

# MIT Industrial Liaison Program Faculty Knowledgebase Report

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## Decarbonizing Buildings

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February 24, 2021 10:00 am - 12:00  
pm

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10:00am - 10:05am

Welcome Remarks  
CJ (Changjie) Guo  
Program Director, [MIT Corporate Relations](#)



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Program Director  
[MIT Corporate Relations](#)

Dr. CJ Guo joined the Office of Corporate Relations as a Senior Industrial Liaison Officer in July, 2015. CJ comes to OCR with 25 years of extensive global experience in technology innovations, portfolio management and business development in emerging and conventional energy sectors with leading multinational corporations in the US, China and Canada.

CJ is a leading expert in emerging energy technologies and energy system transitions. With Shell, he was the Emerging Technology Theme Leader in China/Beijing (2011 to 2015), worked extensively with the Chinese energy communities on the country's future energy landscape, and the Senior Technology Advisor in alternative transportation fuels in the US / Houston (2006-2010), and served during 2010 as Chairman of the Fuel Operations Group for the US DOE FreedomCar Partnership. Prior to joining Shell, CJ has held technology development, commercialization and management positions with Air Liquide (2002-2006) and The BOC Group (1995-2001) after working as a research scientist in oil-sands upgrading with CANMET in Canada (1992-1994).

CJ earned his Ph.D., Chemical Engineering, at CSU, Ohio, his M.S. and B.S., Chemical Engineering at TYUT, China. He has earned various awards from Shell, Air Liquide, BOC, Shanxi Province (China). He holds many patents and has sat on the board of Shenzhen Sanmu Battery Technology Company as an independent board member during 2009-2010.

10:05am - 10:10am

Introduction to MITEI and the Session

Robert Stoner

Deputy Director for Science and Technology, MIT Energy Initiative (MITEI)

Founding Director, MIT Tata Center



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Deputy Director for Science and Technology, MIT Energy Initiative (MITEI)

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[Robert J. Stoner](#) is an inventor and technology entrepreneur who has worked extensively in academia and industry throughout his career, having built and managed successful technology firms in the semiconductor, IT and optics industries. From 2007 through 2009 he lived and worked in Africa and India while serving in a variety of senior roles within the Clinton Foundation. Stoner also serves as Director of the [Tata Center for Technology and Design at MIT](#), and as the faculty co-director of the [MITEI Electric Power Systems Center](#). His current research relates to energy technology and policy for developing countries. He earned his Bachelor's degree in engineering physics from Queen's University, and his Ph.D. from Brown University in condensed matter physics.

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10:10am - 10:35am

Subject Framing, Building Retrofit Opportunities - Video starts at time stamp: 7:07

Christoph Reinhart

Professor, School of Architecture + Planning

Director, Building Technology Program

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Christoph Reinhart is a building scientist and architectural educator working in the field of sustainable building design and environmental modeling. At MIT he is leading the [Sustainable Design Lab](#) (SDL), an inter-disciplinary group with a grounding in architecture that develops design workflows, planning tools and metrics to evaluate the environmental performance of buildings and neighborhoods. He is also the head of [Solemma](#), a technology company and Harvard University spinoff as well as Strategic Development Advisor for [mapdwell](#), a solar mapping company and MIT spinoff. Products originating from SDL and Solemma are used in practice and education in over 90 countries.

Before joining MIT in 2012, Christoph led the sustainable design concentration area at Harvard's Graduate School of Design where the student forum voted him the *2009 Teacher of the Year* for the Department of Architecture. From 1997 to 2008 Christoph had worked as a staff scientist at the National Research Council of Canada and the Fraunhofer Institute for Solar Energy Systems in Germany. He has authored over 140 peer-reviewed scientific articles including [two textbooks](#) on daylighting and seven book chapters. His work has been supported by a variety of organizations from the US National Science Foundation and the Governments of Canada, Kuwait and Portugal to Autodesk, Exelon, Kalwall, Philips, United Technology Corporation and Sage Electrochromics.

