MIT Industrial Liaison Program Faculty Knowledgebase Report

2016 MIT Japan Conference

January 22, 2016 8:40 am - 5:55 pm

8:40am	Registration
9:20am	Opening Remarks Karl Koster Executive Director, MIT Corporate Relations Director, Alliance Management MIT Office of Strategic Alliances & Technology Transfer

Karl Koster
Executive Director, MIT Corporate Relations
Director, Alliance Management
MIT Office of Strategic Alliances & Technology Transfer

Karl Koster is the Executive Director of MIT Corporate Relations. MIT Corporate Relations includes the MIT Industrial Liaison Program and MIT Startup Exchange.

In that capacity, Koster and his staff work with the leadership of MIT and senior corporate executives to design and implement strategies for fostering corporate partnerships with the Institute. Koster and his team have also worked to identify and design a number of major international programs for MIT, which have been characterized by the establishment of strong, programmatic linkages among universities, industry, and governments. Most recently these efforts have been extended to engage the surrounding innovation ecosystem, including its vibrant startup and small company community, into MIT's global corporate and university networks.

Koster is also the Director of Alliance Management in the Office of Strategic Alliances and Technology Transfer (OSATT). OSATT was launched in Fall 2019 as part of a plan to reinvent MIT's research administration infrastructure. OSATT develops agreements that facilitate MIT projects, programs and consortia with industrial, nonprofit, and international sponsors, partners and collaborators.

He is past chairman of the University-Industry Demonstration Partnership (UIDP), an organization that seeks to enhance the value of collaborative partnerships between universities and corporations.

He graduated from Brown University with a BA in geology and economics, and received an MS from MIT Sloan School of Management. Prior to returning to MIT, Koster worked as a management consultant in Europe, Latin America, and the United States on projects for private and public sector organizations.

9:30am

The Problem of Intelligence: Today's Science, Tomorrows Engineering

The birth of artificial-intelligence research as an autonomous discipline is generally thought to have been the month long Dartmouth Summer Research Project on Artificial Intelligence in 1956, which convened 10 leading electrical engineers — including MIT's Marvin Minsky and Claude Shannon — to discuss "how to make machines use language" and "form abstractions and concepts." A decade later, impressed by rapid advances in the design of digital computers, Minsky was emboldened to declare that "within a generation ... the problem of creating 'artificial intelligence' will substantially be solved."

The problem, of course, turned out to be much more difficult than AI's pioneers had imagined. In recent years, by exploiting machine learning — in which computers learn to perform tasks from sets of training examples — artificial-intelligence researchers have built special-purpose systems that can do things like interpret spoken language or play Atari games or drive cars using vision with great success.

But according to Tomaso Poggio, the Eugene McDermott Professor of Brain Sciences and Human Behavior at MIT, "These recent achievements have, ironically, underscored the limitations of computer science and artificial intelligence. We do not yet understand how the brain gives rise to intelligence, nor do we know how to build machines that are as broadly intelligent as we are."

Poggio thinks that AI research needs to revive its early ambitions. "It's time to try again," he says. "We know much more than we did before about biological brains and how they produce intelligent behavior. We're now at the point where we can start applying that understanding from neuroscience, cognitive science and computer science to the design of intelligent machines."

