2023 MIT Research and Development Conference

November 15, 2023 - November 16, 2023

Day One | Plenary with MIT President and Deans (Salon 1-3)

8:00 AM  Registration and Light Breakfast
Welcome and 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.

Yui Yashiro
Program Director, MIT Industrial Liaison Program

Before joining MIT Corporate Relations in 2022, Yui Yashiro was Senior Manager, Commercial Insights & Salesforce Operations at Alexion Pharmaceuticals in Boston. As Manager, Commercial Strategy & Operations, she was responsible for reaching group sales targets and leading cultural change projects, including DEI initiatives. Before Alexion, Yashiro was Senior Planning Analyst, Corporate Planning for TeraDiode Inc. (a Panasonic company) in Wilmington, MA, where she led business planning activities. Additionally, she held two roles at Takeda in Tokyo and Osaka. As Chief of Cardiovascular & Metabolic, Shonan Office, Japan Pharma Business Unit, Yashiro was a leader in sales and sales strategy, consistently achieving & surpassing revenue and market share targets for herself and the sales team that she led.

Yashiro earned her B.A. Education & Human Science at Tsukuba University and her MBA at Ohmae Kenichi Graduate School of Business, both in Japan.
Since January 2023, Sally Kornbluth has served as MIT’s 18th president. In her Inaugural address, she urged the MIT community to tackle humanity’s great global challenges, especially climate change, with renewed urgency. A cell biologist, Kornbluth focused her research on the biological signals that tell a cell to start dividing or to self-destruct — processes key to understanding cancer and various degenerative disorders.

President Kornbluth joined Duke University’s biology faculty in 1994, and in 2006 was named vice dean for basic science at the Duke School of Medicine. She was selected in 2014 to serve as provost, the university’s chief academic officer. Her eight-year tenure won her a reputation as a brilliant administrator with a gift for advancing the university’s intellectual priorities, a creative problem-solver, and a leading advocate of faculty excellence and student wellbeing. She is a member of the National Academy of Medicine, the National Academy of Inventors, and the American Academy of Arts and Sciences.

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Lightning Talks and Panel Discussion: What's Hot and What is Warming Up in Each School and College

Jeffrey Grossman
Professor of Materials Science and Engineering
MacVicar Fellow
MIT Materials Science and Engineering

Daniela Rus
Director, MIT Computer Science and Artificial Intelligence Laboratory (CSAIL)

Daniela Rus is the Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science, director of MIT’s Computer Science and Artificial Intelligence Laboratory. She brings deep expertise in robotics, artificial intelligence, data science and computation. She is a member of the National Academy of Engineering and the American Academy of Arts and Sciences, and a fellow of the Association for the Advancement of Artificial Intelligence, the Institute of Electrical and Electronics Engineer, and the Association for Computing Machinery. She is also a recipient of a MacArthur Fellowship, a National Science Foundation Career award, and an Alfred P. Sloan Foundation fellowship. Rus earned her PhD in computer science from Cornell University.

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Elsa Olivetti
Associate Dean, MIT School of Engineering; Jerry McAfee Professor in Engineering;
Professor, MIT Department of Materials Science and Engineering

Professor Olivetti received a BS in engineering science from the University of Virginia in 2000, and a PhD in materials science and engineering from MIT in 2007. She spent her PhD program studying the electrochemistry of polymer and inorganic materials for electrodes in lithium-ion batteries. In 2014, she joined DMSE as an assistant professor. As an educator, Olivetti overhauled DMSE’s undergraduate curriculum and developed new courses, including one for the MIT Climate and Sustainability Consortium Climate Scholars. She’s a member of the MIT Climate Nucleus and co-director of the MIT Climate & Sustainability Consortium.

Professor Elsa Olivetti’s research focuses on improving the environmental and economic sustainability of materials. Specifically, she develops analytical and computational models to provide early-stage information on the cost and environmental impact of materials. Professor Olivetti and her research-group colleagues work toward improving sustainability through increased use of recycled and renewable materials, recycling-friendly material design, and intelligent waste disposition. The Olivetti Group also focuses on understanding the implications of substitution, dematerialization, and waste mining on materials markets.

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Nergis Mavalvala
Dean, MIT School of Science
11:15 AM  Networking Break
Tricia Dinkel comes to Corporate Relations with several years of experience in the innovation ecosystem and managing relationships with startups and corporates. Tricia previously worked as Director of Navigate (NECEC’s flagship innovation program) at the Northeast Clean Energy Council (NECEC) in Boston where she led all operations and partnership development for 400+ startups, 65+ innovation partners, and 200+ investors & corporates in North America and Europe. Prior to that role, Tricia held positions with increasing responsibility in program management at NECEC. Before that, her experience included Director of Data Analytics and Sustainability Reporting Manager at WegoWise Inc. in Boston, Associate Director at the Committee on Capital Markets Regulation in Cambridge, Senior Sustainability Coordinator at A Better City in Boston, and Assistant Director at The Green Alliance in Portsmouth, NH.

Tricia earned her B.A., in Environmental Studies/Natural Resource Policy at the University of Colorado, and her M.A., in Environmental Science Education at the University of New Hampshire. She served on the NECEC Diversity & Inclusion Committee and as a member of the USGBC (U.S. Green Building Council), Massachusetts Chapter.
12:50 PM  Lunch with Startup Exhibit

Startups at Lunch Exhibit Only
- ThemisAI: The Future of Fair Artificial Intelligence
- nurtur: Nurturing the Minds of Moms
- Zhennovate: AI Coaching to Augment Human and Organizational Growth

2:00 PM  Concurrent Workshops
- Workshop 1: Future of Workforce Development (Salon 1-3)
- Workshop 2: How to Engage MIT’s Innovation Ecosystem (Salon 4)

5:30 PM  Adjournment with Networking Reception

Day One | Workshop 1: Future of Workforce Development (Salon 1-3)

Session One: Workforce Challenges and Practices

2:00 PM  Session Introduction
George Westerman
Founder, Global Opportunity Forum, MIT Office of Open Learning
Senior Lecturer, MIT Sloan School of Management

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Founder, Global Opportunity Forum, MIT Office of Open Learning
Senior Lecturer, MIT Sloan School of Management

George Westerman is a Senior Lecturer at the MIT Sloan School of Management and Founder of the Global Opportunity Forum (http://gof.mit.edu).

George’s work bridges the fields of executive leadership and technology strategy. During more than 20 years with MIT Sloan School of Management, he has written three award-winning books, including Leading Digital: Turning Technology Into Business Transformation. As a pioneering researcher on digital transformation, George has published papers in Harvard Business Review, Sloan Management Review, and other top journals. He is now focused on helping employers, educators, and other groups to rethink the process of workforce learning around the world through the GOF and several research collaborations.

