# MIT Industrial Liaison Program Faculty Knowledgebase Report

## 2024 MIT Tokyo Life Science Symposium

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

**ALL DATES/ TIMES LISTED BELOW ARE JAPAN STANDARD TIME (GMT +9)**
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2:00 PM — Registration

2:30 PM — Welcome & Introduction
Steven Palmer
Senior Director, MIT Corporate Relations

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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.

Shunichi Takahashi, PhD

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

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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

Startup Lightning Talks

Ines Herrero
Biomixing

Floris Engelhardt
Kano Therapeutics

Kevin Christopher
Quantiscope

Karl Ruping
Tiba Biotech

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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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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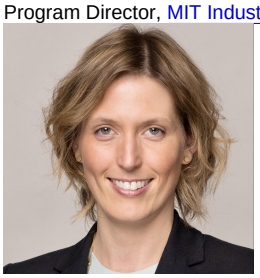
This presentation describes a digital twin that is being developed for end-to-end continuous manufacturing of mRNA biotherapeutics. Mechanistic models are being constructed for all unit operations. These dynamic models are integrated with models for constraints, uncertainties, and disturbances to form 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: Connecting with the MIT Innovation Ecosystem
Rebekah Miller
Program Director, MIT Industrial Liaison Program



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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View full bio
Miki Kato
Program Director, MIT Industrial Liaison Program

Miki Kato

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