MIT Industrial Liaison Program Faculty Knowledgebase Report

2019 MIT Information and Communication Technologies Conference

April 9, 2019 - April 10, 2019

Day One

8:00am	Registration with Light Breakfast
9:00am	Welcome 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.

9:15am

Introduction to Quantum Computing
William Oliver
Professor of Electrical Engineering and Computer Science (EECS)
Professor of Physics
MIT Lincoln Laboratory Fellow
Director, MIT Center for Quantum Engineering (CQE)
Associate Director, MIT Research Laboratory of Electronics (RLE)

William Oliver
Professor of Electrical Engineering and Computer Science (EECS)
Professor of Physics
MIT Lincoln Laboratory Fellow
Director, MIT Center for Quantum Engineering (CQE)
Associate Director, MIT Research Laboratory of Electronics (RLE)

William D. Oliver is a Principal Investigator in the Engineering Quantum Systems Group (MIT campus) and the Quantum Information and Integrated Nanosystems Group (MIT Lincoln Laboratory). He provides programmatic and technical leadership targeting the development of quantum and classical high-performance computing technologies. Will's research interests include the materials growth, fabrication, design, and measurement of superconducting qubits, as well as the development of cryogenic packaging and control electronics involving cryogenic CMOS and single-flux quantum digital logic. Will is a Fellow of the American Physical Society; serves on the National Quantum Initiative Advisory Committee and the US Committee for Superconducting Electronics; is an IEEE Applied Superconductivity Conference (ASC) Board Member; and is a member of IEEE, APS, Sigma Xi, Phi Beta Kappa, and Tau Beta Pi.

Will received his PhD in Electrical Engineering from the Stanford University, the SM in Electrical Engineering and Computer Science from MIT, and a BS in Electrical Engineering and BA in Japanese from the University of Rochester (NY).

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9:50am

How to Survive and Thrive in the Third Digital Revolution
Neil Gershenfeld
Director, Center for Bits and Atoms

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Director, Center for Bits and Atoms

Prof. Neil Gershenfeld is the Director of MIT's Center for Bits and Atoms, where his unique laboratory is breaking down boundaries between the digital and physical worlds, from pioneering quantum computing to digital fabrication to the Internet of Things. Technology from his lab has been seen and used in settings including New York's Museum of Modern Art and rural Indian villages, the White House and the World Economic Forum, inner-city community centers and automobile safety systems, Las Vegas shows and Sami herds. He is the author of numerous technical publications, patents, and books including *Designing Reality*, *Fab*, *When Things Start To Think*, *The Nature of Mathematical Modeling*, and *The Physics of Information Technology*, and has been featured in media such as The New York Times, The Economist, NPR, CNN, and PBS. He is a Fellow of the American Association for the Advancement of Science and the American Physical Society, has been named one of Scientific American's 50 leaders in science and technology, as one of 40 Modern-Day Leonardos by the Museum of Science and Industry, one of Popular Mechanic's 25 Makers, has been selected as a CNN/Time/Fortune Principal Voice, and by Prospect/Foreign Policy as one of the top 100 public intellectuals. He's been called the intellectual father of the maker movement, founding a growing global network of over two thousand fab labs in 125 countries that provide widespread access to prototype tools for personal fabrication, directing the Fab Academy for distributed research and education in the principles and practices of digital fabrication, and chairing the Fab Foundation. He is a co-founder of the Interspecies Internet and of the Science and Entertainment Exchange. Dr. Gershenfeld has a BA in Physics with High Honors from Swarthmore College, a Ph.D. in Applied Physics from Cornell University, honorary doctorates from Swarthmore College, Strathclyde University and the University of Antwerp, was a Junior Fellow of the Harvard University Society of Fellows, and a member of the research staff at Bell Labs.