George is cochair of the MIT Sloan CIO Leadership Awards, a member of the Digital Strategy Roundtable for the US Library of Congress, and member of the Board of Directors for Workcred. He works frequently with senior management teams and industry groups around the world. Prior to earning a Doctorate from Harvard Business School, he gained more than 13 years of experience in product development and technology leadership roles.

View full bio

Technology R&D is an essential capability-building activity. But R&D is a people challenge as much as a technical one; every company we talk to mentions the challenge of hiring good people – in the technology space and the rest of the organization. To complement the technology-focused research presentations this year, we have designed this half-day program to delve into the critical challenges of finding the right people and helping them develop. There are many simple answers that are just too simplistic and insurmountable challenges that have reasonable solutions. In this session, we’ll share expert insights from practicing leaders and internationally-recognized academic researchers. We’ll also introduce a new ILP effort – in collaboration with other parts of MIT – to help our member companies learn and share best practices in the complex world of talent management.
2:15 PM  Executives Panel: Talent & Learning

Kathleen D Kennedy
Senior Director, MIT Horizon
Executive Director
*MIT Center for Collective Intelligence*

Bjørn Jalving
CTO
*Kongsberg Maritime*

Mohamed Kanji
Chief Open Innovation and Operational Excellence Officer
*L’Oréal*

Taiil Kim
Global Director of Strategy
*Schneider Electric*

2:55 PM  Student Panel: MIT Department of Engineering and MIT Sloan School of Management

Susan Sandler Brennan
Assistant Dean, Career Development Office
*MIT Sloan School of Management*

Maya Makarovsky
Junior
*MIT EECS & Data Science/Analytics*

Victory Yinka-Banjo
Junior
*MIT EECS & Molecular Biology*

Pedro Russel
MBA Candidate
*MIT Sloan School of Management*
George Westerman
Founder, Global Opportunity Forum, MIT Office of Open Learning
Senior Lecturer, MIT Sloan School of Management

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3:30 PM

Networking Break

Session Two: MIT Insights and Opportunities
David Autor is Ford Professor in the MIT Department of Economics. His scholarship explores the labor-market impacts of technological change and globalization on job polarization, skill demands, earnings levels and inequality, and electoral outcomes.

Autor has received numerous awards for both his scholarship—the National Science Foundation CAREER Award, an Alfred P. Sloan Foundation Fellowship, the Sherwin Rosen Prize for outstanding contributions in the field of Labor Economics, the Andrew Carnegie Fellowship—and for his teaching, including the MIT MacVicar Faculty Fellowship.

In 2017, Autor was recognized by Bloomberg as one of the 50 people who defined global business. In March of 2019, he was christened “Twerpy MIT Economist, David Autor” by John Oliver, host of Last Week Tonight, during a segment on automation and employment. Autor is currently determining how to merchandise this title.

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Research Highlights from across the Institute
George Westerman
Founder, Global Opportunity Forum, MIT Office of Open Learning
Senior Lecturer, MIT Sloan School of Management

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Kathleen D Kennedy
Senior Director, MIT Horizon
Executive Director
MIT Center for Collective Intelligence

There is so much interesting research on talent and upskilling across MIT. George and Kathleen will share some highlights from Sloan, Open learning and other areas.
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Olivier Cadet was Senior Vice President Global Operations, Americas, and President of Kongsberg Maritime Inc. located in Houston, TX and responsible for Kongsberg Maritime operations in the Americas region. Prior to assuming his role in July 2018, Olivier was Executive Vice President of Products & Services, based in Norway. In that role, Olivier was overseeing the teams managing Kongsberg Maritime’s products portfolio aligned with market demands and future trends, such as autonomous operations and digital performance. Olivier was also accountable for Kongsberg Maritime’s strategic initiative around Information Management System and Smart Data.

Olivier started his international career in the offshore drilling industry in 1998, working for Schlumberger/Transocean as a Controls Engineer where he was involved in the installation, commissioning and support of Dynamic Positioning and Automation systems on offshore drilling rigs. In 2004 Olivier joined Air Liquide, the world leader in industrial gases, where he served for 9 years in a variety of innovation management roles, including R&D Group Manager and Program Director, driving Air Liquide’s research efforts in the field of Advanced Process Control and Operations Research to support the company’s efficiency program.

A dual citizen (U.S./France), Olivier graduated from the Grenoble Institute of Technology (INP Grenoble) in France in 1998 with a Master of Engineering (Diplôme d’Ingénieur) in Electrical Engineering. He completed the Advanced Management Program with MIT Sloan Executive Education in June 2022.
Day One | Workshop 2: How to Engage MIT's Innovation Ecosystem (Salon 4)

2:00 PM

Session Introduction
Rebekah Miller
Program Director, MIT Industrial Liaison Program

Rebekah Miller joined the Office of Corporate Relations team as a Program Director in March 2022. Rebekah brings to the OCR expertise in the life sciences and chemical industries as well as in applications including sensors, consumer electronics, semiconductors and renewable energy.

Prior to joining the OCR, Rebekah worked for over a decade at Merck KGaA, most recently as a Global Key Account Manager in the Semiconductor division. Rebekah also served as Head of Business and Technology Development for the Semiconductor Specialty Accounts, during which time she led strategic planning and technology roadmapping.

While at Merck KGaA, Miller established a strong track record in industry-university partnerships, corporate entrepreneurship, and innovation management, with experience in roles spanning Technology Scouting, Alliance Management, and New Business Development. Early in her career, she led early phase R&D projects as a member of the Boston Concept Lab, which focused on technology transfer from academia.

Miller earned her B.A. in Chemistry and Biology from Swarthmore College and her Ph.D. in Chemistry, with a Designated Emphasis in Nanoscale Science and Engineering, from the University of California, Berkeley. She first joined MIT as a postdoctoral associate in the Bioengineering and Material Science Departments.
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Panel: Connections, Collaborations, and Discovery with MIT OSATT

Adi Gottumukkala
Catalyst
OSATT Core

Anne White (remote)
Vice Provost and Associate Vice President for Research Administration
Office of Strategic Alliances & Technology Transfer

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Meghan McCollum Fenno
Executive Director & Counsel
OSATT Core

Lauren Foster
Associate Director
MIT Technology Licensing Office

Engagement with corporations and support of entrepreneurship are two critical vehicles for delivering on MIT’s mission to bring knowledge to bear on the world’s greatest challenges. MIT commitment to both is among the strongest of any university, with leading corporations involved in over 20% MIT’s research and thousands of startups having spun off from research connected to MIT. MIT’s Office of Strategic Alliances and Technology Transfer (OSATT) provides dedicated resources to make this possible, including the MIT Office of Corporate Relations, the OSATT Core, and the Technology Licensing Office. Representatives of each with speak on their role, the interface with corporations, and lessons learned.