Tomaso Poggio

Eugene McDermott Professor in the Brain Sciences and Human Behavior
Director, Center for Brains, Minds and Machines(CBMM)
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Tomaso A. Poggio, is the Eugene McDermott Professor in the Dept. of Brain & Cognitive Sciences at MIT and the director of the new NSF Center for Brains, Minds and Machines at MIT of which MIT and Harvard are the main member Institutions. He is a member of both the Computer Science and Artificial Intelligence Laboratory and of the McGovern Brain Institute. He is an honorary member of the Neuroscience Research Program, a member of the American Academy of Arts and Sciences, a Founding Fellow of AAAI and a founding member of the McGovern Institute for Brain Research. Among other honors he received the Laurea Honoris Causa from the University of Pavia for the Volta Bicentennial, the 2003 Gabor Award, the Okawa Prize 2009, the AAAS Fellowship and the 2014 Swartz Prize for Theoretical and Computational Neuroscience. He is one of the most cited computational scientists with contributions ranging from the biophysical and behavioral studies of the visual system to the computational analyses of vision and learning in humans and machines. With W. Reichardt he characterized quantitatively the visuo-motor control system in the fly. With D. Marr, he introduced the seminal idea of levels of analysis in computational neuroscience. He introduced regularization as a mathematical framework to approach the ill-posed problems of vision and the key problem of learning from data. In the last decade he has developed an influential hierarchical model of visual recognition in the visual cortex. The citation for the recent 2009 Okawa prize mentions his "…outstanding contributions to the establishment of computational neuroscience, and pioneering researches ranging from the biophysical and behavioral studies of the visual system to the computational analysis of vision and learning in humans and machines." His research has always been interdisciplinary, between brains and computers. It is now focused on the mathematics of learning theory, the applications of learning techniques to computer vision and especially on computational neuroscience of the visual cortex. A former Corporate Fellow of Thinking Machines Corporation and a former director of PHZ Capital Partners, Inc., is a director of Mobileye and was involved in starting, or investing in, several other high tech companies including Arris Pharmaceutical, nFX, Imagen, Digital Persona and Deep Mind.

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10:20am

Teaching Old Waves New Tricks: The Quest For Acoustic Meta-Materials

For centuries we enjoyed light and sound as tools to manipulate, store and control the flow of information and energy. However, our need to transmit information and energy through these wave channels suffered a physical limit dictated by diffraction. For example, Young's double slit experiments suggest that for an observer at a distance away from the two slits, one cannot distinguish these slits from one when the gap of these slits are close to wavelength of light. Can we overcome the diffraction limit by bending and folding waves, in a similar fashion to paper origami?

In this seminar, I will present our efforts to fabricate 3D complex microstructures at unprecedented dimensions. In the arena of sound waves, these structures show promise on focusing and rerouting ultrasound through broadband and highly transparent metamaterials. Recently our research effort on acoustic metamaterials has been expanded to tailoring the wavefront and energy flow of elastic waves. In the optical domain, we report our development of optical imaging probes to measure the distinct local modes in the nanostructures that promote electron-photon interaction down to layers of a few atoms thick, which promise for efficient light emission and detection. These novel metamaterials could be the foundation of broadband photo-absorbers, directional emitters, as well as compact and power-efficient devices.

Nicholas Fang

Professor of Mechanical Engineering
MIT Department of Mechanical Engineering

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Nicholas X. Fang received his BS and MS in physics from Nanjing University, and his PhD in mechanical engineering from University of California Los Angeles. He is currently professor of Mechanical Engineering at MIT. Prior to MIT, he worked as an assistant professor at the University of Illinois Urbana-Champaign from 2004 to 2010. Professor Fang's areas of research look at nanophotonics and nanofabrication. His recognitions include the ASME Chao and Trigger Young Manufacturing Engineer Award (2013); the ICO prize from the International Commission of Optics (2011); an invited participant of the Frontiers of Engineering Conference by National Academies in 2010; the NSF CAREER Award (2009) and MIT *Technology Review Magazine's* 35 Young Innovators Award (2008).

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11:10am

What Do Your Customers (Dis)Like?: Let Their Data Decide

We live in the era where almost everything we do is recorded somewhere. Naturally such massive amounts of social data contains wealth of information about us. This presents us with a huge opportunity to utilize it for operating businesses efficiently, making meaningful policies and better social living. In this talk, I will discuss how we can utilize social data for predicting preferences of a business's customers accurately. We will discuss such a desirable, scalable data processing system for predicting customer preferences that we have built and deployed. We will describe success stories of this technology in the retail industry.

Devavrat Shah
Andrew (1956) and Erna Viterbi Professor, MIT Department of Electrical Engineering and Computer Science

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Devavrat Shah is Andrew (1956) and Erna Viterbi Professor of AI and Decisions at MIT where he is currently the faculty director of Deshpande Center for Technology Innovation as well as founding director of Statistics and Data Science Center. His research focuses on algorithms for Statistics and Machine Learning. He is a Kavli Fellow of National Academy of Sciences, distinguished alumni of his alma mater IIT Bombay. Previously he co-founded retail analytics start-up Celect which is now part of Nike since 2019. Currently, he is focused on making AI functionalities accessible. Towards that, he co-founded Ikigai Labs in 2019 with the mission of enabling the use of AI with the ease of spreadsheets.