View full bio

10:25am

MIT Professional Education
Bhaskar Pant

Executive Director
MIT Professional Education

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Executive Director
MIT Professional Education

Bhaskar Pant is the Executive Director of MIT Professional Education, the arm of MIT that provides technical professionals a gateway to MIT expertise via education courses and programs designed for them. More than 1,500 professionals from over sixty countries arrive on the MIT campus in Cambridge, Massachusetts, every summer to attend courses of a diverse set of technical disciplines. In addition, over 10,000 professionals worldwide are now attending MIT's online professional courses that include topics such as Big Data. MIT Professional Education is also offering select MIT courses in locations in Asia, Latin America, and Europe

Prior to joining MIT, Mr. Pant held several leadership positions such as serving as Managing Director, Asia Pacific, for the Educational Testing Service (ETS), the world's foremost academic testing organization headquartered in Princeton, N.J. As managing director, he was responsible for overseeing the company's English language testing operations throughout Asia. This included the opening of a subsidiary in China that administered the TOEIC English proficiency test for engineers and other working professionals in the nation.

Previously, Mr. Pant led the global corporate training arm of the World Learning Graduate Institute in Vermont and held senior management positions at media and media technology companies such as Sony Corporation and Turner Broadcasting/CNN. Mr. Pant was the first President of Turner Broadcasting's subsidiary in India.

Mr. Pant holds an undergraduate degree in electrical engineering from the University of Rochester and a graduate degree in communications and management from Indiana University in Bloomington. Besides managing MIT Professional Education, Mr. Pant teaches intercultural communication to engineering students at MIT and management students at the Harvard University Extension School.

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MIT Professional Education (http://web.mit.edu/professional) provides a gateway to MIT expertise and knowledge for science and engineering professionals around the world. Through MIT Professional Education programs taught by renowned faculty from across the Institute, technical professionals have the opportunity to gain crucial and timely knowledge in specialized fields, to advance their careers, boost their organization performance, and help make a difference in the world.

ILP members receive a 15 percent discount on all MIT Professional Education Short Programs and Digital Programs at time of registration.

10:30am

Networking Break

10:50am

Cyber Security of IoT
John Williams
Professor of Information Engineering, MIT Department of Civil and Environmental Engineering

John Williams
Professor of Information Engineering
MIT Department of Civil and Environmental Engineering

John Williams holds a BA in Physics from Oxford University, a MS in Physics from UCLA, and a Ph.D. in Numerical Methods from University of Wales, Swansea. His research focuses on the application of large-scale computation to problems in cyber-physical security and energy. He is director of MIT's Geospatial Data Center and from 2006-2012, was Director of the MIT Auto-ID Laboratory, where the Internet of Things was invented. He is author or co-author of over 250 journal and conference papers, as well as the books on Rock Mechanics and RFID Technology. He contributed to the 2013 report for the UK Office for Science Foresight Project- The Future of Manufacturing. Alongside Bill Gates and Larry Ellison, he was named as one of the 50 most powerful people in Computer Networks. He consults to companies including Accenture, Schlumberger, Shell, Total, Exxon, SAP Research, Microsoft Research, Kajima Corp, US Lincoln Laboratory, Sandia National Laboratories, US Intelligence Advanced Research Projects Activity, Motorola, Phillip-Morris Inc., Ford Motor Company, Exxon-Mobil, Shell, Total, and ARAMCO. His international collaborations include Oxford and Cambridge Universities, HKUST, KACST, Alfaisal University, PolyU Hong Kong, Imperial College of Science and Technology UK, Malaysia University of Science and Technology (MUST), and Masdar Institute of Science and Technology Abu Dhabi. He organized the first Cyber-Physical Security Conference in the UK (2011), and along with Dr. Sanchez, he runs the MIT Applied Cyber Security Professional Education summer course. At MIT, he teaches courses Architecting Software Systems (MIT 1.125) and Engineering Computation and Data Science (MIT 1.00/1.001). .

In data engineering and data science, early work included simulation of Ford's global network, and analysis of SAP smart grid billing system. For Altria, he analyzed the performance of item level tagging and also their implementation of an anti-counterfeiting system using the Electronic Product Code (EPC)

In password security, Dr. Williams was a PI that developed the algorithms for a negative password authentication system for the Intelligence Advanced Research Projects Activity (IARPA) agency.

Dr. Williams advises companies in the Americas, Europe, the Middle East, and Asia.

