

# MIT Industrial Liaison Program Faculty Knowledgebase Report

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Sustainability @MIT

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March 9, 2021 11:00 am - 1:00 pm

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11:00am

Welcome and Introduction  
Corey Cheng  
Program Director, [MIT Industrial Liaison Program](#)



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[MIT Industrial Liaison Program](#)

Dr. Corey Cheng joined the Office of Corporate Relations (OCR) as an Senior Industrial Liaison Officer in December 2011. He has broad interests in science and technology, and uses his technical research experience to better serve ILP members in Asia and the United States.

Cheng spent six years in industrial research at Dolby Laboratories, San Francisco, where he contributed to sound compression (Dolby Digital, AAC, MP3), wireless networking, fingerprinting, and spatial/"3-D audio" technologies. Later, he was Associate Professor and Director of the undergraduate and graduate programs in music engineering technology at the University of Miami, Florida, where he also held a dual appointment in Electrical and Computer Engineering. Cheng holds various U.S. and international patents, has published technical papers, and has presented at various conferences. His technical work includes collaborations and consulting work with the U.S. Naval Submarine Medical Research Laboratory, Fujitsu-Ten USA, Starkey Laboratories, America Online, and the Chicago Board of Trade (CBOT). Cheng was an IEEE Distinguished Lecturer for the Circuits and Systems Society from 2009-2010, and was a Westinghouse (Intel) Science Talent Search national finalist many years ago.

Cheng holds degrees in Electrical Engineering (Ph.D., M.S.E. University of Michigan), Electro-Acoustic Music (M.A. Dartmouth College), and physics (B.A. Harvard University).

Personally, Dr. Cheng is an American Born Chinese (ABC), serves as his family's genealogist, and traces his roots back to Toi San, Guang Dong Province and Xing Hua, Jiang Su Province, China. He also has a background in music, and his electro-acoustic compositions have been presented at various U.S. and international venues.

11:05am

The MIT Environmental Solutions Initiative (ESI)  
John Fernández  
Director, Building Technology and Engineering Systems,  
Professor, [MIT Department of Architecture](#)



John Fernández  
Director, Building Technology and Engineering Systems,  
Professor  
[MIT Department of Architecture](#)

Professor John E. Fernández is a professor in the Department of Architecture at MIT, affiliated with the Department of Urban Studies and Planning, and a practicing architect. Fernández is also Director of the Massachusetts Institute of Technology Environmental Solutions Initiative, enlisting the capacity of the MIT community in the transition to a net zero carbon, biodiverse and equitable future.

Fernández founded and currently directs the MIT Urban Metabolism Group and is a member of the World Economic Forum Global Commission on BiodiverCities by 2030, the Urban Climate Change Research Network, and the Leadership Team of Oceanvisions. He has published on a wide range of subjects, from sustainable cities, urban biodiversity, design, and more, and is the author of two books and numerous articles in scientific and design journals, including *Science*, *the Journal of Industrial Ecology*, *Building and Environment*, *Energy Policy* and others, and author of nine book chapters. He is formerly Chair of Sustainable Urban Systems for the International Society of Industrial Ecology and Director of the MIT Building Technology Program from 2010 to 2015.

[View full bio](#)

Today we are at the brink of an accelerating climate crisis while half the world lives in cities and rates of biodiversity loss and deforestation are at historic highs. We are also in a golden era of scientific and engineering breakthroughs and technology and market innovation. From advances in artificial intelligence to carbon capture we may be witnessing the emergence of a transformation of society and industry toward a sustainable, equitable and humane future. Prof. Fernandez will describe the mandate and work of MIT's primary environmental organization charged with creating solutions to climate change and other environmental challenges. The work of the ESI leverages key capacity of the entire MIT faculty, student body and staff across diverse topics in research, education and engagement. The expansion of the ESI bodes well for MIT's ever more targeted role in a sustainable future. In this mission we hope to partner with you.