2:50 PM
Lightning Talk: Product Design at MIT

Antonio (Tony) Hu
Director and Senior Lecturer
MIT Riccio Graduate Engineering Leadership Program

With extensive experience in product design, Tony Hu, Director of MIT’s Integrated Design and Management Program, will share his insights on spanning design, engineering, and business domains to develop a holistic approach to product design.
Panel: Strategies for Success in Industry-Academia Collaboration

Antonio (Tony) Hu
Director and Senior Lecturer
MIT Riccio Graduate Engineering Leadership Program

Christine LeBarre
VP & Senior Director
Liberty Mutual Insurance

Anthony Sinskey
Professor
MIT Department of Biology

Stacy Springs
Executive Director
MIT Center for Biomedical Innovation

Raj Gopalaswamy
Global Technology Director, New Domains
Novelis

MIT Faculty and staff will be joined by industry leaders to explore the role of research collaborations as part of a successful technology innovation strategy.

Networking Break

Join in! MIT Working Groups and Consortia

Aude Oliva
Director of Strategic Industry Engagement
MIT Schwarzman College of Computing

Vladimir Bulović
Director
MIT.nano

Klavs Jensen
Warren K. Lewis Professor, Department of Chemical Engineering at MIT
Professor
MIT Materials Science and Engineering

Juner Zhu
Assistant Professor
Mechanical and Industrial Engineering, Northeastern University

Leaders from four dynamic and impactful MIT Consortia and Centers with share their mission, new developments, and ways that companies can become involved to collaboratively address key challenges.

Lightning Talk: Corporate Engagement in the Startup Entrepreneurial Journey

Erin Scott
Senior Lecturer, Technological Innovation, Entrepreneurship, and Strategic Management
MIT Sloan School of Management

Dr. Scott will draw upon her nearly two decades of academic and practical experience to speak how corporations and startups can navigate the entrepreneurial journey from initial idea to successful commercialization.
Panel: Disruptive Innovation with MIT-Connected Startups

Erin Scott
Senior Lecturer, Technological Innovation, Entrepreneurship, and Strategic Management
MIT Sloan School of Management

Stanley Chu
Chief Financial Officer
Defond

Alex Gruzen
Chief Executive Officer and Board Member
WiTricity

The panelists will explore models for successful corporate-startup engagement, based on research and perspectives from industry and startups with extensive experience.

5:00 PM
Engaging with MIT Worldwide

Sinan Abushanab
Associate Director
MIT Regional Entrepreneurship Acceleration Program (MIT REAP)

Jinhua Zhao
Professor of Cities and Transportation
Founder and Faculty Director
MIT Mobility Initiative

April Julich Perez
Executive Director
MIT International Science and Technology Initiatives (MISTI)

Engaging with MIT is not limited to Kendall Square. In this session, representatives from MIT programs with global reach will share how to maximize impact through programs such as MIT Sloan Global Programs, the SMART M3S program, and MIT MISTI.

5:30 PM
Adjournment with Networking Reception

Day Two | Plenary

8:25 AM
Registration and Light Breakfast
Mr. David Martin joined Corporate Relations on August 15, 2018 as Program Director for the ILP. Martin comes to OCR with deep and broad knowledge and expertise in program management, innovation, commercial and government contracting, and strategic planning. In his most recent position at Altran (Burlington, MA) as the VP Programs, Dave had many major accomplishments including leading an innovation team to develop new technology in the beverage-filling industry, and managing client-facing relations supporting sales and execution of projects. Before that, he was at Windmill International as VP, Product Development, R&D. There he spearheaded the move into new markets for an innovative satellite communications product including through the SBIR program where he secured funding and sponsorship. Martin also leveraged other government programs collaborating with the DoD and congressional contacts. He began his career in the US Air Force as an Active Duty Captain and served for 10 years as an Acquisition Manager, Scientist, Test Director, and finally as Executive Officer in the Executive Office for Command, Control and Communications Systems in the Pentagon. Martin also served in the US Air Force Reserves before joining Windmill.

Mr. Martin earned his B.S., Physics from MIT, and his M.S., Systems Management from the University of Denver. He also earned a Certificate in Information Systems at the University of Denver.
Michael Short joined the faculty in the Department of Nuclear Science and Engineering in July, 2013. He brings 15 years of research experience in the field of nuclear materials, microstructural characterization, and alloy development. His group’s research is a mixture of large-scale experiments, micro/nanoscale characterization, and multiphysics modeling & simulation. The main areas of Short’s research focus on 1) Non-contact, non-destructive measurement of irradiated material properties using transient grating spectroscopy (TGS) more, 2) Preventing the deposition of deleterious phases, such as CRUD in nuclear reactors, as fouling deposits in energy systems more, and 3) Quantification of radiation damage by stored energy fingerprints more. This last project was recently selected for an NSF CAREER award.

Education

- B.S., Nuclear Science and Engineering, MIT, 2005
- B.S., Materials Science and Engineering, MIT, 2005
- M.S., Materials Science and Engineering, MIT, 2010
- Ph.D., Nuclear Science and Engineering, MIT, 2010

View full bio
Dr. Corey Cheng joined the Office of Corporate Relations (OCR) as a Senior Industrial Liaison Officer in December 2011. He has broad interests in science and technology, and uses his technical research experience to better serve ILP members in Asia and the United States.

Cheng spent six years in industrial research at Dolby Laboratories, San Francisco, where he contributed to sound compression (Dolby Digital, AAC, MP3), wireless networking, fingerprinting, and spatial/"3-D audio" technologies. Later, he was Associate Professor and Director of the undergraduate and graduate programs in music engineering technology at the University of Miami, Florida, where he also held a dual appointment in Electrical and Computer Engineering. Cheng holds various U.S. and international patents, has published technical papers, and has presented at various conferences. His technical work includes collaborations and consulting work with the U.S. Naval Submarine Medical Research Laboratory, Fujitsu-Ten USA, Starkey Laboratories, America Online, and the Chicago Board of Trade (CBOT). Cheng was an IEEE Distinguished Lecturer for the Circuits and Systems Society from 2009-2010, and was a Westinghouse (Intel) Science Talent Search national finalist many years ago.

Cheng holds degrees in Electrical Engineering (Ph.D., M.S.E. University of Michigan), Electro-Acoustic Music (M.A. Dartmouth College), and physics (B.A. Harvard University).

Personally, Dr. Cheng is an American Born Chinese (ABC), serves as his family’s genealogist, and traces his roots back to Toi San, Guang Dong Province and Xing Hua, Jiang Su Province, China. He also has a background in music, and his electro-acoustic compositions have been presented at various U.S. and international venues.

