Welcome and Introduction
David Martin
Program Director, MIT Corporate Relations

Mr. David Martin joined Corporate Relations on August 15, 2018 as Program Director for the ILP. Over time, Martin will take on more ILP members in the Middle East.

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.
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

Zegras is Professor of Transportation and Urban Planning in the Dept. of Urban Studies and Planning at MIT, where he teaches integrated land use-transportation planning, transportation finance, and field-based/client-based workshops. He has co-taught urban design and planning studios in Beijing, Boston, Cartagena (Colombia), Guadalajara (Mexico), Mexico City, and Santiago de Chile. He is the Lead Principal Investigator for the Future Urban Mobility research group, sponsored by the Singapore MIT Alliance for Research and Technology, and is MIT Lead of Transportation Systems under the MIT Portugal Program.

His research spans three inter-related areas critical to tackling metropolitan mobility challenges:
(1) Human Behavior: understanding the dynamic relationships between human behavior and the built, social, and natural environments;
(2) Digitalization: leveraging new technologies to deepen our understanding of relevant dynamics, offer new ways to interact with individuals, and enhance people’s engagement in mobility-related data collection and planning processes; and,
(3) Strategic Planning: devising new techniques for supporting mobility planning, aiming to understand how they can ultimately improve the design, finance, and implementation of innovative mobility policies and interventions.

He has consulted widely for a diverse range of organizations, including the International Energy Agency, the World Bank, the Inter-American Development Bank, the Canadian, German, US, and Peruvian Governments, and the World Business Council for Sustainable Development. He serves on the Boston BRT Study Group and the MIT Transportation and Parking Committee. 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.

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Resilience is the New Sustainability
Franz-Josef Ulm
Professor, Construction Management, Civil and Environmental Engineering
Faculty Director, Concrete Sustainability Hub

Dr. Ulm received his Ph.D. from Ecole Nationale des Ponts et Chaussees in 1994. Since then he has been a research engineer at Laboratoire Nationale des Ponts et Chaussees and head of the research group on Materials Modeling in the Concrete Division. He is leading efforts to bridge theoretical mechanics of porous media, numerical modeling and physical chemistry with applications to concrete and other structural and geological materials, and more recently biological materials as bone. He has published 40 papers in refereed journals of the highest quality and is well known worldwide, particularly in Europe and in the United States. His specialty may be described as "durability mechanics", an emerging branch of engineering mechanics. Recent research focus on the development of biochemomechanics of bone remodeling and fracture processes, with application to osteoporosis. He is chairman of the International Symposium on Creep, Shrinkage and Durability Mechanics of Concrete and other quasi-brittle materials, which takes place at MIT on August 20-22, 2001.

His research strength derives from an unusual combination consisting of a strong background in structural analysis, design and computational mechanics and his skill in relating mechanical behavior to physical, chemical and biological phenomena. His research represents, in an unique fashion, an evolutionary approach starting with the modeling of materials at the microscale, typing this behavior with the damage phenomenon at the macro scale, and extending the development to applications to large scale structures. The department feels fortunate to have a young individual with such a well-established track record and reputation join its faculty.


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

Umberto Fugiglando is a Research Manager at the Senseable City Lab at Massachusetts Institute of Technology (MIT), a multidisciplinary research group that studies the interface between cities, people, and technologies. He has been leading projects on data science applied to smart cities initiatives with a focus on human driving behavior and mobility patterns in cities. Moreover, he develops and maintains partnerships between cities, companies and foundations that support the group’s research agenda, contributing in the fields of smart and connected cities, urban mobility and innovative urban technology. Additionally, he has served as an External Expert for the European Commission, working with policy makers on the future of mobility. Umberto’s background is in Applied Mathematics and Engineering, and he has studied in Italy, Sweden, Canada and US.

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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.

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

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.

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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.
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.

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

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).

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.
MIT’s Mobility Initiative: Preparing for the next generation of transportation infrastructure

Jinhua Zhao
Associate Professor of City and Transportation Planning
Director, MIT JTL Mobility Lab

Jinhua Zhao is the Associate Professor of City and Transportation Planning at the Massachusetts Institute of Technology (MIT). Prof. Zhao brings behavioral science and transportation technology together to shape travel behavior, design mobility system, and reform urban policies. He develops methods to sense, predict, nudge, and regulate travel behavior and designs multimodal mobility systems that integrate automated and shared mobility with public transport. He sees transportation as a language to describe a person, characterize a city, and understand an institution and aims to establish the behavioral foundation for transportation systems and policies.

Prof. Zhao directs the JTL Urban Mobility Lab and Transit Lab at MIT and leads long-term research collaborations with major transportation authorities and operators worldwide, including London, Chicago, Hong Kong, and Singapore. He is the co-director of the Mobility Systems Center of the MIT Energy Initiative, and the director of the MIT Mobility Initiative. He very much enjoys working with students.

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Traditionally systems with massive amounts of fixed, long-life assets, the changes roiling transportation are also presenting new challenges—and opportunities—for transportation infrastructure. An unprecedented combination of new technologies (autonomy, electrification, computation, and AI) is meeting new and evolving priorities and objectives (decarbonization, public health, and social justice) and challenging traditional approaches to transportation assets themselves.

Professor Jinhua Zhao, Director of MIT’s Mobility Initiative and Associate Professor of Transportation and City Planning, will introduce MIT’s Mobility Initiative and how it is working to address the many changes, challenges, and, significantly, opportunities facing transportation infrastructure in today’s mobility landscape. In particular, he will focus on the Institute’s budding research efforts related to V2X and electric charging infrastructure optimization.

MIT Startup Exchange Lightning Talks

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- **Envelope City**: Visualize the rules that shape your city
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Jeevan Kalanithi
CEO
OpenSpace

Henriette Fleischmann
Co-Founder and COO
Hosta Labs

Cindy McLaughlin
CEO
Envelope City

David Morczinek
CEO
AirWorks