11:25am

## When to Embrace Sustainability in a Business (and When Not To)

Yossi Sheffi

Elisha Gray II Professor of Engineering Systems

Director, [MIT Center for Transportation and Logistics](#)



Yossi Sheffi

Elisha Gray II Professor of Engineering Systems

Director

[MIT Center for Transportation and Logistics](#)

Yossi Sheffi is an expert in systems optimization, risk analysis and supply chain management. He is author of a text book and seven award-winning management books. His latest books are: "The New Abnormal: Reshaping Business and Supply Chain Strategy Beyond Covid-19," (October 1, 2020) and "A Shot in the Arm: How Science, Technology and Supply Chains Converged to Vaccinate the World (October 2021).

Under his leadership, MIT CTL has launched many educational, research, and industry/government outreach programs, including the MIT SCALE network involving six academic centers round the world. In 2015, CTL has launched the on-line Micromaster's program, enrolling over 480,000 students in 196 countries.

Outside the institute, Dr. Sheffi has consulted with numerous organizations. He has also founded or co-founded five successful companies, all acquired later by large enterprises.

Dr. Sheffi has been [recognized](#) in numerous ways in academic and industry forums and won dozens of awards.

He obtained his B.Sc from the Technion in Israel in 1975, and SM and Ph.D. from MIT in 1978.

For more information visit: <http://sheffi.mit.edu/>

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Despite the increasing evidence of climate change and its growing consequences, green promises have outpaced green actions. Most consumers, companies, and governments have made only minor, incremental changes to their behavior. Even the promised changes, if actually enacted, are at best ineffective and at worst will ensure that the planet continues on its current destructive path. The addition of billions of developing countries consumers to the world's idle class is likely to doom any small changes. My argument is that while current efforts should continue, the solution is technology for carbon sequestrations and storage (it the green movement will still stall the development of nuclear plants).

11:45am

## MIT Startup Exchange Lightning Talk

[Sourcemap](#): Supply chain transparency platform

Leonardo Bonanni

Founder & CEO

[Sourcemap](#)

## MIT Startup Exchange Lightning Talk

[Via Separations](#) - Membrane platform that transforms industrial separations by improving filtration materials and reducing energy

Brent Keller

Co-Founder & CTO

[Via Separations](#)

11:50am

The Joint Program on the Science and Policy of Global Change: Advancing a Sustainable World through Interconnected Global and Regional Systems

Sergey Paltsev

Deputy Director, MIT Joint Program on the Science and Policy of Global Change  
Senior Research Scientist, MIT Energy Initiative and MIT Center for Energy and Environmental Policy Research (CEEPR)  
Director, Energy at Scale Center



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Director, Energy at Scale Center

Dr. Sergey Paltsev is a Deputy Director of the MIT Joint Program on the Science and Policy of Global Change, a Senior Research Scientist at the MIT Energy Initiative and MIT Center for Energy and Environmental Policy Research (CEEPR), and a Director of the MIT Energy-at-Scale Center, Massachusetts Institute of Technology (MIT), Cambridge, USA. He is the lead modeler in charge of the MIT Economic Projection and Policy Analysis (EPPA) model of the world economy. Dr. Paltsev is an author of more than 100 peer-reviewed publications in scientific journals and books in the area of energy economics, climate policy, transport, advanced energy technologies, and international trade. Sergey was a Lead Author of the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). He is a recipient of the 2012 Pyke Johnson Award (by the Transportation Research Board of the National Academies, USA, for the best paper in the area of planning and environment). Sergey is an Advisory Board Member for the Global Trade Analysis Project (GTAP) Consortium and a Member of the Scientific Steering Committee of the Integrated Assessment Modeling Consortium. Additional information at:

<https://globalchange.mit.edu/about-us/personnel/paltsev-sergey>

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Many world regions face increasing pressures from global and regional changes in climate, population growth, urban-area expansion, and the socio-economic impacts of fossil-based development. One of the global community's most significant contemporary challenges is the need to satisfy growing energy and food demand while simultaneously achieving very significant reductions in the greenhouse gas emissions and sustainable development. The massive scaling is required for low-carbon technologies to make a substantial contribution to future global energy needs. Using land for agriculture, energy, and carbon storage requires sustainable integrated solutions. This session explores how we are advancing a prosperous world through an analysis of the complex interactions among co-evolving, interconnected global and regional systems of human behavior and the Earth components. ?