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12:05pm

Lunch

1:15pm

Advanced Manufacturing Innovation: Tested concepts and emerging models

Manufacturing and production of invented products have been demonstrated as key to a sustained innovation ecosystem. Here, we will discuss recent analysis of local, regional, and national activities that support manufacturing innovation and workforce development. This includes U.S. efforts including the National Network for Manufacturing Innovation and Advanced Technological Education programs that can reduce the barrier to commercialization of new and important technologies, as well as contrasting efforts in other regions of the world.

Yuriy Román
Professor of Chemical Engineering, MIT

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?Professor Yuriy Román ?is from Mexico City, Mexico. He earned his B.S.E. in Chemical Engineering from the University of Pennsylvania in 2002. After working in industry for a year, Prof. Román moved to Madison, WI to pursue graduate studies. He received his Ph.D. in Chemical and Biological Engineering from the University of Wisconsin-Madison in 2008, working under the supervision of Professor James A. Dumesic. His thesis work involved the catalytic conversion of carbohydrates obtained from lignocellulosic biomass into chemical intermediates used for the production of biofuels and biomaterials. He then moved to the California Institute of Technology to do postdoctoral research in the synthesis and characterization of microporous and mesoporous materials in the group of Professor Mark E. Davis. There, he investigated the synthesis and implementation of microporous Lewis and Brønsted solid acids for the isomerization of carbohydrates and production of acetic acid from methanol.

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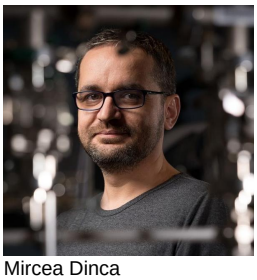
2:55pm Coffee Break

3:15pm Porous Materials for Energy, Catalysis, and the Environment

Traditional applications of metal-organic frameworks (MOFs) are focused on gas storage and separation, which take advantage of the inherent porosity and high surface area of these materials. The MOFs' use in technologies that require charge transport have lagged behind, however, because MOFs are poor conductors of electricity. We show that design principles honed from decades of previous research in molecular conductors can be employed to produce MOFs with remarkable charge mobility and conductivity values that rival or surpass those of common organic semiconductors and even graphite. We further show that these, ordered, and crystalline conductors can be used for a variety of applications in energy storage, electrocatalysis, electrochromics, and selective chemiresistive sensing. Another virtually untapped area of MOF chemistry is related to their potential to mediate redox reactivity and heterogeneous catalysis through their metal nodes. We show that MOFs can be thought of as unique macromolecular ligands that give rise to unusual molecular clusters where small molecules can react in a matrix-like environment, akin to the metal binding pockets of metalloproteins. By employing a mild, highly modular synthetic method and a suite of spectroscopic techniques, we show that redox reactivity at MOF nodes can lead to the isolation and characterization of highly unstable intermediates relevant to biological and industrial catalysis, and to industrially relevant catalytic transformations that are currently performed only by homogeneous catalysts.

Mircea Dinca

W. M. Keck Professor of Energy
MIT Department of Chemistry



Mircea Dinca

W. M. Keck Professor of Energy
MIT Department of Chemistry

Born in Romania in 1980, Mircea Dinca obtained his Bachelor of Arts in Chemistry from Princeton University in 2003. He did his graduate work at UC Berkeley, receiving a Ph.D. in Inorganic Chemistry in 2008. At Berkeley, he worked on the synthesis and characterization of microporous metal-organic frameworks for hydrogen storage and catalysis under the supervision of Prof. Jeffrey R. Long. After a two-year stint as a postdoctoral associate working on heterogeneous electrocatalytic water splitting with Prof. Daniel G. Nocera at MIT, he became an Assistant Professor in the Department of Chemistry at MIT in July 2010. For his group's research on microporous materials with applications in energy storage (e.g., new electrode materials and ion conductors), energy conversion (e.g., electrocatalysis and adsorption heat pumps), and heterogeneous catalysis, Prof. Dinca was awarded the US Department of Energy Young Investigator Award in 2011, the 3M Non-Tenured Faculty Grant in 2013, the Sloan Fellowship and Cottrell Award in 2014, and the NSF CAREER Award, the ACS ExxonMobil Solid State Chemistry Fellowship, and Dream Chemistry Award (Polish Academy of Science) in 2015.

