IAB2022:

MTL Industrial Advisory Board Annual Meeting 2022

MTL MICROSYSTEMS TECHNOLOGY LABORATORIES

January 27-28, 2022
Virtual Annual Meeting

MICROSYSTEMS TECHNOLOGY LABORATORIES • MASSACHUSETTS INSTITUTE OF TECHNOLOGY

IAB2022: AGENDA

INDUSTRIAL ADVISORY BOARD ANNUAL MEETING
JANUARY 27, 2022

6:00pm	**Prof. Harry Lee:** "MTL Director's Update"
6:45pm	**Prof. Vladimir Bulović:** "MIT.nano Update"
7:15pm	**Prof. Jesus del Alamo:** "MIT and the Role of Universities in the Microelectronics Ecosystem"
7:45pm	Break
8:00pm	**Prof. Tayo Akinwande:** "Updates on MTL Grand Challenge"
8:30pm	**Sixian You:** "Label-free in vivo Microscopy"
8:55pm	**Kevin Chen:** "Versatile Robots at the Insect-scale: Applications and Challenges"
9:15pm	**Viky Diadiuk, Jorg Scholvin, Nick Menounso, Jeff Lang:** "Facilities and Services Update"
9:45pm	Discussion
10:00pm	Adjourn

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AGENDA

INDUSTRIAL ADVISORY BOARD
ANNUAL MEETING
JANUARY 28, 2022

9:00am	**Prof. Harry Lee:** "MTL Director's Update"
9:45am	**Prof. Vladimir Bulović:** "MIT.nano Update"
10:15am	**Prof. Jesus del Alamo:** "MIT and the Role of Universities in the Microelectronics Ecosystem"
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11:55am	**Kevin Chen:** "Versatile Robots at the Insect-scale: Applications and Challenges"
12:15pm	**Viky Diadiuk, Jorg Scholvin, Nick Menounso, Jeff Lang:** "Facilities and Services Update"
12:45pm	Discussion
1:00pm	Adjourn

MIG MEMBER BIOGRAPHIES

Susan Feindt
Fellow & Advanced Process Development Director
Analog Devices

Susan is an ADI fellow and Director of Analog's Advanced Process Development Group in Wilmington, MA. She has been with Analog Devices for over 30 years. Susan has led process development efforts for integrated circuits used in various applications and markets including automotive, communications, industrial and healthcare. She focuses on silicon based Bipolar and BiCMOS processes, Gallium Nitride and Heterogeneous Integration. Before joining Analog Device, Susan worked for Harris Semiconductor in Melbourne, Florida. Susan received her BS in Chemical Engineering from the Massachusetts Institute of Technology.

Chorng-Ping Chang
Senior Director
Applied Materials

Dr. Chorng-Ping Chang is Senior Director of Strategic External Research in the office of CTO, Applied Materials. Prior to joining Applied Materials in 2004, Dr. Chang was a Distinguished Member of Technical Staff at Bell Laboratories, Murray Hill, New Jersey, where he had done extensive R&D on advanced plasma sources, processing technology, CMOS integration, and novel device architecture. He received his B.S. degree from National Tsing Hua University and Ph.D. degree from University of California at Berkeley. He has authored or co-authored over 120 conference and journal papers and has filed over 20 patents. Dr. Chang is a fellow of IEEE. He also served on the editorial board of IEEE.

Philip A. Kraus, Ph.D
Appointed Vice President
Head of Core R&D
Semiconductor Products Group
Applied Materials, Inc.

Dr. Philip Kraus is Appointed Vice President and leads Core R&D for the Semiconductor Products Group at Applied Materials. He oversees the development of innovative technologies and prototype products for the semiconductor wafer fabrication equipment market. Prior to rejoining Applied Materials in 2015, Dr. Kraus was at several start-up companies, including from 2012 to 2015 as CEO of Ultora, a manufacturer of carbon nanotube electrochemical energy storage devices. Previously at Applied Materials from 1999 to 2006, Dr. Kraus developed FEOL plasma systems. Dr. Kraus is the inventor of more than 50 patents and co-authored more than 40 publications. He earned a Ph.D. in Physics from the University of Minnesota and a B.S. in Engineering Science from the Pennsylvania State University.