12:09pm

## Assessing the Environmental Benefits of Materials Recovery in Commodity Materials Elsa Olivetti

Co-Director, [MIT Climate and Sustainability Consortium](#)

Jerry McAfee (1940) Professor, [Department of Materials Science and Engineering](#)

Associate Dean, [MIT School of Engineering](#)



Elsa Olivetti

Co-Director, [MIT Climate and Sustainability Consortium](#)

Jerry McAfee (1940) Professor, [Department of Materials Science and Engineering](#)

Associate Dean, [MIT School of Engineering](#)

Professor Olivetti received a BS in engineering science from the University of Virginia in 2000, and a PhD in materials science and engineering from MIT in 2007. She spent her PhD program studying the electrochemistry of polymer and inorganic materials for electrodes in lithium-ion batteries. In 2014, she joined DMSE as an assistant professor. As an educator, Olivetti overhauled DMSE's undergraduate curriculum and developed new courses, including one for the MIT Climate and Sustainability Consortium Climate Scholars. She's a member of the MIT Climate Nucleus and co-director of the MIT Climate & Sustainability Consortium.

Professor Elsa Olivetti's research focuses on improving the environmental and economic sustainability of materials. Specifically, she develops analytical and computational models to provide early-stage information on the cost and environmental impact of materials. Professor Olivetti and her research-group colleagues work toward improving sustainability through increased use of recycled and renewable materials, recycling-friendly material design, and intelligent waste disposition. The Olivetti Group also focuses on understanding the implications of substitution, dematerialization, and waste mining on materials markets.

Environmental benefits attributed to recycling rely on the assumption that we are substituting energy intensive primary production for lower-impact secondary production. However, this argument tends to be a purely engineering lens on a complex socioeconomic system. This presentation will discuss whether closing material and product loops does, in fact, prevent primary production. The basis for this counter argument is that when secondary replaces primary, it decreases the price of secondary and thus more primary will switch to secondary if possible, causing primary price to drop, and driving up demand for more primary which may negate the potential for substitution. There is a strong parallel in this argument to the concept of energy efficiency rebound, and is also referred to as the potential for secondary material to displace primary production. The critical aspects that influence displacement are the ability of secondary products to substitute for primary products, and price effects. This presentation will describe tools and analytical modeling efforts that explore the potential for recycling displacement for the case of commodity materials such as paper, copper and aluminum. These approaches help to assess the contexts under which recycling may reduce a material or product footprint.

12:34pm

## MIT Startup Exchange Lightning Talk

**InEnTec:** Gasifier technology that safely transforms waste into clean fuels and other valuable products

Jeffrey Surma  
President and CEO  
[InEnTec](#)

MIT Startup Exchange Lightning Talk

[Renewlogy](#): Innovative solutions for renewing waste and creating circular economies

Priyanka Bakaya  
Founder & CEO  
[Renewlogy](#)

12:39pm

Can Sustainable Investing Save the World?  
Jason Jay

Senior Lecturer, [MIT Sloan School of Management](#)  
Director, [Sustainability Initiative at MIT Sloan](#)



Jason Jay

Senior Lecturer, [MIT Sloan School of Management](#)  
Director, [Sustainability Initiative at MIT Sloan](#)