Dr. Williams affiliations include:

- MIT Department of Civil and Environmental Engineering
- MIT Center for Computational Science and Engineering (CCSE)
- MIT Geospatial Data Center (GDC)
- MIT Auto-ID Laboratory
- MIT Center for Complex Engineering Systems (CCES)
- MIT Consortium for Improving Critical Infrastructure Cybersecurity (IC3)

View full bio

How can you protect yourself against threats you don't know about? What measures can you take to assess your risk before a breach? How can you protect yourself against an attack that originates in an innocuous object like a toaster? Professor John Williams will discuss how organizations can prepare themselves to defend against cybersecurity threats to protect their enterprises. He will discussrisk a modeling and data analytics tool (Saffron), that helps to identify risk tolerance and strategies for assessing, responding to, and monitoring cyber security risks.

11:25pm

Situational Awareness Tool for Cyber Security Event Prediction and Quantification (SAFFRON)

Abel Sanchez
Executive Director, MIT Geospatial Data Center (GDC)

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Executive Director
MIT Geospatial Data Center (GDC)

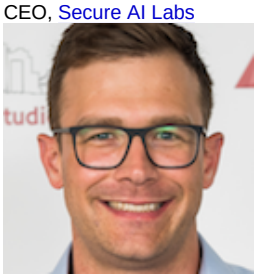
Dr. Abel Sanchez holds a Ph.D. from the Massachusetts Institute of Technology (MIT). He is the Executive Director of MIT's Geospatial Data Center, architect of "The Internet of Things" global network, and architect of data analytics platforms for SAP, Ford, Johnson & Johnson, Accenture, Shell, Exxon Mobil, and Altria. In cyber security, Dr. Sanchez architected impact analysis of large-scale cyber attacks designing Cyber Ranges for the Department of Defense (DOD). In password security, Dr. Sanchez led the design of a password firewall (negative authentication) for the Intelligence Advanced Research Projects Activity (IARPA) agency. In machine learning, addressing fraud detection, Dr. Sanchez designed a situational awareness framework that exploits different perspectives of the same data and assigns risk scores to entities for Accenture. He led the design of a global data infrastructure simulator, modeling follow-the-sun engineering, to evaluate the impact of competing architectures on the performance, availability and reliability of the system for Ford Motor Company. He has been involved in developing E-Educational software for Microsoft via their I- Campus Program and with establishing the Accenture Technology Academy, an online resource for over 200,000 employees. He has 10 years of experience with learning management systems and has made deployments in America, Asia, and Europe. He teaches MIT courses on cybersecurity, engineering computation, and data science and has produced over 150 educational videos.

View full bio

SAFFRON is a risk modeling and data analytics tool that allows energy delivery OT operators to better understand the risks associated with cyber threats. At present they do not have the capability to fully understand the risks associated with the cyber threats of today and tomorrow – risks that will continue to grow as Information Technology (IT) and Operations Technology (OT) networks increasingly integrate. It is important to have a better understanding of these risks, costs, and potential consequences. This aggregation of risk data will inform EDS OT operators in understanding how risk changes as the software deployed changes, and support actions (i.e., identify corrective actions that reduce the risk.) Similarly, risk computation will support operators in equipment replacement and procurement by quantifying device risk and impact on the network. SAFFRON has developed a risk model and data analytics tool, along with the necessary algorithms that identify risk tolerance and strategy for assessing, responding to, and monitoring cyber security risks. Foundational validated research is presingly neededed to develop risk models and visual analytics that are understandable to OT operators and leads to or even suggests corrective action. The tool uses a simulation model of the physical/IT system and acts as a proxy for the physical infrastructure.

Noon

MIT Startup Exchange: Introduction with Lightning Talks
Ryan Davis
CEO, Secure AI Labs



Ryan Davis
CEO
Secure AI Labs

Ryan Davis is the CEO of SAIL and a graduate fellow from MIT Sloan. Secure AI Labs (SAIL) helps businesses access unshared data by protecting data during analysis. Advancing the same technology used to protect movie streaming, SAIL protects data by digitally enforcing data-use policies. Now data owners can control who, how and where their data is used, even after sharing, and businesses can access data as easily as renting a movie, and without the liability of holding personal data.