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4:05pm

Materials in Energy and Extreme Environments: Watching Nanoscale in Action

In this talk I will focus on applying in situ transmission electron microscopy (TEM) and lab-on-a-chip to mechanistic investigations of energy materials. Recent advances in nano-manipulation, environmental TEM and MEMS have allowed us to investigate coupled mechanical and electrochemical phenomena with unprecedented spatial and temporal resolutions. For example, we can now quantitatively characterize liquid-solid and gas-solid interfaces at nanometer resolution for in situ corrosion, fatigue and hydrogen embrittlement processes. These experiments greatly complement our modeling efforts, and together they help provide insights into how materials degrade in service due to combined electrochemical-mechanical forces.

Ju Li

Battelle Energy Alliance Professor, MIT Department of Nuclear Science & Engineering
Professor, MIT Department of Materials Science and Engineering

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Battelle Energy Alliance Professor, MIT Department of Nuclear Science & Engineering
Professor, MIT Department of Materials Science and Engineering

Ju Li is the Tokyo Electric Power Company Professor in Nuclear Engineering and a Professor at the MIT Department of Materials Science and Engineering. Prof. Li's group investigates the mechanical, electrochemical, and transport behaviors of materials, as well as novel means of energy storage and conversion. His research has led to advances in materials with applications in nuclear energy, batteries, and electrolyzers—and near- and long-term implications for decarbonizing the planet. His group also works on various aspects of computing, from the development of the first universal neural network interatomic potential to energy-efficient neuromorphic computing hardware.

Li is a recipient of the 2005 Presidential Early Career Award for Scientists and Engineers, the 2006 Materials Research Society Outstanding Young Investigator Award, and the TR35 award from Technological Review. He was elected Fellow of the American Physical Society in 2014 and a Fellow of the Materials Research Society in 2017. Li is the chief organizer of the yearly MIT A+B Applied Energy Symposia that aims to develop practical solutions to global climate change with "A-Action before 2040" and "B-Beyond 2040" technologies.

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4:55pm

Ripe for Disruption: the Next Agricultural Revolution

Resource scarcity, flattening yields, changing climate, and booming urban populations impose increasing limits on current food systems. The MIT Media Lab Open Agriculture Initiative is committed to driving a paradigm shift to computationally-based food systems that address environmental, economic, and social challenges. The next agricultural revolution now taking root harnesses the power of distributed food-computing across a global network of innovators and producers to foster an agile, open, and responsive food future.

Caleb Harper

Principal Investigator and Director, OpenAg, MIT Media Lab

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Caleb Harper is the principal investigator and director of the Open Agriculture Initiative (OpenAg) at the MIT Media Lab, where he leads a group of engineers, architects, urban planners, economists, and plant scientists in the exploration and development of high performance urban agricultural systems. Under his guidance, this diverse group (which he calls an “anti-disciplinary group”) is developing an open-source agricultural hardware, software, and data common aiming to create a more agile, transparent, and collaborative food system.

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5:45pm

Closing Remarks
Gregory Ornatowski
Senior Director, MIT Corporate Relations
Director, MIT-ILP, Japan
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Senior Director, MIT Corporate Relations
Director, MIT-ILP, Japan

Dr. Ornatowski is currently a Senior Director in the Office of Corporate Relations (OCR) at MIT and the Director, MIT-ILP, Japan. He works with various companies in the automotive, electronics and materials industries. Prior to joining MIT, he worked as a consultant in the Boston area with Standard and Poor's DRI and Harbor Research.

Previously he spent nine years with General Electric, where he held various management positions in business development, strategic planning and marketing in the U.S. and Asia and worked with several of GE's technology-focused businesses. Dr. Ornatowski began his professional career as a management consultant working with the Tokyo office of the Boston Consulting Group.

In addition to his corporate experience, Dr. Ornatowski has taught at the MIT Sloan School of Management, Boston University, and Trinity College. He has also published articles in the Sloan Management Review, Far Eastern Economic Review, The Journal of the American Chamber of Commerce in Japan, and the Journal of Socio-Economics. He is fluent in Japanese, having lived and worked in Japan a total of 12 years, and has worked extensively with Asian and European companies as well.

5:55pm

Reception and Networking