MIT Industrial Liaison Program Faculty Knowledgebase Report

Built Infrastructure @MIT

March 30, 2021 10:00 am - 12:30 pm

10:00 AM

Welcome and Introduction
David Martin
Program Director, MIT Industrial Liaison Program

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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.

10:05 AM

Overview of MIT Department of Urban Studies and Planning
Christopher Zegras

Professor of Mobility and Urban Planning,
Department Head, Department of Urban Studies and Planning (DUSP)

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Zegras is Professor of Mobility and Urban Planning and the current Department Head of DUSP. He has taught planning methods and techniques, integrated land use-transportation planning, quantitative methods, and transportation finance. He has also co-taught urban planning and design studios in Beijing, Boston, Cartagena (Colombia), Guadalajara (Mexico), Mexico City, and Santiago de Chile. He serves on the Executive Board of the BRT+ Centre of Excellence and the International Scientific Committee for the Center for Sustainable Urban Development (Centro de Desarrollo Urbano Sustentable, CEDEUS). At MIT he serves on the Climate Nucleus. From 2015-2020 he was the Lead Principal Investigator for the Future Urban Mobility interdisciplinary research group, sponsored by the Singapore MIT Alliance for Research and Technology. From 2007 to 2016 he was Transportation Systems Focus Area Lead for the MIT Portugal Program.

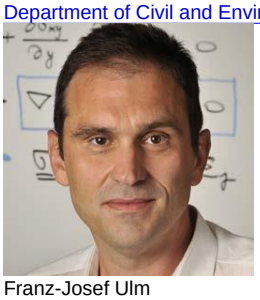
His research spans inter-related areas critical to tackling metropolitan mobility challenges: human behavior, digital transformation, and strategic planning techniques and technologies. He has consulted widely for a diverse range of governments, inter-governmental organizations, and nongovernmental organizations. Prior to becoming a Professor, he worked for the International Institute for Energy Conservation in Washington, DC and Santiago de Chile and for MIT's Laboratory for Energy and the Environment. Zegras holds a BA in Economics and Spanish from Tufts University, a Master in City Planning and a Master of Science in Transportation from MIT and a PhD in Urban and Regional Planning, also from MIT.

View full bio

10:20 AM

Resilience is the New Sustainability

Franz-Josef Ulm
Faculty Director, Concrete Sustainability Hub
Professor, Construction Management, Civil and Environmental Engineering, MIT Department of Civil and Environmental Engineering



Franz-Josef Ulm
Faculty Director, Concrete Sustainability Hub
Professor, Construction Management, Civil and Environmental Engineering
MIT Department of Civil and Environmental Engineering

Franz-Josef Ulm is Professor of Civil & Environmental Engineering at MIT. A structural engineer by training he joined MIT in 1999, where he is responsible for Materials and Structures. He is an elected member of the US National Academy of Engineering, of the European Academy of Sciences and Arts and of the Austrian Academy of Sciences. He is Editor-In-Chief of the Journal of Engineering Mechanics of the American Society of Civil Engineers.

View full bio

Resilience is the time it takes to bring a system after an extreme event to the same or higher performance. This requires that architects, engineers and builders, go beyond our comfort zone of classical design tools. Physics-based Molecular-Dynamics inspired engineering tools permit just this: implementing, into our design practice, the critical link between damage inventory of structural and non-structural elements to extreme events: storms, fire, flooding… This damage inventory serves as input for Life-Cycle Cost Analysis that permit evaluating the return of investment of structural resilience enhancement such as shear walls, sprinkler systems and so on, at building, community and city scale. Through a number of applications, we show that this new approach of quantitative physics-based engineering resilience, resilience of buildings and infrastructure is a key lever for the sustainable development of our societies.

10:35 AM

The Senseable City: Bits, Bricks and People
Umberto Fugiglando
Research Manager & Partnerships Lead, MIT Senseable City Lab

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Umberto Fugiglando is a Research Manager at the Senseable City Lab at the Massachusetts Institute of Technology (MIT), a multidisciplinary research group that studies the interface between cities, people, and technologies. He has been leading and managing multi-stakeholder research projects on data science applied to urban technology initiatives, and he is in charge of developing and maintaining partnerships between cities, companies, and foundations that support the group's research agenda. Additionally, Umberto is co-founder of ReFuse, a social enterprise that aims at improving the well-being of communities exposed to waste hazards. Umberto's background is in Applied Mathematics and Engineering, and he has studied in Italy, Sweden, Canada, and the US.

The real-time city is now real! The increasing deployment of sensors and hand-held electronics in recent years is opening a new approach to the study of the built environment. Digital technologies are radically changing the way we understand, design, and ultimately live cities. This is having an impact at different scales – from the single building to the scale of the metropolis. Umberto will address these issues from a critical point of view through some of the latest projects by the Senseable City Lab, a multi-disciplinary research group at MIT that is developing research in many cities across the globe.

