director, MIT Sloan Sustainability Initiative

Jay W. Forrester Professor of Management, [MIT Sloan School of Management](#)



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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.

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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.

10:00 AM

Electrochemistry Renaissance for Climate Actions

Yang Shao-Horn

Keck Professor of Energy, Mechanical Engineering, [MIT Department of Materials Science and Engineering](#)



Yang Shao-Horn

Keck Professor of Energy, Mechanical Engineering

[MIT Department of Materials Science and Engineering](#)

Yang Shao-Horn is a JR EAST Professor of Engineering and faculty member in the Department of Mechanical Engineering, Department of Materials Science and Engineering, and the Research Laboratory of Electronics at MIT. Her research is centered on physical/material chemistry to understand kinetics and dynamics in enabling energy storage and making chemicals and fuels.

Professor Shao-Horn is a scientist and Entrepreneur in electrochemical science and engineering, among the top most cited female chemists in the world, focusing on clean energy solutions. She has advised 100+ students and postdocs at MIT who are now pursuing successful careers in the industry, including Tesla, Amazon, and Apple, startups, and academia (~40) for the US, Europe, and Asia.

Professor Shao-Horn is a member of the National Academy of Engineering and a fellow of the American Association for the Advancement of Science, the Electrochemical Society, the National Academy of Inventors and the International Society of Electrochemistry. Her work has been recognized by the Faraday Medal of the Royal Society of Chemistry, the Dr. Karl Wamslser Innovation Award, and the Hans Fischer Senior Fellowship from the Technical University of Munich, and the Humbolt Prize in Chemistry from the Alexander von Humboldt Foundation. She has co-founded startups on batteries, and serves on the boards of public and private organizations including the Pioneer Center for Accelerating P2X Materials Discovery (CAPEX) (Denmark), Fritz Haber Institute of Max Plank Society (Germany) and Wallenberg Initiative Materials Science for Sustainability (Sweden).

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Professor Yang Shao-Horn will discuss fundamental processes and challenges underpinning electrochemical reactions and how they catalyze the opportunities and development of cutting-edge technologies that convert electrical energy to chemical energy or vice versa for climate actions.

10:40 AM

Networking Break

11:00 AM

Building Microbial Chemical Factories: Design, Assembly, and Engineering of Biological Routes to Chemical Compounds

Kristala L Jones Prather

Arthur Dehon Little Professor

Department Head, [MIT Chemical Engineering](#)



Kristala L Jones Prather

Arthur Dehon Little Professor

Department Head

[MIT Chemical Engineering](#)

Kristala Jones Prather is the Arthur D. Little Professor and Head of MIT Department of Chemical Engineering. She received an S.B. degree from MIT in 1994 and a Ph.D. from the University of California, Berkeley (1999), and worked four 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.

[View full bio](#)

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.

11:40 AM

MIT Startup Exchange Lightning Talks
Ariadna Rodenstein
Program Manager, [MIT Startup Exchange](#)



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Program Manager
[MIT Startup Exchange](#)

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.

Francesco Maria Benedetti
Co-Founder and CEO
[Osmoses](#)

Kenneth (Kenny) Jensen
CTO
[Navier](#)

Jeanne Pidoux
Business Development and Operations
[Active Surfaces](#)

Cameron Halliday
Co-Founder and CEO
[Mantel](#)

Joshua Passantino
Electrochemist
[Nth Cycle](#)

Jacob Grose
Co-Founder and CEO
[Copernic Catalysts](#)

Peter Godart
Co-Founder and CEO
[Found Energy](#)

Stephanie Young
Head of Product
[Ikigai Labs](#)

Ho-Jun Suk
Co-Founder and CEO
[DxLab](#)

Will Pierce
Director of Automation
[Cache DNA](#)

Lavi Erisson
CEO and Co-Founder
[Gensaic](#)

12:40 PM

Lunch with Startup Exhibit

2:00 PM

The Future Prospects of Chinese Economy

Yasheng Huang

Epoch Foundation Professor of Global Economics and Management, [MIT Sloan School of Management](#)



Yasheng Huang

Epoch Foundation Professor of Global Economics and Management

[MIT Sloan School of Management](#)

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.

Professor 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 TheWall Street Journal, The Economist, Businessworld, Le Monde, the Economic Times, as well as in numerous Chinese publications. He also 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.

[View full bio](#)

After more than 40 years of robust growth, the Chinese economy is now entering into a new era of substantial uncertainty. One source of uncertainty is the direction of the Chinese government's policy and reform agenda. Professor Huang will give a lecture on some of the key dynamics in the Chinese economy, and he will draw from his recently released book.