Christopher Savoie
CEO, Zapata Computing

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CEO
Zapata Computing

Christopher Savoie is the CEO of Zapata Computing, a Harvard spinout quantum computing software and algorithm company funded by The Engine, the venture firm founded by MIT to invest in tough tech. Dr. Savoie is a published scholar in medicine, biochemistry, and computer science, and his research and business interests over the years have focused on the intersection of machine learning, biology, and chemistry. Dr. Savoie is the original inventor of AAOSA, the AI-based natural language interface technology that was used to develop Apple's Siri.

Dr. Savoie has led big data analytics efforts at Nissan and has previously founded and served as CEO of technology companies that have been acquired or exited via IPO. Dr. Savoie is also a licensed attorney and serves as the current Vice Chairman of the Big Data Committee of the American Bar Association. Savoie is a published legal expert on liability issues surrounding Artificial Intelligence, Big Data, Information Security, and Data Privacy and has lectured and taught continuing legal education courses on these subjects.

Founder & CEO, Labber

Founder & CEO
Labber

Dr. Simon Gustavsson is CEO and Founder at Labber. The company develops control and automation software with special focus on quantum applications. He is also Principal Research Scientist in the Engineering Quantum Systems group at MIT. His work involves designing and testing superconducting qubits and quantum-limited amplifiers, and implementing control techniques to improve coherence in superconducting circuits. Gustavsson received his MS in engineering physics from Chalmers University of Technology and his PhD in physics from ETH in Zurich.

View full bio
John Polo
Cofounder & CEO, Top Flight Technologies

12:40pm

MIT and the Cambridge Innovation Cluster
Stephen Campbell

Associate Director
MIT Investment Management Company

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Associate Director
MIT Investment Management Company

Stephen Campbell, Associate Director, joined MITIMCo in 2010. Prior to joining MITIMCo, he served as a Principal at Goedecke Company, structuring Debt and Equity capital market transactions. Prior to Goedecke, Campbell worked within the transaction group at Jones Lang LaSalle and spent 12 years at AEW structuring debt and equity investments, as well as asset management duties. He is a member of the transactions group and is responsible for structuring capital market and lease transations for the Cambridge real estate portfolio. As a member of the Massachusetts Bar, he holds a JD from Suffolk Law School and a BA from the University of Massachusetts, Amherst in accounting. In addition, Campbell is a Certified Public Accountant (inactive) and a licensed real estate broker.

12:45pm

Lunch with Startup Exhibit

Additional exhibiting IT and IoT startups:
- **Abstract**: *Discover hidden factory with retrofit sensors & video*
- **Gradient**: *Authentication for IoT & edge devices*
- **IIoT-OXYS**: *Industrial IoT and domain-specific machine learning*
- **DeepWeb**: *Macro trends visualization and analysis for finance and research*
- **Silverthread**: *Improving software health and economics*
- **Posh**: *Conversational AI for customer service & helpdesk*

2:00pm

The Network in Network Coding
Muriel Médard

Cecil H. Green Professor of Electrical Engineering
MIT Department of Electrical Engineering and Computer Science

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Cecil H. Green Professor of Electrical Engineering
MIT Department of Electrical Engineering and Computer Science

Muriel Médard is the Cecil H. Green Professor in the EECS Department at MIT and leads the Network Coding and Reliable Communications Group at the Research Laboratory for Electronics. She has co-founded three companies to commercialize network coding. She has served as editor for the Institute of Electrical and Electronics Engineers (IEEE), of which she was elected Fellow, and as Editor in Chief of the IEEE Journal on Selected Areas in Communications. She was President of the IEEE Information Theory Society in 2012, and served on its board of governors for eleven years. She received the 2009 IEEE Communication Society and Information Theory Society Joint Paper Award, the 2009 William R. Bennett Prize, the 2002 IEEE Leon K. Kirchmayer Prize Paper Award, and the 2018 ACM SIGCOMM Test of Time Paper Award. She received the 2016 IEEE Vehicular Technology James Evans Avant Garde Award, the 2017 Aaron Wyner Distinguished Service Award and the 2017 Edwin Howard Armstrong Achievement Award.