David Carter
Laboratory Fellow
Draper

Dr. David Carter is Laboratory Fellow at Draper Laboratory. He has been at Draper for 20 years, where he has led multiple technical groups, most recently Materials Science and Chemistry. He has led efforts to apply nanofabrication and nanotechnology in a variety of areas including RF MEMS, integrated optics, plasmonic devices, carbon nanotube MEMS/NEMS integration, and self-assembly. His work in molded nanoscale polymers led to the first-ever demonstration of human climbing using biomimetic synthetic gecko adhesion. He has advised several graduate Draper scholars and has initiated multiple collaborations with university researchers (including several with MIT).

Prior to Draper, he held a research staff position at MIT, where he led the development of zone-plate-array lithography (ZPAL). Before MIT, he held a staff position at Harvard University, where he managed the cleanroom facility. Dr. Carter received his Ph.D. in Electrical Engineering from MIT and his A.B. and M.S. degrees in Engineering Sciences from Dartmouth College. He has co-authored 33 journal and conference papers and has 21 patents in micro/nanofabrication, nanotechnology, and materials.

George Courville
Business Development Manager, Technology Partnerships
Edwards

Anthony Taylor
Applications Technologist
Edwards

Mr. Courville has over 25 years of experience as a marketing and business development professional. His career has included senior management positions with both large, multi-national corporations as well as small, nanotechnology startups. He has led global business development teams offering high performance materials and equipment for many uses in semiconductor, display, solar and other high technology markets. He was responsible for managing a marketing and applications team that introduced and supported the first dry vacuum pumps for the semiconductor market.

Mr. Courville received his Bachelor of Science degree in Chemical Engineering from Tufts University, and an MBA from Boston University.

Anthony has over 30 years' experience working in the semiconductor industry and conducting research in thin film technology and microsystems. He has been with Edwards, Sanborn, New York, as an Applications Engineer and Applications Technologist for the past 28 years and a visiting scientist at MIT since 2014. His work at MIT has focused on novel fabrication methods of micro and nano-systems, specifically graphene-based gas sensors for vacuum and exhaust management applications, and 3D-printed miniature vacuum and liquid pumps. He received a Bachelor of Science degree in Physics (cum laude) from Saint Lawrence University, a Master of Science degree in Physics from the University of Arizona, and the Doctor of Philosophy in Physics from Rensselaer Polytechnic Institute (RPI).

Kurt Bettenhausen
HARTING Technology Group
Member of the Managing Board
New Technologies & Development"
HARTING, Inc. of North America

Vivek Dave
Director of Technology Development
HARTING, Inc. of North America

Dr. Bettenhausen joined HARTING Technology Group as Member of the Managing Board in September 2021. He is responsible for New Technologies & Development.

From October 2011 until June 2019 Dr. Bettenhausen served as Senior Vice President at Siemens Corporation USA. He was responsible for the global Technology Field "Fu-ture of Automation" and Corporate Technology in the United States of America.

Dr. Bettenhausen attained a master's degree and a Ph.D. in electrical engineering from Technical University of Darmstadt.

Dr. Bettenhausen served as chairman of the interdisciplinary committee „Digital Trans-formation" at VDI (Association of German Engineers) and as chairman of the VDI/VDE Society for Measurement and Automatic Control.

In the USA Dr. Bettenhausen was member of the Advisory Board at UC Berkeley Col-lege of Engineering, member of the Advisory Board at CITRIS, member of the External Advisory Board of the Institute for Robotics and Intelligent Machines at Georgia Institute of Technology, member of MForesight Leadership Council, member of the Board of Di-rectors of the Research & Development Council of New Jersey, as well as member of the Innovator's Roundtable of Darden School of Business at the University of Virginia.