Christoph's work has been recognized with various awards among them a *Fraunhofer Bessel Prize* by the Alexander von Humboldt Foundation (2018), the IBPSA-USA *Distinguished Achievement Award* (2016), a *Star of Building in Science* award by Buildings4Change magazine (2013) and seven best paper awards. Mapdwell has been recognized with FastCompany's *Design by Innovation* 2015 award for Data Visualization as well as a *Sustainia 100* award. Christoph is a physicist by training and holds a doctorate in architecture from the Technical University of Karlsruhe.

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10:35am - 10:55am

Reducing Embodied Energy with Novel Building Structure - Video starts at time stamp: 46.46

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.

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10:55am - 11:15am

Advanced Heat Pumps - Video starts at time stamp: 24.58

Leslie Norford

Professor of Building Technology, [MIT Department of Architecture](#)



Leslie Norford

Professor of Building Technology

[MIT Department of Architecture](#)

Leslie Norford is Professor of Building Technology in the Department of Architecture at MIT. His research focuses on reducing building energy use and associated resource consumption and carbon emissions and his teaching includes project-based efforts to improve schools in developing countries and promote the use of simulation-enhanced building design workflows. He has developed fault detection and optimal control strategies for HVAC equipment and explored design options for low-energy space-conditioning systems based on the use of desiccants and membranes for latent cooling. Working with mechanical and electrical engineering colleagues and students at MIT, he has studied how control of HVAC systems can help electric utilities mitigate the impact of power fluctuations associated with wind and PV systems through provision of such services as power reserves and frequency regulation. Active internationally, he has conducted measurement campaigns and numerical analyses of building energy consumption in Russia, China, Pakistan, the UK and Norway. Work in India focused on indoor and ambient air quality, with emphasis on mitigating the impact of cooking and land-clearing fires in agricultural areas that surround cities. Over a decade of leading a research group in Singapore, under the auspices of the Singapore-MIT Alliance for Research and Technology, and related work with colleagues in Abu Dhabi continues to yield measurements and models of urban microclimates, with a focus on identifying strategies to improve human thermal comfort in outdoor urban areas. With colleagues, current work focuses on computational design of building structures and energy systems to minimize life-cycle carbon emissions while ensuring heat resilience and indoor thermal comfort.

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11:15am - 11:35am

Future of Building Energy - Video starts at time stamp: 1.03.14

Yang Shao-Horn

Keck Professor of Energy, Mechanical Engineering, [MIT Department of Materials Science and Engineering](#)



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Keck Professor of Energy, Mechanical Engineering

[MIT Department of Materials Science and Engineering](#)

Yang Shao-Horn is a JR EAST Professor of Engineering and faculty member in the Department of Mechanical Engineering, Department of Materials Science and Engineering, and the Research Laboratory of Electronics at MIT. Her research is centered on physical/material chemistry to understand kinetics and dynamics in enabling energy storage and making chemicals and fuels.

Professor Shao-Horn is a scientist and Entrepreneur in electrochemical science and engineering, among the top most cited female chemists in the world, focusing on clean energy solutions. She has advised 100+ students and postdocs at MIT who are now pursuing successful careers in the industry, including Tesla, Amazon, and Apple, startups, and academia (~40) for the US, Europe, and Asia.

Professor Shao-Horn is a member of the National Academy of Engineering and a fellow of the American Association for the Advancement of Science, the Electrochemical Society, the National Academy of Inventors and the International Society of Electrochemistry. Her work has been recognized by the Faraday Medal of the Royal Society of Chemistry, the Dr. Karl Wamslser Innovation Award, and the Hans Fischer Senior Fellowship from the Technical University of Munich, and the Humbolt Prize in Chemistry from the Alexander von Humboldt Foundation. She has co-founded startups on batteries, and serves on the boards of public and private organizations including the Pioneer Center for Accelerating P2X Materials Discovery (CAPEX) (Denmark), Fritz Haber Institute of Max Plank Society (Germany) and Wallenberg Initiative Materials Science for Sustainability (Sweden).

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11:35am - 11:55am

Q&A Session - Video starts at time stamp: 1.20.22

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11:55am

Closing Remarks  
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