Jason Jay is a Senior Lecturer and Director of the MIT Sloan Sustainability Initiative. He teaches executive and masters-level courses on strategy, innovation, and leadership for sustainable business. He has helped secure MIT Sloan's position as a leader in the field of sustainability through teaching, research, and industry engagement. Dr. Jay's publications have appeared in the Academy of Management Journal, California Management Review, MIT Sloan Management Review, Stanford Social Innovation Review, Greenbiz, and World Economic Forum. With Gabriel Grant, he is the author of the international bestseller Breaking Through Gridlock: The Power of Conversation in a Polarized World. Dr. Jay also works as a facilitator for companies, organizations, and business families, supporting high quality conversation and shared commitment to ambitious sustainability goals. His clients have included EFG Asset Management, Novartis, Bose, Environmental Defense Fund, BP and the World Bank.

We are seeing tremendous growth in the field of sustainability, particularly in the capital markets. Investors are rapidly moving to incorporate environmental, social, and governance (ESG) considerations into their decision making. There are, however, three important barriers to sustainable investing. The first is that investors' mental models don't always match the reality of complex systems, as exemplified by climate change and what "net zero carbon" really requires. The second is measurement - the quality of data is not where we need it to be to drive portfolio construction and shareholder engagement. The third is impact - investors sometimes assume that avoiding risky stocks will change the world, and feel pressure to divest, but the reality is that shareholder engagement with imperfect companies may be a faster way to change the world, even if this strategy is harder to communicate to the marketplace.

12:55pm

## Electrification and Decarbonization of Chemical Synthesis

Karthish Manthiram

Theodore Miller Career Development Chair and Assistant Professor, Chemical Engineering



Karthish Manthiram

Theodore Miller Career Development Chair and Assistant Professor, Chemical Engineering

Karthish Manthiram is the Theodore T. Miller Career Development Chair and Assistant Professor in Chemical Engineering at MIT. The Manthiram Lab at MIT is focused on the molecular engineering of electrocatalysts for the synthesis of organic molecules, including pharmaceuticals, fuels, and commodity chemicals, using renewable feedstocks. Karthish received his bachelor's degree in Chemical Engineering from Stanford University and his Ph.D. in Chemical Engineering from UC Berkeley, where his dissertation research was focused on the development of nanoscale materials for storing solar energy in chemical bonds. Most recently, he was a postdoctoral researcher at the California Institute of Technology, where he worked on developing new ionically-conductive polymers using olefin metathesis. Karthish's research has been recognized with several awards, including the NSF CAREER Award, DOE Early Career Award, 3M Nontenured Faculty Award, American Chemical Society PRF New Investigator Award, Dan Cubicciotti Award of the Electrochemical Society, and Forbes 30 Under 30 in Science. Karthish's teaching has been recognized with the C. Michael Mohr Outstanding Undergraduate Teaching Award, the MIT ChemE Outstanding Graduate Teaching Award, and the MIT Teaching with Digital Technology Award. He serves on the Early Career Advisory Board for *ACS Catalysis* and on the Advisory Board for both *Trends in Chemistry* and the *MIT Science Policy Review*.

Chemical synthesis is responsible for significant emissions of carbon dioxide worldwide. Using renewable electricity to drive chemical synthesis may provide a route to overcoming the carbon footprint, by enabling synthetic routes which operate at benign conditions and utilize sustainable inputs. We are developing an electrosynthetic toolkit in which distributed feedstocks, including carbon dioxide, dinitrogen, water, and renewable electricity, can be converted into diverse fuels, chemicals, and materials. In this presentation, we will first share recent advances made in our laboratory on nitrogen fixation to synthesize ammonia at ambient conditions. We will then discuss how to drive selective carbon dioxide reduction and use water as an oxygen-atom source for epoxidation reactions. These example reactions will illustrate how the modularity of chemical manufacturing could be enhanced through electrochemical routes which open up local and on-demand production of critical chemicals and materials.

1:09pm

Closing Remarks