2024 MIT Tokyo Life Science Symposium

July 16, 2024 2:00 pm - 7:30 pm

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2:00 PM	Registration
2:30 PM	Welcome & Introduction Steven Palmer Director, MIT Corporate Relations

Steven Palmer
Director
MIT Corporate Relations

Steve 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.

2:35 PM

Artificial Intelligence for the Design and Synthesis of Small Molecule Therapeutic Candidates
Connor W. Coley

Class of 1957 Career Development Professor and Assistant Professor,
MIT Chemical Engineering and MIT Electrical Engineering and Computer Science
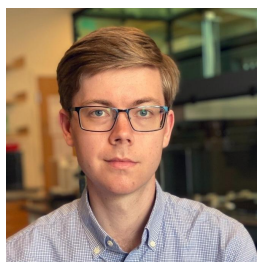
Connor W. Coley

Class of 1957 Career Development Professor and Assistant Professor,
MIT Chemical Engineering and MIT Electrical Engineering and Computer Science

Connor W. Coley is the Class of 1957 Career Development Professor and an Assistant Professor at MIT in the Department of Chemical Engineering and the Department of Electrical Engineering and Computer Science. He received his B.S. and Ph.D. in Chemical Engineering from Caltech and MIT, respectively, and did his postdoctoral training at the Broad Institute. His research group at MIT works at the interface of chemistry and data science to develop models that understand how molecules behave, interact, and react and use that knowledge to engineer new ones, with an emphasis on therapeutic discovery. Connor is a recipient of C&EN's "Talented Twelve" award, Forbes Magazine's "30 Under 30" for Healthcare, Technology Review's 35 Innovators Under 35, the NSF CAREER award, the ACS COMP OpenEye Outstanding Junior Faculty Award, the Bayer Early Excellence in Science Award, the 3M NTFA, and was named a Schmidt AI2050 Early Career Fellow and a 2023 Samsung AI Researcher of the Year.

Artificial intelligence and machine learning have become important components of the computational toolbox that can be used to advance chemical research and discovery. In this talk, I will discuss our group's work advancing AI/ML as it applies to the broad subfields of medicinal chemistry and synthetic organic chemistry. I will describe several approaches to facilitate decision-making when planning iterative design-make-test-analyze cycles, including the use of formal optimization techniques for selecting molecules from virtual libraries or proposed by generative AI and the use of computer-aided synthesis planning algorithms to define synthetically-accessible chemical spaces. A pervasive theme of our research is the formulation of problems in molecular design and synthesis in a manner amenable to computational approaches.

3:20 PM

Advanced Bio-Fermentation Reactors

Ines Herrero
Biomixing

BioMixing has developed new agitation systems for bio-fermentation reactors that uses fluid dynamics concepts to reduce damage to cells and optimizes mixing in the vessel. The new agitation systems reduce processing times by more than 50% (depending on the culture) and increases production capacity by a similar amount. The components can be used in new systems, as well as to retrofit other brands of bioreactors.

3:30 PM

DNA Nanotechnology and Synthetic Biology for Gene Delivery

Floris Engelhardt
Kano Therapeutics

Developer of a biotechnological production platform intended to expand the reach of genome-editing-based therapies through the development of transformational biomaterials. The company uses DNA nanotechnology and synthetic biology to design and engineer novel gene vectors that carry genetic information, providing pharmaceutical and synthetic biology companies with gene delivery and vaccine construct knowledge.

3:40 PM   AI-Enhanced Imaging and Language Tools for Drug Discovery

Kevin Christopher
Quantiscope

Developer of artificial intelligence imaging and language tools intended to identify potential drugs. The company's platform uses machine learning to analyze and predict at the pixel level whether potential therapeutics are safe and effective, enabling scientists to have validation for bio-manufacturing processes and have a new mode of drug discovery.

3:50 PM   New Delivery Modalities for RNA Therapeutics

Jasdave Chahal

4:00 PM   Networking Break

4:20 PM   A Digital Twin for Continuous mRNA Manufacturing
Richard Braatz
Edwin R. Gilliland Professor, MIT Department of Chemical Engineering

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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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This presentation describes a digital twin that is being developed for end-to-end continuous manufacturing of mRNA biotherapeutics. Mechanistic models are being constructed for all unit operations. These dynamic models are integrated with models for constraints, uncertainties, and disturbances to form a digital twin for automated, integrated continuous manufacturing. The digital twin is suitable for (1) 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, and (5) the real-time operation alongside plant operations. Experimentally validated results are presented for multiple unit operations.

5:05 PM   Panel Discussion
Miki Kato
Program Director, MIT Industrial Liaison Program

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Program Director
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Miki Kato joined the MIT Industrial Liaison Program as a Program Director in October 2021. Mr. Kato has over 20 years of experience in new business development, including various activities with MIT.

Prior to joining the ILP, Kato worked at FUJIFILM Corporation for 40 years in various new business development sectors. He was President of FUJIFILM Pharmaceuticals U.S.A., Inc., conducting the clinical trials of FUJIFILM pipeline drugs and leading the joint research project in drug delivery with MIT's Koch Institute. During his tenure, he also collaborated with the Department of Electrical Engineering at MIT for digital camera's CMOS image sensors and the Department of Materials Sciences and Engineering for high-speed photodetectors.

Kato has presented at several conferences at the Cambridge Innovation Center, including the 2018 Japan Innovation Forum with the Consulate General of Japan and the 60th-anniversary Kyoto-Boston sister city celebration Life Science Forum (2019) with the City of Boston, the Japan Society of Boston, and the Consulate General of Japan.

He holds an M.E. in Polymer Chemistry from Kyoto University and an M.S. in Management of Technology from MIT.

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Hideyuki Mototani, PhD, CA-AM, PMP

Yoh Terada, Ph.D.

5:25 PM	Connecting with the MIT Innovation Ecosystem Miki Kato Program Director, MIT Industrial Liaison Program

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6:00 PM	Closing Remarks and Networking Reception
7:00 PM	Adjournment