10:50 AM

MIT Startup Exchange Lightning Talk

OpenSpace: Your jobsite, fully captured. Just tap record and go.

Jeevan Kalanithi
CEO
OpenSpace

MIT Startup Exchange Lightning Talk

Hosta Labs: Automated digital structural assessment

Henriette Fleischmann
Co-Founder and COO
Hosta Labs

MIT Startup Exchange Lightning Talk

Envelope City: Visualize the rules that shape your city

Cindy McLaughlin
CEO
Envelope City

MIT Startup Exchange Lightning Talk

AirWorks: Automatically turning aerial data into maps and engineering plans

David Morczinek
CEO
AirWorks

11:10 AM

An Overview of the Digital Structure Research Group

Caitlin Mueller
Associate Professor, Structural Design
Director, Digital Structures Research Group
Joint appointment with Civil and Environmental Engineering Department
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Caitlin Mueller is a researcher, designer, and educator working at the interface of architecture and structural engineering. She is currently an Associate Professor in the Building Technology Program, where she leads the Digital Structures research group and co-directs the Structural Design Lab.

As a researcher, Mueller focuses on developing new computational methods and tools for synthesizing architectural and structural intentions in early-stage design. She also works in the field of digital fabrication, with a focus on linking high structural performance with new methods of architectural making. In addition to her digital work, she conducts research on the nature of collaboration between architects and engineers from a historical perspective. Mueller also aims for interdisciplinary learning and integration in her teaching efforts, which include subjects in structural design and computational methods.

View full bio

Professor Caitlin Mueller leads the Digital Structures group. The Digital Structures research group works at the interface of architecture, structural engineering, and computation. They focus on the synthetic integration of creative and technical goals in the design and fabrication of buildings, bridges, and other large-scale structures, using emerging technologies such as artificial intelligence, machine learning, and digital fabrication. With an emphasis on building performance and the reduction of operational and embodied carbon emissions in the built environment, this research offers new opportunities for a sustainable future empowered by new architectural geometries, structural materials, and construction methods.

11:25 AM

Old Stones
Brandon Clifford
Associate Professor & MArch Director, MIT
Director, Matter Design

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Associate Professor & MArch Director, MIT
Director
Matter Design

Brandon Clifford is a time-traveler who develops creative approaches to the world's most pressing problems. He identifies contemporary blind-spots by mining ancient knowledge that holds resonance with topics of today. Brandon is the director of Matter Design and associate professor at MIT. Brandon received his Master of Architecture from Princeton University and his Bachelor of Science in Architecture from Georgia Tech. As a designer and researcher, Clifford has received recognition with prizes such as the American Academy in Rome Prize, a TED Fellowship, the SOM Prize, and the Architectural League Prize for Young Architects & Designers. Clifford is dedicated to re-imagining the role of the architect. His speculative work continues to provoke new directions for the digital era.

As an architect and researcher, I address contemporary challenges by developing approaches that are distinctly different from standard modes of practice in the building industry. The contemporary division between how things are conceived and how they are made produces blind spots that neither design nor construction can respond to in isolation—from recycling building materials, to supply chain transportation, and the energy of assembly, critical topics are outside the conventional scope of the architect. But there are examples in the historical past when master builders produced enduring architectures by merging designing and making in order to address broad concerns such as the material supply chain, technology, resources, and energy. My research leverages abandoned but relevant knowledge from our past to transform our contemporary architectural practices into viable and smarter alternatives for our future.

11:40 AM

Infrastructure Sustainability Through Sensing and Material Innovation
Oral Buyukozturk
George Macomber Professor in Construction Management

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Professor Buyukozturk's research focuses on mechanics and design of structures and innovative materials. His work includes behavior and design of concrete structures, integrity assessment of reinforced/prestressed nuclear containment systems, durability of materials, earthquake engineering, interface fracture mechanics, fiber-reinforced polymer (FRP) composites in structural rehabilitation, and structural assessment and nondestructive testing (NDT). His recent research focus also includes multi-scale analysis of multi-layer material systems using molecular dynamics (MD).

View full bio

In this talk I will present some recent developments in my laboratory, Lab for Infrastructure Science and Sustainability (LISS) in the field of infrastructure sustainability. I will cover the topics of sensing and monitoring as well as innovations in sustainable concrete material development for resilient and sustainable infrastructure design and rehabilitation of existing ageing systems. Novel sensing technologies including vision-based sensing with motion magnification, and data driven dynamic characterization of structures with applications to bridges and tall buildings will be described. Concepts of building and neighborhood level assessments of fragility towards designing smart cities will be addressed. Finally, multiscale mechanics based cementitious material development and repurposing waste plastic into concrete manufacturing for global sustainability will be outlined. These developments, from multidisciplinary multi- team projects, representing cutting-edge research encompass elements of computation, material science, sensing technologies, data analytics and algorithmic developments.

12:15 PM Closing Remarks