Please find further information here: https://www.linkedin.com/in/kurtdbettenhausen

Vivek Earned his Bachelor's degree in Engineering his Applied Science with Honor from the California Institute of Technology, and his Master's and Doctorate degrees in Materials Engineering from the Massachusetts Institute of Technology. He has worked at Fortune 50 aerospace companies, National Labs, various startups in three states, and presently serves as the Director of Technology for North America for HARTING Inc., family-owned private company based in Espelkamp, Germany with North American headquarters in Elgin, IL.

His current focus is on the Industrial Internet of Things (IIoT) and specifically how to provide Edge-level hardware and software solutions that will truly enable IIoT to reach its full potential. He is additionally a technical expert in problems pertaining to sensing, control, data analytics, manufacturing, quality control, understanding and eliminating sources of process variance, and the impact of manufacturing problems or defects on downstream product performance and process reliability. Sgnificant experience as an Entrepreneur working with early-stage advanced technologies encompassing manufacturing, materials, and algorithms.

HITACHI
Inspire the Next

Takanobu Haga
Manager, Innovation Promotion Group
Hitachi High-Tech Corporation

Dr. Takanobu Haga is a member of Innovation Promotion Group of Hitachi High-Tech America. He is based in Boston to scout innovative technologies and startups in life science.

He started his career as a research scientist and an optical engineer at Central Research Laboratory, Hitachi, in 2005. During his nine-year of professional experience at Hitachi, he achieved various advancements in DNA sequencing technologies: he published a number of research findings and patents related to sequencing instruments and methods; as the optical engineer of Hitachi High-Technologies, he also joined collaboration projects with Life Technologies (now Thermo Fisher Scientific) in commercialization of Next Generation DNA Sequencer. After his experience at Hitachi, he worked at a venture capital firm in Tokyo for two years and joined Hitachi High-Technologies in 2018.

He graduated from Tokyo University of Agriculture and Technology with PhD in optical engineering during his placement at Hitachi in 2013; he received his master of science in biophysics from Osaka University in 2005 and his bachelor of science in chemistry from Tohoku University in 2003. He earned MBA from IE Business School, Spain, in 2015.

HITACHI
Inspire the Next

Hiroshi Suzuki
General Manager, Technology Innovation Division
Hitachi High-Tech Corporation

Dr. Hiroshi Suzuki is the General Manager of the Technology Innovation Division of Hitachi High-Tech (HHT) headquarters in Tokyo and is responsible for the technology strategy of the HHT group.

He joined Central Research laboratory (CRL), Hitachi Ltd. in 1989, and researched electron-beam instruments for improving yields of semi-conductor and/or magnetic devices. He developed several methods and apparatuses to characterize the electrical properties of LSIs and to analyze the magnetic properties of several magnetic devices used in HDDs. He received academic awards including the Technology Development Award (JIM, 1999) and the Technology Award (JSPE, 2003). As a part of his carrier in Hitachi, he worked in research planning at CRL for several years, and he was temporary transferred to the corporate venture capital (CVC) of Hitachi's R&D division from 2004 to 2005.

He moved to Hitachi High-Technologies Corporation in 2011, where he was in charge of R&D planning and strategy, and he was temporary transferred to the HHT's subsidiary company to develop new technologies for inspection of social infrastructure from 2016 to 2018.

He graduated with his Bachelor's and Master's degrees in precision engineering from Tohoku University in 1987 and 1989. He obtained a Ph.D. in engineering from Tohoku University in 2007 when he worked for CRL, Hitachi Ltd..

Dirk Pfeiffer
Sr. Manager, Microelectronics Research Laboratory
IBM

Nerissa Draeger, Ph.D
Director of Global University Engagements
Lam Research Corporation

Dr. Dirk Pfeiffer currently oversees all advanced hardware prototyping and fabrication services within IBM Research. The facilities he manages are staffed with 200+ engineers and scientist and include a 200 mm wafer scale fabrication line with a fleet of 150+ processing tools, 40000sf of clean room space, offline laboratories and model shop, offering a wide range of design and fabrication services, ranging from novel devices fabrication all the way to packaging, test, design, characterization, electronics, system integration and assembly. The wafer scale fabrication line is equipped with 200mm silicon wafer semiconductor processing tools ranging from ebeam/optical lithography, reactive ion etching , films, wets, CMP, plating, characterization tools to packaging tools such as wafer/chip bonding, deep silicon etch, others. The laboratory supports a broad scope of advanced device and hardware prototype development projects including CMOS scaling (5nm and beyond), non volatile memory, photonics, quantum computing, neuromorphic devices for AI based computing architectures, IoT devices for applications in health care, supply chain others.