Jim Flynn
Program Director, MIT Industrial Liaison Program

Before MIT, Jim was the assistant dean of research business development at the UMass Amherst College of Information and Computer Sciences. Jim founded, built, and sold multiple technology companies in fintech and online media. He has bootstrapped startups and closed venture capital, angel, and private equity funding rounds. Jim also served as the Chief Operating Officer of a public company and a subsidiary of Pitney Bowes. He began his career at AT&T as a software developer, hardware engineer, and national account manager. Jim has authored patents and wrote one of the first books on Java programming. Out of all the roles he’s held, Jim’s favorite job title by far is dedicated dad of four. He earned a BS from Manhattan College and an MBA with concentrations in finance and international business from New York University.

This lightning talk introduces the main results from a survey MIT Corporate Relations and Innolead Inc. (https://www.innovationleader.com/) recently conducted on “Best Practices in University-Corporate Partnering.” Through a blend of surveys and deep conversations with 100+ corporate leaders in 20+ different industries, this study illustrates corporates’ different strategic reasons and priorities for engaging with universities, along with what works and what doesn’t in initiating and maintaining these relationships. In the survey, corporates give some advice to other corporates interested in engaging with universities; discuss some challenges they encounter; and offer universities some ideas for improvement.
Day Two | Track 1 | Manufacturing: Charting the Future of Production (Salon 1-2)

10:15 AM  Manufacturing@MIT
John Hart
Department Head and Professor, MIT Department of Mechanical Engineering

John Hart is Professor of Mechanical Engineering and Head of the Department of Mechanical Engineering at MIT. He is also the Director of the MIT Laboratory for Manufacturing and Productivity and the Center for Advanced Production Technologies. John’s research group focuses on the science and technology of production, including work on additive manufacturing, materials processing, automation, and computational methods. John has been recognized by awards from the United States NSF, ONR, AFOSR, DARPA, SME, and ASME, along with two R&D 100 awards. He has also received the MIT Ruth and Joel Spira Award for Distinguished Teaching in Mechanical Engineering and the MIT Keenan Award for Innovation in Undergraduate Education, for his leadership in undergraduate manufacturing education using new pedagogical models and digital resources. John is a co-founder of Desktop Metal and VulcanForms, and a Board Member of Carpenter Technology Corporation.

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Prof. John Hart will describe a new initiative at MIT - Manufacturing@MIT - that aims to develop and scale the technologies and systems that will shape the future of production. The vision for Manufacturing@MIT incorporates research, education and training initiatives, entrepreneurship, new lab facilities, and more. Manufacturing@MIT is building an industry alliance that allows members to work closely with one another, and with MIT faculty and students on shaping their manufacturing strategy, exploring manufacturing-related research across campus, and educating their workforce.
Generative AI and The Quest for Realistic and High-Performance Design

Faez Ahmed
d’Arbeloff Career Development Assistant Professor, MIT Department of Mechanical Engineering

Prof. Faez Ahmed is the d’Arbeloff Career Development Assistant Professor in the Department of Mechanical Engineering at the Massachusetts Institute of Technology (MIT). He leads the Design Computation and Digital Engineering (DeCoDE) lab, with a research focus on the synergy of machine learning and engineering design. His recent work addresses the synthesis of designs tailored to real-world constraints and promotes the collaborative potential between human designers and machines. Prior to his appointment at MIT, Prof. Ahmed was a postdoctoral fellow at Northwestern University and earned his Ph.D. in Mechanical Engineering from the University of Maryland. He has industrial experience in Australia’s railway and mining sectors, where he championed data-driven predictive maintenance initiatives. Prof. Ahmed’s vision is to create a world where humans and AI design together to solve our biggest challenges.

Advances in Artificial Intelligence are transforming industries by discerning patterns in vast data sets and delivering accurate predictions. Notably, Generative AI is poised to reshape engineering product design, heralding new avenues of innovation. While tools like ChatGPT and Dall-E have shown significant potential in multimedia applications, design synthesis presents distinct challenges. This talk will probe these challenges, emphasizing the quest for realistic and high-performance designs. We’ll unveil emerging generative AI methods addressing precision, constraints, and novelty, and present solutions to navigate these hurdles. A central theme will be the synergy of deep generative models with engineering optimization techniques, spotlighting how this fusion augments the design process. We’ll wrap up by highlighting the transformative implications of these methodologies in fields like aerospace, robotics, and transportation, underscoring the impact of generative optimization on design democratization and engineering innovation.

The Promise of Biomanufacturing

J. Christopher Love
Raymond A. (1921) And Helen E. St. Laurent Professor, MIT Department of Chemical Engineering

Biomanufacturing will change the food we eat, energy we use, and how we cure diseases. It has the potential to drastically reduce our reliance on greenhouse gases. But there are enormous challenges to getting promising advances from labs to the market. Standing up a large-scale manufacturing facility can run to $2 billion, the field is full of regulatory hurdles, and workers need advanced training. We’ll look ahead at promising biomanufacturing solutions, and what it will take to scale them.
Manufacturing firms that employ advanced technologies need an enlightened and empowered workforce. In this session, I will discuss the MIT Learning Engineering and Practice (LEAP) group’s projects to address workforce challenges in advanced manufacturing. Topics will include critical thinking manufacturing education, regional training systems, and extended reality simulations to train next-generation workers.

12:30 PM Adjournment with Bagged Lunch

Day Two | Track 2 | Recent Advances in RNA Research and Therapeutics (Salon 3)

10:15 AM Translating Gene Control
Richard A. Young
Professor of Biology
Core Member, Whitehead Institute

Richard Young is a Professor at the Whitehead Institute and MIT. Dr. Young studies gene regulation in health and disease. Therapeutic concepts from these studies have led to development of multiple anti-cancer drugs that are currently in clinical trials. Dr. Young has served as an advisor to the World Health Organization, the National Institutes of Health and numerous scientific societies and journals. His honors include Membership in the National Academy of Sciences and the National Academy of Medicine, and Scientific American has recognized him as one of the top 50 leaders in science, technology and business. He has founded and advised companies in the biotechnology and pharmaceutical industry, and currently serves on the boards of Syros Pharmaceuticals, CAMP4 Therapeutics, Omega Therapeutics, Dewpoint Therapeutics, Paratus Sciences and Precede Biosciences. Dr. Young is also an aviator and holds a commercial pilot license.