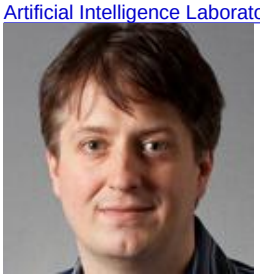
View full bio

In this talk, we overview the application of random linear network coding (RLNC) in a variety of layers of the network, ranging from right above the physical layer to the application layer. We show that coding can be included in a flexible fashion at multiple layers, without the need for selecting a single layer. We provide a few use cases.

2:35pm

Computational Design and Manufacturing

Wojciech Matusik
Professor, Electrical Engineering and Computer Science , MIT Computer Science and Artificial Intelligence Laboratory



Wojciech Matusik
Professor, Electrical Engineering and Computer Science
MIT Computer Science and Artificial Intelligence Laboratory

Wojciech Matusik is a professor in MIT's Department of Electrical Engineering and Computer Science, and leads the Computational Fabrication Group at the Computer Science and Artificial Intelligence Laboratory. His research interests are in computer graphics, computational design and fabrication, computer vision, robotics and human-computer interaction. Before coming to MIT, he worked at Mitsubishi Electric Research Laboratories, Adobe Systems and Disney Research Zurich. He has received a Ruth and Joel Spira Award for Excellence in Teaching, a DARPA Young Faculty Award and a Sloan Foundation fellowship. He has been named one of the world's top 100 young innovators by MIT Technology Review and received a Significant New Researcher Award from ACM Siggraph. He earned a PhD in computer graphics at MIT.

View full bio

Over the next few decades, we are going to transition to a new economy where highly complex, customizable products are manufactured on demand by flexible robotic systems. This change is already underway in a number of fields. For example, additive manufacturing is revolutionizing production of parts in consumer, aerospace, automotive, and medical industries. Overall, these new machines enable batch-one manufacturing of products that have unprecedented complexity.

In this talk, I will present a new computational design and manufacturing workflow that draws inspiration from computer architectures, programing languages, and program synthesis. I will describe how designs can be synthesized from their functional specifications to the corresponding low-level instructions that are executed on intelligent manufacturing hardware.

3:10pm

Creating the Next Generation Enterprise
Stephanie Woerner

Research Scientist
Center for Information Systems Research (CISR)
MIT Sloan School of Management

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Research Scientist
Center for Information Systems Research (CISR)
MIT Sloan School of Management

Stephanie Woerner is a Research Scientist at the Center for Information Systems Research (CISR) at the MIT Sloan School of Management. Stephanie is an expert on how companies use technology and data to create more effective business models and her research centers on how companies manage organizational change caused by the digitization of the economy. In 2016, she was a subject matter expert on enterprise digitization for the Wall Street Journal CEO Council Conference. She has a passion for measuring hard-to-assess digital factors such as connectivity and customer experience, and linking them to firm performance. Recent articles (with Peter Weill) include "Thriving in an Increasingly Digital Ecosystem," and “Is Your Company Ready for a Digital Future?”, in *Sloan Management Review*. Stephanie is the coauthor, with Peter, of *What’s Your Digital Business Model? Six questions to help you build the next generation enterprise*, (Harvard Business Review Press, 2018).

View full bio

How will your company compete in the digital economy? Based on her book *What’s Your Digital Business Model?* (Harvard Business School Press, 2018), co-authored with Peter Weill and cited by *Forbes* as one of the top ten business books in 2018, Stephanie L. Woerner presents six questions for business leaders to answer in order to navigate their digital transformation journeys. Stephanie will describe the future business model framework, based on two dimensions of major change enabled by digitization — getting closer to end consumers and moving from value chains to ecosystems—and show the financial performance of firms pursuing each model with examples drawn from a variety of industries. She will discuss what it takes to succeed in each model and the key capabilities each company must build.

3:45pm

MIT Sloan Executive Education
Eric Bergemann
Senior Director, Executive Programs, MIT Sloan Executive Education

Eric Bergemann
Senior Director, Executive Programs
MIT Sloan Executive Education

Eric Bergemann is Senior Director of Executive Programs at the MIT Sloan School of Management, where he oversees a portfolio of non-degree executive programs. He has worked with firms in the fields of energy, pharmaceuticals/life science, mobility, high technology, banking/finance, and consumer products. Bergemann is active in business development, and is the Executive Education capability development leader in Program & Instructional Design Methodology and Improvement. In 2009, he received the MIT Sloan Appreciation Team Award.