Prior management assignments, Dr. Pfeiffer has been the PI/coPI of several government projects within IBM research related to hardware based security and anti tampering. Dr. Pfeiffer started his career at IBM in the lithography group as a polymer chemist, where he ran a join development project with commercial partners to develop new polymer films for high resolution lithography. His innovations were implemented in lithography processes at the IBM semiconductor manufacturing facilities in East Fishkill, NY for product generations at 32nm node and beyond. He also worked as the technical assistant to the director of silicon technology at IBM prior becoming an IBM manager. Dr. Pfeiffer holds a Ph.D. in oranometallic chemistry from Wayne State University, Detroit, MI and completed a postdoctoral assignment at the University of Pennsylvania, PA working on organic synthesis and catalysis. Dr. Pfeiffer has authored and co-authored over 150 patents and publications and received several IBM outstanding technical achievement awards.

Dr. Nerissa Draeger is a senior innovation leader in the semiconductor industry. Her interests lie at the intersection of emerging technologies, strategy, communications, and people. In the Office of the CTO at Lam Research, Dr. Draeger guides implementation of Lam's technology vision through open innovation. As Director of Global University Engagements, she enables new solutions for semiconductor fabrication through academic collaborations and leads partnerships to create diversity in Lam's technology and talent pipelines. Prior to this role, Dr. Draeger managed programs on materials for advanced devices, new process and product development, strategic business and intellectual property development.

Dr. Draeger has over 20 years of experience in thin film deposition and surface science and has authored over 30 patents and numerous technical publications. She currently serves on the board of directors for the Materials Research Society (MRS) and UIDP.

She earned a Ph.D. in materials science and engineering from the University of Illinois, Urbana-Champaign where she received the department's 2020 Alumni Loyalty Award, and a B.S.E. from the University of Michigan which sparked a lifelong fandom for Wolverines football. She is a voracious reader and member of a book club that has been together for two decades and enjoys long-distance trekking.

Akihiro Kirihara
Senior Manager, System Platform Research Laboratories
NEC Corporation

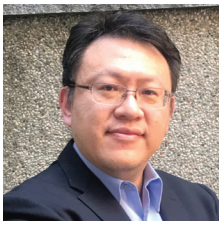
Tomo Tanaka
Researcher, System Platform Research Laboratories
NEC Corporation

Mr. Akihiro Kirihara is a Senior Manager in NEC System Platform Research Laboratories, and is responsible for managing research projects on nano and quantum devices (e.g. quantum atomic clocks and nano-carbon sensors), and data-driven material R&D.

After he obtained B. Eng. (in 2002) and M. Eng. (in 2004) from the University of Tokyo, he joined NEC Corporation in 2004. Since then, he has studied on quantum-dot emitters, spintronic devices, and quantum atomic clocks. From 2013 to 2014, he was a visiting researcher in Technische Universitaet Kaiserslautern. His current interest is highly accurate sensing and positioning based on quantum effects.

Tomo Tanaka received his Ph.D. in Engineering from Hokkaido University. He joined the Smart Energy Research Laboratories of NEC Corporation in 2014, and he was engaged in the R&D of infrared photodetectors. From 2018 to 2019, he was a visiting scientist at MIT. From 2019, he has been at NEC System Platform Research Laboratories in Japan. His current research interests are emerging quantum devices.