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Recent discoveries in RNA biology have changed the textbook paradigm of gene regulation and provide new therapeutic opportunities for many unmet medical needs. I will discuss these breakthroughs, the new therapeutic opportunities they offer, and how they enable rapid drug discovery and development. I’ll show how one company is pioneering a new class of medicines based on this new RNA science.
10:45 AM

Recent Advances in the Manufacturing of mRNA Biotherapeutics

Richard Braatz

Edwin R. Gilliland Professor, MIT Department of Chemical Engineering

Dr. Richard D. Braatz is the Edwin R. Gilliland Professor of Chemical Engineering at MIT, where he conducts research into advanced biomanufacturing systems. He is the Director of the Center on Continuous mRNA Manufacturing and leads process data analytics, mechanistic modeling, and control systems for projects on vaccine, monoclonal antibody, and gene therapy manufacturing. Dr. Braatz received an M.S. and Ph.D. from the California Institute of Technology and was the Millennium Chair and Professor at the University of Illinois at Urbana-Champaign and a Visiting Scholar at Harvard University before moving to MIT. Dr. Braatz has collaborated with more than 20 companies, including Novartis, Pfizer, Merck, Bristol-Myers Squibb, Biogen, Amgen, Takeda, and Abbott Labs. He has published over 300 papers and three books. Dr. Braatz is a Fellow of IEEE, IFAC, AIChE, and AAAS and a member of the U.S. National Academy of Engineering.

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Mechanistic models are being constructed for all unit operations for the end-to-end continuous manufacturing of mRNA biotherapeutics. The dynamic models are integrated with models for constraints, uncertainties, and disturbances to form a digital twin for automated, integrated manufacturing. The digital twin is suitable for:

1. The evaluation and validation of mechanistic hypotheses to gain mechanistic understanding,
2. Comparison of multiple process flowsheet options,
3. Optimization of individual unit operations and their control systems,
4. The design of end-to-end operations,
5. The real-time operation alongside plant operations. Experimentally validated results are presented for multiple unit operations.

11:15 AM

Networking Break
mRNA translation is tightly regulated in mammalian cells. In this talk, I will begin by presenting a high-resolution 3D in situ sequencing approach (RIBOmap and TEMPOmap) that enables simultaneous mapping of mRNA transcription, export, translation, and degradation of thousands of genes within intact cells and tissues. Following that, I will explore strategies to improve mRNA translation and stability using mRNA-oligonucleotide conjugates, with a focus on their potential biomedical applications.
The Economics of Energy Innovation
Jacquelyn Pless
Fred Kayne Career Development Professor of Entrepreneurship and Assistant Professor in the Technological Innovation, Entrepreneurship, and Strategic Management group,
MIT Sloan School of Management

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Fred Kayne Career Development Professor of Entrepreneurship and Assistant Professor in the Technological Innovation, Entrepreneurship, and Strategic Management group
MIT Sloan School of Management

Jacquelyn Pless is the Fred Kayne (1960) Career Development Professor of Entrepreneurship and an Assistant Professor at the MIT Sloan School of Management. Her research interests are in the economics of innovation, energy and environmental economics, and public economics.

Her research focuses on understanding how policy affects firm behavior and innovation outcomes, with a particular interest in clean energy innovation. Current projects concentrate on the role of public subsidies in driving private research and development investments and the direction of innovation. Other work examines renewable energy markets and how environmental policy impacts firm competitiveness.

She holds an MS and PhD in mineral and energy economics from the Colorado School of Mines, and a BA in economics and political science from the University of Vermont.

Jacquelyn Pless is an Assistant Professor in the Technological Innovation, Entrepreneurship, and Strategic Management group at the MIT Sloan School of Management and the Fred Kayne (1960) Career Development Professor of Entrepreneurship. Her research interests are in the economics of innovation, energy and environmental economics, and public finance. Most of her work studies the effects of policies and investment (both public and private) on innovation for social progress — innovation that protects the planet and people — focusing primarily on energy and environmental innovation. One of her current obsessions is understanding how market failure interdependencies and policy interactions shape firms’ and individuals’ incentives to innovate and especially how they steer the direction of innovation.

Jacquelyn is also an Honorary Research Associate with the University of Oxford, a Research Affiliate of CESifo, and an Invited Researcher with J-PAL’s Science for Progress Initiative.

Before joining MIT, Jacquelyn held various positions in the public and private sectors. She worked in the Pennsylvania House of Representatives and National Conference of State Legislatures supporting state and tribal governments on energy policy and project finance issues, and she was a research economist at the National Renewable Energy Laboratory. She was also the Head of Analytics for a boutique consulting firm in the UK helping companies manage their reorganizations.

View full bio

Climate change is one of today’s greatest threats to humanity and the economy. Stabilizing global temperatures and avoiding the most catastrophic consequences, though, will require new and more affordable technologies and processes for producing low-carbon energy as well as innovative approaches to energy management in the utility sector. This talk will discuss the challenges and opportunities for fostering energy innovation from an economics perspective, focusing on what has been learned from experience so far and how industry leaders, investors, and policymakers can help steer innovation moving forward.
Donald Sadoway is the John F. Elliott Professor Emeritus of Materials Chemistry in the MIT Department of Materials Science and Engineering. He obtained the B.A.Sc. in Engineering Science, the M.A.Sc. in Chemical Metallurgy, and the Ph.D. in Chemical Metallurgy, all from the University of Toronto. After a year of postdoctoral study at MIT as a NATO Fellow, Dr. Sadoway joined the faculty in 1978. He is the author of over 180 scientific papers and holder of over 37 U.S. patents, and his research is directed towards the development of batteries for grid-level storage and mobile applications as well as environmentally sound technologies for the extraction of metals. Sadoway’s contributions include two breakthroughs. First came the liquid metal battery, which could enable the large-scale stationary storage of renewable energy. That represents a huge step forward in the transition to green energy, according to António Campinos, president of the European Patent Office, when Sadoway won the 2022 European Inventor Award for the invention in the category for non-European Patent Office Countries. The second breakthrough is molten oxide electrolysis, which produces metal from ore with no CO2 emissions. Discovered at MIT, Sadoway spun out the company today known as Boston Metal, which is the most credible solution to green steel. In 2012 he was named by Time magazine as one of the 100 Most Influential People in the World.

Professor Donald Sadoway’s research seeks to establish the scientific underpinnings for technologies that make efficient use of energy and natural resources in an environmentally sound manner. The overarching theme of his work is electrochemistry in nonaqueous media. Specific topics in applied research are environmentally sound electrochemical extraction and recycling of metals; rechargeable batteries for stationary storage or mobile applications; synthesis of thin films or of nanoparticles in cryogenic media.

View full bio

Today’s lithium-ion batteries are still too expensive for most large-scale applications. To address this limitation, Prof. Sadoway has founded Avanti: “The aluminum battery – A unique storage solution for widespread decarbonization.” This new battery architecture uses aluminum and sulfur (two of the most abundant elements on earth) as its two electrode materials, with a molten salt electrolyte in between.