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MIT Sloan Executive Education's non-degree executive programs are led by senior MIT Sloan faculty and provide business professionals from around the world with a targeted and flexible means to advance their career development goals and position their organizations for future growth. Our cutting-edge leadership training includes more than 50 short courses, executive certificates, online courses, custom programs for organizations, and our flagship program, the five-week Advanced Management Program.

ILP members receive a 15 percent discount on selected courses at time of registration.

3:50

Networking Break

4:10pm

Scaling ICT Capacity by 1,000,000x at Constant Cost, Energy, and Footprint

Lionel Kimerling

Thomas Lord Professor of Materials Science and Engineering
Director, Microphotonics Center
MIT Department of Materials Science and Engineering

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Director, Microphotonics Center
MIT Department of Materials Science and Engineering

Lionel Kimerling is the Thomas Lord Professor of Materials Science and Engineering at MIT and the Director of the MIT Microphotonics Center. After a PhD at MIT, he served as Captain in the USAF. He was Head, Materials Physics Research at AT&T Bell Laboratories when he joined the faculty of MIT as Professor. He has authored more than 550 technical articles, and he holds more than 75 patents in the fields of integrated photonics and semiconductor processing. At AT&T, he led the corporate-wide Silicon Materials R,D&M Technology Forum. At MIT, Kimerling was Director of the Materials Processing Center for 15 years, establishing it as the industry portal for faculty across all materials-related disciplines. The MIT Microphotonics Center brings together faculty from eight departments in the Schools of Engineering, Science, Business, and Humanities for large industry-sponsored research programs and the Communication Technology Roadmap (CTR). More than 300 industrial, academic, and government organizations have contributed to Roadmap releases, which are now merged under the Integrated Photonics System Roadmap, International (IPSR-I). Kimerling's research teams have enabled long-lived telecommunications lasers; developed semiconductor inspection and root cause diagnostic methods such as DLTS, SEM-EBIC and RF-PCD; and pioneered silicon microphotonics.

Kimerling was President, TMS; Chairman, Editorial Board of the Journal of Electronic Materials; and he has served on the Advisory Board, National Center for Photovoltaics, DOE and the National Materials Advisory Board, NRC. Kimerling is the recipient of the ECS Electronics Division award, the TMS John Bardeen Award, the MIT Perkins Award for Excellence in Graduate Advising, and the Humboldt Senior Scientist Research Award. He is a Fellow of the American Physical Society, AAAS, TMS, MRS and the U Tokyo School of Engineering.

View full bio

During the past two decades, compute performance, measured by GFLOPS, has increased at a rate of 1000x/10yr. Is this pace sustainable for the next two decades? Hardware, software, and system architectures are undergoing radical changes to meet growing ICT demand with available resources. Hardware solutions based on revolutionary electronic-photonic integration are emerging. The endpoint will likely be a sort of worldwide data center that virtualizes distributed resources and provisions them as services with optimized efficiency and performance.

4:45pm

MIT TRUST::DATA CONSORTIUM
Alex Pentland
Toshiba Professor
Professor of Media Arts and Sciences
Head, Human Dynamics Research Group

Alex Pentland
Toshiba Professor
Professor of Media Arts and Sciences
Head
Human Dynamics Research Group

Alex "Sandy" Pentland directs MIT's Connection Science initiative and the MIT Media Lab Entrepreneurship Program and is a founding member of advisory boards for the World Economic Forum, AT&T, Telefonica, United Nations, and Nissan. He previously helped create and direct MIT's Media Laboratory, the Media Lab Asia laboratories at the Indian Institutes of Technology, and Strong Hospital's Center for Future Health.

Forbes magazine declared Pentland "one of the seven most powerful data scientists in the world," along with the founders of Google and the CTO of the United States. Pentland is among the most-cited computational scientists in the world, and a pioneer in big data analytics, computational social science, organizational engineering, and wearable computing. His research has been featured in *Nature*, *Science*, the World Economic Forum, and *Harvard Business Review*, as well as being the focus of TV features including "Nova" and "Scientific American Frontiers." His most recent books are *Social Physics*, and *Trust :: Data*.