Jim Wieser
Director of University Research and Technology
Texas Instruments



Meng-Fan (Marvin) Chang
Director, Corporate Research
TSMC

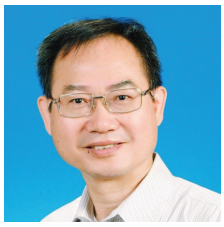
Jim serves Texas Instruments as Director of University Research and Technology within the university relations organization in close collaboration with the CTO Office. In this role he identifies and drives strategic technology initiatives, research strategy and aligns university research to the needs of the company. His semiconductor experience spans over 40 years in the areas of design, product development management and technologist. He is an IEEE Life Senior Member and SRC Executive Technical Advisory Board member for TI. Jim has been an active member of the SRC-SIA Decadal Plan for Semiconductors committee, chairing the analog focus area workshop and report.

Jim received his BSEE and MSEE from University of Michigan and joined National Semiconductor starting his career in the semiconductor industry. He began as a circuit designer in the pioneering days of analog CMOS, including switched capacitor filters and data converters. Jim developed circuits and managed design of telecom products, including voice band codecs, modems, ISDN and ADSL. Jim spent two years as Director/VP of Analog/Mixed Signal Methodology refining the analog design flow to address National's SoC product strategy. Later he led the development of 10/100 and Gigabit Ethernet Phys and MACs in the Networking division as Design Director. In 2002 Jim was promoted to Chief Technologist of the Interface Division and was later promoted to Chief Technologist for the Product Group covering four product divisions. He later joined the CTO office to drive strategic technology and university research. Jim holds 21 patents in the area of analog circuits and system design.

Dr. Chang is Director of Corporate Research (CR) of TSMC and is responsible for University Program, Design Solution and Memory Devices at CR. Prior to joining TSMC in 2019, he is a Distinguished Professor in the Electrical Engineering Department at National Tsing Hua University (NTHU), Taiwan during 2006-2019. Before 2006, he has worked in industry on memory circuit designs over 10 years. During 1996-2006, Dr. Chang was with Mentor Graphics, TSMC, and IPLib.

His research interests include design-technology co-optimization (DTCO), circuit designs for volatile and nonvolatile memory, ultra-low-voltage systems, 3D-memory, circuit-device interactions, spintronics circuits, cryogenic CMOS circuits, memristor logics for neuromorphic computing, and computing-in-memory for artificial intelligence chips.

Dr. Chang has published more than 80 papers in ISSCC, IEDM, VLSI and DAC. He has also been serving on the Executive Committee for IEDM, as well as Subcommittee Chairs for ISSCC, IEDM, DAC, ISCAS, and numerous international conferences. He has been a Distinguished Lecture speaker for IEEE Solid-State Circuits Society (SSCS) and Circuits and Systems Society (CASS). He has also been serving as the Program Director of Micro-Electronics Program of Ministry of Since and Technology (MOST) in Taiwan during 2018-2020, Associate Executive Director for Taiwan's National Program of Intelligent Electronics (NPIE) and NPIE bridge program during 2011-2018. He is a Fellow of the IEEE.



Chuei-Tang Wang
Technical Director
TSMC

Dr. Chuei-Tang Wang is Director of Pathfinding for System Integration (PSI) in TSMC. He is responsible for system electrical and thermal simulations for system technology solution development.

He received the B.S. and M.S. degrees in materials science and engineering from National Tsing Hua University, Hsinchu, Taiwan, in 1983 and 1985, respectively, and the Ph.D. degree from Stanford University, Stanford, CA, USA, in 1997. In 2000, he joined USI in Nantou, Taiwan and led EE and packaging team for wireless connectivity SIP module design & manufacturing. In 2011, he joined TSMC Integrated Interconnect and Packaging (IIP) R&D team as a Technical Director for system architectures and their SI, PI, and RF performance exploratory study.