The molten salt the team chose as an electrolyte simply because of its low melting point turned out to have a fortuitous advantage. One of the biggest problems in battery reliability is the formation of dendrites, which are narrow spikes of metal that build up on one electrode and eventually grow across to contact the other electrode, causing a short circuit and hampering efficiency. But this particular salt, it happens, is very good at preventing that malfunction.

Avanti is working on demonstrating that the technology works at scale, including running through hundreds of charging cycles.
The Race to Mitigate Methane Emissions
Desirée Plata
Associate Professor, MIT Department of Civil and Environmental Engineering

Desirée Plata’s research seeks to maximize technology’s benefit to society while minimizing environmental impacts in industrially important practices through the use of geochemical tools and chemical mechanistic insights. Plata earned her doctoral degree in Chemical Oceanography and Environmental Chemistry from the Massachusetts Institute of Technology and the Woods Hole Oceanographic Institution’s Joint Program in Oceanography (2009) and her bachelor’s degree in Chemistry from Union College in Schenectady, NY (2003). Plata is an NSF CAREER Awardee (2016), an Odebrecht-Braskem Sustainable Innovation Awardee (2015), a two-time National Academy of Engineers Frontiers of Engineering Fellow (2012, 2020), a two-time National Academy of Sciences Kavli Frontiers of Science Fellow (2011, 2013), a Caltech Resnick Sustainability Fellow (2017), and winner of MIT’s Junior Bose Teaching Award (2019), Edgerton Faculty Achievement Award (2021), and Perkins Graduate Advising Award (2021). Having previously served as John J. Lee Assistant Professor of Chemical and Environmental Engineering at Yale University and Associate Director for Research at the Center for Green Chemistry and Green Engineering at Yale, Plata is now Associate Professor of Civil and Environmental Engineering at MIT, co-director of the MIT Climate and Sustainability Consortium, and Faculty Lead of Belonging, Achievement, and Composition in the MIT School of Engineering. Plata directs MIT’s Methane Network, serves on the Scientific Advisory Board of Spark Climate, and served on the National Academy of Science Engineering and Medicine’s Atmospheric Methane Removal study (recused). Plata is co-founder of Nth Cycle (nthcycle.com), co-founder and President of Sustainable Chemical Resource Advisors LLC, and co-founder and President of Moxair Inc.

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Methane emissions reductions on the order of 50% of anthropogenic sources could save 0.5°C warming by 2100. However, over 80% of all methane emissions are diffuse and dilute, making their abatement technically challenging. Plata will discuss the work her group is doing to tackle this problem using Earth-abundant zeolite catalysts, which are low-cost, operate at low-temperature, and show robust reactivity over long time periods. Application of these materials and customized reactors in key locations could have a meaningful effect on global methane emissions reduction in certain sectors, like coal extraction. Further development is needed for other targets, and Plata will briefly highlight opportunities undertaken by the MIT Methane Network to advance this mission.
Our research focuses primarily on the development of electrochemical processes to facilitate chemical separations and to mediate the transformation of captured waste to useful commodity chemicals. The electrochemically-mediated separation processes that are currently under development and investigation in our group can primarily be divided into two areas: (i) carbon capture from both point (power plants, industrial emissions) and distributed (ambient air, ocean waters) sources; and (ii) water purification (including decontamination of wastewater and desalination). These research projects are supported by both government agencies and industrial partners.

We also have experience in the synthesis, characterization, and application of stimuli-responsive materials, which include nanoparticles, nanofibers, surfactants, polymers, and gels; these materials have a wide variety of applications in, for example, drug delivery, protein, environmental separations, rheology, and surface tension modification. We have particular experience with redox-active polymers for selective separations, and on the use of superparamagnetic nanoparticles (e.g. magnetic fluids) in environmental, biological and chemical separations.

Research advances in our group have resulted in the formation of a start-up company, Verdox Inc., developing electro-swing adsorption processes for removal of CO2 and other acid gases from process streams and the ambient environment. Other potential start-up ventures are currently under consideration.

As carbon dioxide continues to build up in the Earth’s atmosphere, research teams around the world have spent years seeking ways to remove the gas efficiently from the air. Meanwhile, the world’s number one “sink” for carbon dioxide from the atmosphere is the ocean, which soaks up some 30 to 40 percent of all of the gas produced by human activities.

Recently, the possibility of removing carbon dioxide directly from ocean water has emerged as another promising possibility for mitigating CO2 emissions, one that could potentially someday even lead to overall net negative emissions. But, like air capture systems, the idea has not yet led to any widespread use, though there are a few companies attempting to enter this area.

A team lead by Prof. Hatton and Prof. Kripa Varanasi has come up with a reversible process consisting of membrane-free electrochemical cells. Reactive electrodes are used to release protons to the seawater fed to the cells, driving the release of the dissolved carbon dioxide from the water. The process is cyclic: It first acidifies the water to convert dissolved inorganic bicarbonates to molecular carbon dioxide, which is collected as a gas under vacuum.
Materials at the Body-Machine Interface
Aristide Gumyusenge
Merton C. Flemings Assistant Professor, MIT Department of Materials Science & Engineering

Professor Aristide Gumyusenge received a BS in chemistry from Wofford College and a PhD in chemistry from Purdue University. Before joining DMSE, he was a postdoctoral fellow of the Geballe Lab for Advanced Materials at Stanford University, working with Professor Zhenan Bao and Professor Alberto Salleo. Professor Gumyusenge's research background and interests are in semiconducting polymers, their processing and characterization, and their role in the future of electronics. Particularly, he has tackled long-standing challenges in operation stability of semiconducting polymers under extreme heat and has pioneered high-temperature plastic electronics. At MIT, Professor Gumyusenge’s research group, OMSE Lab, focuses on developing novel organic semiconducting materials and using them to build organic electronic devices and body-machine interfaces. Through polymer design, novel processing strategies, large-area manufacturing of electronic devices, he’s interested in relating molecular design to device performance, especially transistor devices able to mimic and interface with biological systems.