Jeremiah Johnson

Professor

[MIT Department of Chemistry](#)

Professor Jeremiah Johnson conducted undergraduate research with Prof. Karen L. Wooley at Washington University in St. Louis where he received a B.S. in biomedical engineering with a second major in chemistry. He then received a PhD in chemistry at Columbia University under the mentorship of Prof. Nicholas J. Turro and Prof. Jeffrey T. Koberstein. In 2011, following a Beckman Postdoctoral Fellowship at California Institute of Technology under the guidance of Professors David A. Tirrell and Robert H. Grubbs, he moved to MIT where he is now a Professor of Chemistry. He is also a member of the MIT Program for Polymers and Soft Matter (PPSM), the Koch Institute for Integrative Cancer Research, and the Broad Institute of MIT & Harvard. He is a Co-Founder of Window Therapeutics Inc. and Electrolyte Solutions Inc., both of which are based on technologies (co)developed by his laboratory at MIT.

Jeremiah received a 2019 ACS Cope Scholar Award, the 2018 Macromolecules-Biomacromolecules Young Investigator Award, the 2018 Nobel Laureate Signature Award for Graduate Education, a Sloan Research Fellowship, the Air Force Young Investigator Award, the Thieme Journal Award for Young Faculty, the DuPont Young Professor Award, the 3M Non-tenured Faculty Award, and an NSF CAREER award. In 2019 and 2023 he was named as a Finalist for the Blavatnik Award for Young Scientists. In recognition of his teaching, he was awarded the 2018 MIT School of Science Undergraduate Teaching Prize. The Johnson research group is focused on the development of methods and strategies for macromolecular synthesis and surface functionalization.

Solving global challenges such as renewable energy storage, plastics accumulation, and cancer requires new methods and strategies for chemical synthesis. This talk will highlight our efforts to design, synthesize, and discover new (macro)molecules to address these challenges. First, the invention of electrolytes for next-generation, high-energy-density batteries, and the construction of a high-throughput tool for closed-loop discovery of such materials, will be described. Then, a novel molecular strategy for circularizing the life cycles of intractable thermoplastics, high-performance engineering thermosets, and composites will be introduced. Finally, a new platform for dual-targeted antibody–drug conjugates (ADCs) that significantly expands the payloads and mechanisms of action available to targeted cancer therapies will be discussed.

3:20 PM

Microfluidic Flow Dynamics for Health: Bridging Experimental and Computational Approaches for Precision Medicine
Qin (Maggie) Qi
James R. Mares '24 Career Development Chair Assistant Professor, [MIT Chemical Engineering](#)



Qin (Maggie) Qi
James R. Mares '24 Career Development Chair Assistant Professor
[MIT Chemical Engineering](#)

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.

4:00 PM

Networking Break

4:20 PM

Efficient, Agile, Data-Driven Vision-Based Onboard Autonomy Under Uncertainties

Jonathan How

Director, Aerospace Controls Laboratory (ACL)

Richard Cockburn Maclaurin Professor, [MIT Department of Aeronautics and Astronautics](#)



Jonathan How

Director, Aerospace Controls Laboratory (ACL)

Richard Cockburn Maclaurin Professor

[MIT Department of Aeronautics and Astronautics](#)

Jonathan P. How is the Richard C. Maclaurin Professor of Aeronautics and Astronautics at the Massachusetts Institute of Technology. He received a [B.A.Sc.](#) from the University of Toronto in 1987, and his S.M. and Ph.D. from MIT in 1990 and 1993, respectively. Prior to joining MIT in 2000, he was an assistant professor at Stanford University. He was the editor-in-chief of the IEEE Control Systems Magazine (2015-19) and was elected to the Board of Governors of the IEEE Control System Society in 2019. His research focuses on robust planning and learning under uncertainty, with an emphasis on multiagent systems. He is a Fellow of IEEE and AIAA and was elected to the National Academy of Engineering in 2021.

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.

5:00 PM

Thermal and Optical Evaporation

Gang Chen

Carl Richard Soderberg Professor of Power Engineering, [MIT Department of Mechanical Engineering](#)



Gang Chen

Carl Richard Soderberg Professor of Power Engineering

[MIT Department of Mechanical Engineering](#)

Gang Chen is the Carl Richard Soderberg Professor of Power Engineering at the Massachusetts Institute of Technology (MIT). He served as the Department Head of the Department of Mechanical Engineering at MIT from 2013 to 2018. He obtained his PhD degree from the Mechanical Engineering Department at UC Berkeley. He was a faculty member at Duke University and UCLA before joining MIT in 2001. He received an NSF Young Investigator Award, an R&D 100 award, an ASME Heat Transfer Memorial Award, an ASME Frank Kreith Award in Energy, a Nukiyama Memorial Award by the Japan Heat Transfer Society, a World Technology Network Award in Energy, an Eringen medal from the Society of Engineering Science, and the Capers and Marion McDonald Award for Excellence in Mentoring and Advising from MIT. He is a fellow of the American Association for the Advancement of Science, the American Physical Society, The American Society of Mechanical Engineers, and the Guggenheim Foundation. He serves on the board of the Asian American Scholar Forum ([aasforum.org](#)). He is an academican of Academy Sinica, a fellow of the American Academy of Arts and Sciences, a member of the US National Academy of Engineering, and a member of the US National Academy of Sciences.

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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.

5:40 PM

Closing Remarks and Networking Reception

7:00 PM

Adjournment