Interesting experiences include winning the DARPA 40th Anniversary of the Internet Grand Challenge, dining with British Royalty and the President of India, staging fashion shows in Paris, Tokyo, and New York, and developing a method for counting beavers from space.

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Developing privacy-preserving identity systems and safe distributed computation, enabling an Internet of Trusted Data. The Trust::Data Consortium addresses the growing tension between societal data proliferation and data security by developing specifications, software, tools and documentation that help organizations adopt a holistic approach to cyber protection. Trust::Data is building new models for digital identity, data provenance, universal access, and secure privacy-preserving transactions to harness the future potential of global data sharing.

5:20pm

Networking Reception

Day Two

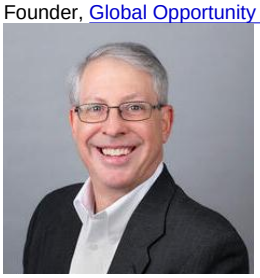
8:30am

Registration with Light Breakfast

9:05am

Leading Digital Transformation: How You Can Make Your Company into a Digital Master

George Westerman
Senior Lecturer, MIT Sloan School of Management
Founder, Global Opportunity Forum, MIT Office of Open Learning



George Westerman
Senior Lecturer, MIT Sloan School of Management
Founder, Global Opportunity Forum, MIT Office of Open Learning

George Westerman is a Senior Lecturer at the MIT Sloan School of Management and Founder of the Global Opportunity Forum (http://gof.mit.edu).

George's work bridges the fields of executive leadership and technology strategy. During more than 20 years with MIT Sloan School of Management, he has written three award-winning books, including *Leading Digital: Turning Technology Into Business Transformation*. As a pioneering researcher on digital transformation, George has published papers in *Harvard Business Review*, *Sloan Management Review*, and other top journals. He is now focused on helping employers, educators, and other groups to rethink the process of workforce learning around the world through the GOF and several research collaborations.

George is cochair of the MIT Sloan CIO Leadership Awards, a member of the Digital Strategy Roundtable for the US Library of Congress, and member of the Board of Directors for Workcred. He works frequently with senior management teams and industry groups around the world. Prior to earning a Doctorate from Harvard Business School, he gained more than 13 years of experience in product development and technology leadership roles.

View full bio

Amidst the hype over digital transformation, there is an important truth: Some companies manage it better than others. In seven years of research with more than 400 organizations, the key capabilities of Digital Masters were identified. These large traditional companies, which exist in every industry, are better able to translate technology into transformation again and again. In this session, we will examine how Digital Masters are different from their peers, share numerous examples, and discuss how you can turn your company into a digital master.

9:40am

Discovering Your Way to Greatness: How the Most Successful Organizations Repeatedly Get to the Right Answers Fastest

Steven Spear
Senior Lecturer, MIT Sloan School of Management
Senior Fellow, Institute for Healthcare Improvement
Principal, See to Solve LLC

Steven Spear
Senior Lecturer, MIT Sloan School of Management
Senior Fellow, Institute for Healthcare Improvement
Principal, See to Solve LLC

How some organizations generate value faster than others, with rewards for all stakeholders, is the focal question for Steve Spear (DBA MS MS), senior lecturer at MIT, author of *The High Velocity Edge*, and patent holder for the See to Solve Real Time Alert System. Winners create new knowledge and skills faster—ideally, everyone discovering something new always. These ideas have been expounded across *Harvard Business Review, Annals of Internal Medicine* and *Academic Medicine, School Administrator*, and *Proceeding of the US Naval Institute*. Proofs in practice include Pratt and Whitney's winning the F-35 engine contract, the Pittsburgh Regional Healthcare Systems "Perfecting Patient Care System," standing up the Alcoa Business System, and development/promotion of the Navy's High Velocity Learning initiative.

View full bio

Knowing how to manage complex undertakings—invention of new science, development of new products, stand up of new systems, operation of sprawling operations—such that new knowledge and skills are developed at incredible speed is a source of sustainable competitive advantage. But how does this advantage translate? We undertake projects, programs, and the like because there is a problem for which no solution exists. It has to be invented, and the faster and easier we discover our way to the right answers, the better for all of our stakeholders. Do that repeatedly and consistently, and competitors cannot keep up. Existing opportunities to build knowledge and skills will be identified during planning, practice, and performance with examples from drug development, software design, social services, and military applications.