Smart body-machine interfaces offer great potential for healthcare and consumer products. For effective merging of the body and machines, the necessary electronic hardware should be mechanically compatible, function stably within the body's dynamic environment, accurately capture and process body signals, learn from the body's reactions and act accordingly. Mixed ionic-electronic polymers are promising for this highly demanding task. They react to ions, changing their properties, which can then be used in applications. To date, the main hurdle is finding a material that balances ion movement with electronic movement. In my lab at MIT lab (the Laboratory of Organic Materials for Smart Electronics, OMSE Lab), we focus on creating such materials. I will discuss how we design new semiconductors that respond differently to ions and how we tweak molecules for varied uses. One method we use is copolymerization, allowing us to produce a range of conductors suited for devices from quick electrochemical transistors to advanced artificial synapses. By adding polar groups to known good electronic conductors, we can study the balance of ionic and electronic movement and its impact on performance. I will also touch on our work in creating bio-compatible probes that combine sensing and brain-like signal processing.
Polina Anikeeva received her BS in Physics from St. Petersburg State Polytechnic University, and a PhD in Materials Science and Engineering from MIT. She completed her postdoctoral training at Stanford, where she created devices for optical stimulation and recording from brain circuits. Polina joined the MIT faculty in 2011 and is currently a Matoula S. Salapatas Professor of Materials Science and Engineering and a Professor of Brain and Cognitive Sciences. She serves as the director of the K. Lisa Yang Brain-Body Center. Anikeeva's Bioelectronics research group focuses on the development of minimal approaches to record and modulate the physiology of the nervous system, especially in the context of brain-body communication. Anikeeva is a recipient of the NSF CAREER Award, the DARPA Young Faculty Award, the TR35, the Vilcek Prize for Creative Promise, and the NIH Pioneer Award.

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To understand the function and dynamics of the nervous system and to find treatments for the neurological and psychiatric conditions that increasingly affect our aging society, new tools capable of addressing neuronal signaling complexity are urgently needed. These tools must also match the mechanical and chemical properties of the neural tissue to avoid functional perturbation to local circuits. By leveraging fiber drawing, our group creates flexible and stretchable probes capable of recording and stimulation of neural activity as well as delivery of drugs and genes into the brain and peripheral nervous system. Simultaneously, we develop magnetic nanotransducers that convert magnetic fields into thermal, chemical, and mechanical signals, which can then be perceived by ion channels on neurons. Weak magnetic fields can penetrate arbitrarily deep into the body, allowing us to remotely control a variety of biological processes.
Recent decades have seen exciting explosions of research into new and lesser-studied semiconductors, including such broad categories as complex-structured nitrides and chalcogenides and layered and two-dimensional (2D) materials. Even so, silicon has further consolidated its position as the leading material for computing, solar energy conversion, and even for some optoelectronics. In light of this friendly but often overmatched competition with silicon, I will motivate continued innovation in new semiconducting materials and present materials development projects in my research group that address future technology and market needs. I will highlight research on forming high-performance semiconductor-dielectric interfaces with 2D materials for transistors and on exploring new perovskite semiconductors for solar cells. Throughout, I will emphasize how choices in fundamental research topics can address the manufacturability of future semiconductor technologies.
Dr. Iwnetim (Tim) Abate is an Assistant Professor in the Department of Materials Science and Engineering at the Massachusetts Institute of Technology. Previously, he was both Miller Fellow and a Presidential Post-Doctoral Fellow at UC Berkeley (with Professor Mark Asta and Kwabena Bedikao), working on layered materials for application in computing, catalysis, and sensing. His Ph.D. in Materials Science and Engineering at Stanford University focused on designing high-performance materials for Li- and Na-ion batteries and elucidating their reaction mechanism (with Professor William Chueh and Thomas Devereaux). Before joining Stanford, he was researcher at IBM Alamden and Los Alamos National Laboratory working on metal-air batteries and hybrid perovskite solar cells, respectively.

Dr. Abate’s achievements have been acknowledged with awards such as C&EN’s “Talented Twelve,” the Electrochemical Society’s “Daniel Cubicciotti,” and the Stanford Materials Science and Engineering “John Stevens Jr Memorial” Award, the “Miller” and “Presidential Postdoctoral” at UC Berkeley, among others.

Professor Abate is also a co-founder and president of a non-profit organization (www.scifro.org), working on empowering the African youth to solve local problems through scientific research and innovation. The organization is generously supported by the Bill & Melinda Gates Foundation, National Science Foundation, American Physical Society, and others.

To decarbonize transportation, grid systems, and heavy industries, we rely on disruptive technologies and novel materials. Among these solutions, chemical and electrochemical energy storage mechanisms play pivotal roles in our journey. In the realm of chemical energy storage, hydrogen emerges as a clean and versatile fuel, holding the potential to drive us towards net-zero emissions by 2050. However, current hydrogen production methods have limitations, including CO₂ emissions and high energy consumption. The Abate lab is committed to developing more efficient hydrogen production chemistries, eliminating CO₂ emissions, and achieving a cost below $1/kg—an essential milestone for broader hydrogen adoption. In the field of electrochemical energy storage, our mission is to create high-energy-density, cost-effective batteries reliant on sustainable minerals. Sodium-ion batteries (NiBe) offer promise in this endeavor. Our laboratory actively explores manganese and iron-rich NIB technology, aiming to contribute to a more sustainable and eco-friendly energy future.
Panel: Fintech Innovation - The Nexus of Technology and Policy
Jim Flynn
Program Director, MIT Industrial Liaison Program

Before MIT, Jim was the assistant dean of research business development at the UMass Amherst College of Information and Computer Sciences. Jim founded, built, and sold multiple technology companies in fintech and online media. He has bootstrapped startups and closed venture capital, angel, and private equity funding rounds. Jim also served as the Chief Operating Officer of a public company and a subsidiary of Pitney Bowes. He began his career at AT&T as a software developer, hardware engineer, and national account manager. Jim has authored patents and wrote one of the first books on Java programming. Out of all the roles he’s held, Jim’s favorite job title by far is dedicated dad of four. He earned a BS from Manhattan College and an MBA with concentrations in finance and international business from New York University.

Ed Golding
Executive Director and Senior Lecturer
MIT Golub Center for Finance and Policy

Daniel Aronoff
Research Scientist, MIT Media Lab

Daniel Aronoff is a Research Scientist at the MIT Media Lab. He has published two peer-reviewed books on the economic foundations of the 2008 global financial crisis. His research on digital currencies is focused on two areas. One area is game theoretic analysis of the consensus protocols that underlie cryptocurrencies and the design of new protocols to improve security. The other area is the design of smart contracts to improve the performance of financial markets in environments where money and securities are appended to distributed ledgers. Daniel received his BSc in Philosophy and Economics with first-class honors from the London School of Economics and his PhD in Economics from MIT.

In this panel, two distinguished experts, Edward Golding and Dan Aronoff, will engage in a thought-provoking discussion that delves into the ever-evolving landscape of finance, digital currencies, and blockchain technologies.

Edward Golding is a seasoned veteran with a wealth of experience in housing finance and economic policy. Having served as the head of the Federal Housing Administration and as an executive at Freddie Mac, his insights into the regulatory and policy dimensions of finance are invaluable. Edward brings a unique perspective on how financial markets and regulations have evolved over the years.