In 2007, he had received a National Award of Industrial Technology Advancement (ITA), Taiwan, for the leadership of connectivity SiP module development in industry and a National Innovation and Creation Award for new SiP packaging invention, respectively. Now he is a committee member in RF, High-Speed Components & Systems subcommittee in ECTC. He holds more than 100 US patents and publishes more than 20 papers in IEDM, VLSI, ECTC, and etc

MIT FACULTY AND STAFF BIOGRAPHIES

Akintunde Ibitayo (Tayo) Akinwande
Professor, Department of Electrical Engineering & Computer Science

Akintunde Ibitayo (Tayo) Akinwande is a Professor in the Electrical Engineering and Computer Science Department a core member of Microsystems Technology Laboratories (MTL). His research has focused on micro-fabrication and electronic devices with particular emphasis on smart sensors and actuators, displays, large area electronics (macro-electronics), field emission devices, Micro-/Nano-Electro Mechanical Systems (MEMS/NEMS) and devices that exploit charged particle beams such as x-ray sources to enable portable phase contrast x-ray imaging. Before MIT, Tayo was a Staff Scientist at Honeywell Inc in Bloomington, MN. Tayo was a program manager in the Microsystems Technology Office (MTO) of the Defense Advanced Projects and Research Agency (DARPA) from 2009 to 2013 while on a leave of absence from MIT.

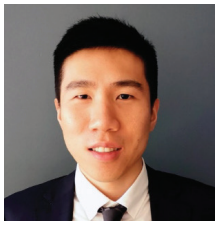
Duane S. Boning
Associate Director, MTL
Clarence J. LaBel Professor, Department of Electrical Engineering & Computer Science
Engineering Faculty Co-Director, MIT Leaders for Global Operations (LGO) Program

Duane S. Boning is the Clarence J. LeBel Professor in the Electrical Engineering and Computer Science Department at MIT. He is affiliated with the MIT Microsystems Technology Laboratories and serves as MTL Associate Director for Computation and CAD. From 2004 to 2011, he served as Associate Head of the EECS Department at MIT, from 2011 through 2013 as Director/Faculty Lead of the MIT Skoltech Initiative, and from 2011 to 2018 as the Director of the MIT/Masdar Institute Cooperative Program. From July 2019 to June 2021, he served as Associate Chair of the Faculty at MIT. He is currently the Engineering Faculty Co-Director for the MIT Leaders for Global Operations (LGO) Program.

He received his S.B. degrees in electrical engineering and in computer science in 1984, and his S.M. and Ph.D. degrees in electrical engineering in 1986 and 1991, respectively, all from the Massachusetts Institute of Technology. He was an NSF Fellow from 1984 to 1989, and an Intel Graduate Fellow in 1990. From 1991 to 1993 he was a Member Technical Staff at the Texas Instruments Semiconductor Process and Design Center in Dallas, Texas, where he worked on semiconductor process representation, process/device simulation tool integration, and statistical modeling and optimization. His research at MIT focuses on statistical and machine learning for understanding, controlling and reducing variation in semiconductor, photonics, and MEMS processes, devices, and circuits.

Vladimir Bulović
Founding Director, MIT.nano
Maseeh Professor, Department of Electrical Engineering & Computer Science

Vladimir Bulović is a Professor of Electrical Engineering at the Massachusetts Institute of Technology, holding the Fariborz Maseeh Chair in Emerging Technology. He directs the Organic and Nanostructured Electronics Laboratory, co-leads the MIT-Eni Solar Frontiers Center, leads the Tata GridEdge program, and is the Founding Director of MIT.nano, MIT's nano-fabrication, nano-characterization, and prototyping facility. He is an author of over 250 research articles (cited over 50,000 times and recognized as the top 1% of the most highly cited in the Web of Science). He is fellow of the National Academy of Inventors and an inventor of over 120 U.S. patents in areas of light emitting diodes, lasers, photovoltaics, photodetectors, chemical sensors, programmable memories, and micro-electro machines, majority of which have been licensed and utilized by both start-up and multinational companies. The start-up companies Bulović co-founded jointly employ over 350 people, and include Ubiquitous Energy, Inc., developing nanostructured solar technologies, Kateeva, Inc., focused on development of printed electronics, and QD Vision, Inc. (acquired in 2016) that produced quantum dot optoelectronic components. Products of these companies have been used by millions. Bulović was the first Associate Dean for Innovation of the School of Engineering and the Inaugural co-Director of MIT's Innovation Initiative, which he co-led from 2013 to 2018. For his passion for teaching Bulović has been recognized with the MacVicar Fellowship, MIT's highest teaching honor. He completed his Electrical Engineering B.S.E. and Ph.D. degrees at Princeton University.