10:15am

Networking Break

10:35am

Artie: An Artificial Heat Transfer Student
Anthony Patera

Ford Professor of Engineering
MIT Department of Mechanical Engineering

Anthony Patera

Ford Professor of Engineering
MIT Department of Mechanical Engineering

Anthony T. Patera is Ford Professor of Engineering and Professor of Mechanical Engineering at MIT. He has undergraduate and graduate degrees in Mechanical Engineering from MIT and a doctorate in Applied Mathematics also from MIT. His current research focuses on two areas: natural language and image processing for mathematical modeling and numerical approximation in disciplines informed by partial differential equations; reduced basis model order reduction and a posteriori error estimation for the parametrized partial differential equations of continuum mechanics and transport.

View full bio

An undergraduate student in heat transfer (or similar engineering science continuum discipline) maps a non-prescriptive problem statement in natural language to a relatively simple mathematical model to a closed-form approximate solution. This classical approach remains relevant even today: to develop design tools which serve to narrow the parameter domain; to provide transparent reference solutions which serve to verify the results of simulation. "Artie" is software which replicates the undergraduate student procedure and further expands the analysis capability to incorporate numerical solution of partial differential equations. Artie may ultimately be capable of an A+ in an MIT heat transfer subject. The latter, in turn, has important implications for education and professional practice: we must adapt our undergraduate curriculum, and we must revisit the roles of engineers. However, many technical challenges remain, in particular related to geometry and image processing, natural language understanding, incorporation of (heat transfer) empirical data and correlations, and assessment of model and approximation error.

11:10am

Implosion Fabrication
Daniel Oran

PhD Candidate, Synthetic Neurobiology Group
MIT Media Lab

Daniel Oran

PhD Candidate, Synthetic Neurobiology Group
MIT Media Lab

Daniel Oran is an artist, scientist, and inventor who explores novel uses of light to create everything from experimental artworks to new methods of fabrication. He received his BA in Natural Science and Photography at Hampshire College in 2011 before working as a freelance photographer, fine art printmaker, and archivist for five years. After years of working as an artist Daniel dove back into science and engineering when he joined Edward Boyden's Synthetic Neurobiology group at the MIT Media Lab. Initially as a visiting scientist in 2016 and then later as a PhD student. During this time he, along with his collaborators in the Boyden lab, invented a new form of nanofabrication by combining his knowledge of photographic chemistry with contemporary multiphoton lithography and the recent invention of Expansion Microscopy. This new technology, Implosion Fabrication, recently published in Science demonstrates the ability to create 3D nanoscale structures out of silver, semiconductors, dielectrics, proteins, and DNA in any geometry within the same substrate.

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Although a range of materials can now be fabricated using additive manufacturing techniques, these usually involve assembly of a series of stacked layers, which restricts three-dimensional (3D) geometry. Oran et al. developed a method to print a range of materials, including metals and semiconductors, inside a gel scaffold (see the Perspective by Long and Williams). When the hydrogels were dehydrated, they shrunk 10-fold, which pushed the feature sizes down to the nanoscale.

Lithographic nanofabrication is often limited to successive fabrication of two-dimensional (2D) layers. We present a strategy for the direct assembly of 3D nanomaterials consisting of metals, semiconductors, and biomolecules arranged in virtually any 3D geometry. We used hydrogels as scaffolds for volumetric deposition of materials at defined points in space. We then optically patterned these scaffolds in three dimensions, attached one or more functional materials, and then shrank and dehydrated them in a controlled way to achieve nanoscale feature sizes in a solid substrate. We demonstrate that our process, Implosion Fabrication (ImpFab), can directly write highly conductive, 3D silver nanostructures within an acrylic scaffold via volumetric silver deposition. Using ImpFab, we achieve resolutions in the tens of nanometers and complex, non–self-supporting 3D geometries of interest for optical metamaterials.

11:45am

Adjournment with Bagged Lunch