Dan Aronoff, a research scholar with an academic foundation in economics, has not only studied the roots of the 2008 global financial crisis but has also ventured into the exciting world of digital currencies and blockchain technology. His expertise in game theory, consensus protocols, and smart contracts positions him as a thought leader in the fintech space.

During this panel, Golding and Aronoff will engage in a lively discussion, tackling critical issues at the forefront of the fintech revolution. They will discuss the practical utility of digital currencies, explore use cases for blockchain technologies, discuss the future of the mortgage market, and share insights on how Central Bank Digital Currencies (CBDCs) may influence the economy. Additionally, the panel will examine the potential for future disruptions in financial markets, drawing parallels to historical events.

The discussion will delve into the role of financial regulation in this rapidly changing landscape, exploring how regulations can either foster or hinder innovation and economic stability. Attendees will have an enlightening conversation that bridges the worlds of policy and technology.
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<td>11:15 AM</td>
<td>Networking Break</td>
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<td>11:30 AM</td>
<td>Startup Talk: Previously-Impossible Views Into Your Competition - Covariance.ai</td>
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<td>12:00 PM</td>
<td>Startup Talk: Where Behavioral Finance Meets Analytics - Andes Wealth Technologies</td>
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Day Two | Track 6 | Mobility: Challenges and Opportunities in Transportation (The Innovation Hall)
Join us for a 45-minute presentation (followed by Q&A) by the MIT Mobility Initiative (MMI) on the state of mobility and transportation in 2023. The MMI was founded as a cross-disciplinary initiative at MIT in 2020 in response to the rapid transformation of the transportation sector. New technologies, such as electrification, autonomous/connected/software-defined vehicles, and shared mobility services, are creating new opportunities and challenges for transportation systems across the world. The MMI is working to better understand these technologies and ensure that these new technologies are used to create safer, cleaner, and more inclusive transportation systems.

After a brief overview of the MMI, this talk will cover some of the challenges facing our modern transportation systems, covering topics such as climate change, congestion, safety, reliability, and inequality. This will be looked at from the perspective of different types of systems – the private automobile, public transit, micromobility, and on-demand ride hail.

Examples from academia and industry highlighting the unique challenges will be presented. Promising new trends and technologies in mobility that can be used to address and overcome some of the aforementioned challenges will be covered next. And finally, the research at MMI and, more broadly, at MIT tackling these issues by working in partnership with industry will be highlighted. The audience will leave this talk with a greater appreciation for the critical role that mobility plays in society, its unique challenges, and the promising research taking place at MIT that can help accelerate a safe, clean, and inclusive mobility system.
Demand-Responsive Microtransit: Design and Operations
Alexandre Jacquillat
Associate Professor of Operations Research and Statistics, MIT Sloan School of Management

Alexandre Jacquillat is an Associate Professor of Operations Research and Statistics at the MIT Sloan School of Management. His research focuses on data-driven decision-making, spanning integer optimization, stochastic optimization, and machine learning. His primary focus is on the optimization of complex transportation and logistics systems to promote efficient, reliable and sustainable mobility of people and goods. Alexandre is the recipient of several awards, including the INFORMS Dantzig Dissertation Award, the Best Paper Prize from INFORMS Transportation Science and Logistics (twice), the Pierskalla Best Paper Award from INFORMS Health Applications, and the Best Paper Award from INFORMS Data Mining and Decision Analytics. Prior to joining MIT, Alexandre was an Assistant Professor at Carnegie Mellon University. He received a Master of Science in Applied Mathematics from the Ecole Polytechnique and PhD in Engineering Systems from MIT.

Microtransit offers opportunities to enhance urban mobility by combining the reliability of public transit and the flexibility of ride-sharing. This paper optimizes the design and operations of a demand-responsive micro-transit system and performs on-demand deviations in response to passenger demand. We formulate a Microtransit Network Design (MiND) model via two-stage stochastic optimization. The model features a tight second-stage formulation thanks to a subpath-based representation of microtransit operations in a load-expanded network, which optimizes on-demand deviations between checkpoint stops. We develop a double-decomposition algorithm combining Benders decomposition and subpath-based column generation armed with a tailored label-setting algorithm. Using real-world data from Manhattan, results suggest that our method scales to large practical instances, with up to 100 candidate lines and hundreds of stops. Comparisons with transit and ride-sharing benchmarks suggest that microtransit provides win-win outcomes toward efficient mobility (high demand coverage, low operating costs, high level of service), equitable mobility (broad geographic reach), and sustainable mobility (limited environmental footprint).
Human Centered Automobility: Learning and Evolving as a Continual Process

Bryan Reimer
Research Scientist
MIT Center for Transportation and Logistics

Highly automated vehicle technology has been touted as a revolutionary fix to many of our transportation problems. However, this view ignores that, for the foreseeable future, drivers will remain effectively responsible for control while being assisted by automation, placing them in the role of collaborators with AI.

The MIT Advanced Vehicle Technology (AVT) consortium was formed in 2015 to develop a better understanding of the challenges that today’s drivers experience, as well as to identify related opportunities to promote better system design and user experiences that enhance safety, convenience, and comfort in a rapidly evolving mobility landscape. Today, AVT draws together 25 organizations to collectively accelerate insight into system performance and how drivers adapt to, use (or do not use), and behave with advanced vehicle features.

This talk will provide highlights from recent MIT AVT consortium research and offer some projections concerning the future of automated and electrified mobility.

Day Two | Post-Conference Campus Tours

Join the ILP for a unique opportunity to explore the MIT. Sign-up sheet will be available at the registration desk.

1:00 PM - 2:00 PM
MIT Campus Walking Tour (15 people max)
Take a guided tour of our dynamic campus and experience firsthand how MIT is making a better world. From cutting edge research to innovation, from world-renowned architecture to rich community life, the MIT campus is a treasure to explore. MIT is also the heart of the vibrant innovation district of Kendall Square, the most innovative square mile in the world – come see how academics, entrepreneurs, corporations and non-profits make it all happen.

1:00 PM - 2:00 PM
MIT.nano includes the Immersion Lab (15 people max)
Set in the heart of campus, MIT.nano is the Institute’s 200,000 sf center for nanoscience and nano engineering research. Take a behind the scenes tour of key research spaces, hear about the progress MIT.nano has made since its launch in 2018, and learn how this remarkable building is helping researchers from every corner of MIT explore the dawn of the Nano Age.

1:00 PM - 2:00 PM
MIT Museum (15 people max)
Participants will be introduced to provocative exhibitions on CRISPR and AI, the magical kinetic sculptures of Arthur Ganson and Andy Cavatora, and countless unexpected treasures from the museum collection of more than a million artifacts.