Kevin Chen
Assistant Professor, Department of Electrical Engineering & Computer Science

Kevin Chen is the D. Reid Weedon, Jr. '41 Career Development Assistant Professor at the Department of Electrical Engineering and Computer Science, MIT. Kevin received his bachelor's degree in Applied and Engineering Physics from Cornell University in 2012 and his PhD in Engineering Sciences at Harvard University in 2017. His research interest includes developing multifunctional insect-scale robots capable of multimodal locomotion in complex environments. At MIT, his group focuses on developing high bandwidth and robust soft actuators for microrobot manipulation and locomotion. His group has developed the first sub-gram aerial robot powered by soft artificial muscles, and his team is working on realizing power autonomy in these microscale robotic systems. He has published in top journals including Nature, Science Robotics, Advanced Materials, PNAS, Nature Communications, IEEE TR-O, and Journal of Fluid Mechanics. He is a recipient of the RAL 2020 best paper award, the IROS 2015 best student paper award, Forbes 30 Under 30 (Science Category), and a Harvard Teaching Excellence Award.

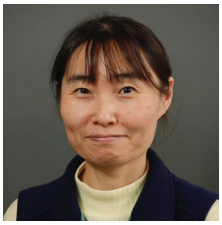
Jesús del Alamo
Donner Professor, Department of Electrical Engineering & Computer Science

Vicky Diadiuk
Associate Director of Operations, MTL

Jesús A. del Alamo is the Donner Professor and Professor of Electrical Engineering at Massachusetts Institute of Technology. He obtained a Telecommunications Engineer degree from Polytechnic University of Madrid and MS and PhD degrees in Electrical Engineering from Stanford University. In 1985 he joined Nippon Telegraph and Telephone LSI Laboratories in Japan and since 1988 he has been with the Department of Electrical Engineering and Computer Science of Massachusetts Institute of Technology. From 2013 until 2019, he served as Director of the Microsystems Technology Laboratories at MIT. His current research interests are focused on nanoelectronics based on compound semiconductors and ultra-wide band-gap semiconductors and novel ionic devices for artificial intelligence accelerators.

Prof. del Alamo was an NSF Presidential Young Investigator. He is a member of the Royal Spanish Academy of Engineering and Fellow of the Institute of Electrical and Electronics Engineers, the American Physical Society and the Materials Research Society. He is the recipient of the Intel Outstanding Researcher Award in Emerging Research Devices, the Semiconductor Research Corporation Technical Excellence Award, the IEEE Electron Devices Society Education Award, the University Researcher Award by Semiconductor Industry Association and Semiconductor Research Corporation, the IPRM Award and the IEEE Cledo Brunetti Award. He currently serves as Editor-in-Chief of IEEE Electron Device Letters. He is the author of "Integrated Microelectronic Devices: Physics and Modeling" (Pearson 2017, 880 pages), a rigorous and up to date description of transistors and other contemporary microelectronic devices.

Vicky Diadiuk received the B.S. and Sc.D. degrees in Physics from the Massachusetts Institute of Technology, in 1972 and 1978, respectively. Her theses were in the field of Josephson and Nb-based superconducting junctions. Starting in 1978, she was a member of the research staff at MIT Lincoln Laboratory, where she worked on optoelectronic devices in III-V semiconductors. Her research effort concentrated on the development, fabrication, and characterization of high-speed PIN and high-gain avalanche photodetectors on InP-based compounds. She also worked on diode lasers for optical communications, including external cavity-coupled laser and lenslet arrays. In 1996 she joined the Microsystems Technology Laboratories, where she is now Associate Director, Operations. She is in charge of managing the micro/nanofabrication laboratories, in which Si, MEMS & photonic devices are fabricated. She is the Chair of MTL's Process Technology Committee. Dr. Diadiuk holds several US patents and is co-author of numerous publications. She has served on a variety of Conference Committees and University Technical Advisory Boards.



Jing Kong
Associate Director, MTL
Professor, Department of Electrical Engineering & Computer Science

Jing Kong is a principal investigator in the Research Laboratory of Electronics (RLE) at the Massachusetts Institute of Technology (MIT). She received the B.S in chemistry from Peking University in 1997 and the Ph.D. in chemistry from Stanford University in 2002. From 2002 to 2003, she was a research scientist at NASA Ames Research Center, and from 2003 to 2004, she was a postdoctoral researcher at Delft University. She joined the MIT faculty in 2004 in the Department of Electrical Engineering & Computer Science.

Professor Kong is a member of IEEE. The research in her group focuses on the synthesis, characterization, and application of nanomaterials including carbon nanotubes and two-dimensional materials such as graphene and transition metal dichalcogenides.

Jeffrey Lang
Associate Director, MTL
Professor, Department of Electrical Engineering & Computer Science

Jeffrey H. Lang received his SB (1975), SM (1977) and PhD (1980) degrees from the Department of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology. He joined the faculty of MIT in 1980 where he is now the Vitesse Professor of Electrical Engineering. He served as the Associate Director of the MIT Laboratory for Electromagnetic and Electronic Systems from 1991 to 2003, and now serves as an Associate Director of the MIT Microsystems Technology Laboratories since 2012. Professor Lang's research and teaching interests focus on the analysis, design and control of electromechanical systems with an emphasis on: rotating machinery; micro/nano-scale (MEMS/NEMS) sensors, actuators and energy converters; flexible structures; and the dual use of electromechanical actuators as motion and force sensors. He has written over 320 papers and holds 29 patents in the areas of electromechanics, MEMS, power electronics and applied control. He has been awarded 6 best-paper prizes from IEEE societies, and has received two teaching awards from MIT. He is a coauthor of Foundations of Analog and Digital Electronic Circuits published by Morgan Kaufman, and the editor of, and a contributor to, Multi-Wafer Rotating MEMS Machines: Turbines Generators and Engines published by Springer. Professor Lang is a Life Fellow of the IEEE, and a former Hertz Foundation Fellow. He served as an Associate Editor of Sensors and Actuators between 1991 and 1994. He has also served as the Technical Co-Chair and General Co-Chair of the 1992 and 1993 IEEE MEMS Workshops, respectively, and the General Co-Chair of the 2013 PowerMEMS Conference.

Hae-Seung (Harry) Lee
MTL Director
Professor, Department of Electrical Engineering & Computer Science

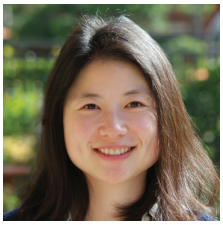
Prof. Hae-Seung (Harry) Lee received the Ph.D. degree in electrical engineering from the University of California, Berkeley, in 1984, where he developed self-calibration techniques for A/D converters. Since 1984, he has been on the faculty in the Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge, MA, where he is now Advanced Television and Signal Processing Professor of Electrical Engineering. He is the Director of Microsystems Technology Laboratories and the Director of Center for Integrated Circuits and Systems. He has served the Technology Advisory Committee for Samsung Electronics, Cypress Semiconductor, Sensata Technologies, and Dual Aperture, Inc. He co-founded several companies including SMaL Camera Technololgies, Cambridge Analog Technologies, Omni Design Technologies, and Merlin Tech. His research interests are in the areas of analog andmixed-signal integrated circuits in scaled CMOS technologies as well as medical electronics. Prof. Lee is a recipient of the 1988 Presidential Young Investigators' Award, and a co-recipient ISSCC Jack Kilby Outstanding Student Paper Award in 2002 and 2006. He has served a number of technical program committees for various IEEE conferences, including the International Electron Devices Meeting, the International Solid-State Circuits Conference, the Custom Integrated Circuits Conference, and the IEEE Symposium on VLSI circuits. Prof. Lee is an inventor or a co-inventor of 63 issued U.S. patents and numerous international patents. He has published more than 160 peer reviewed journal and conference papers, and is a Fellow of IEEE.

Nicholas Menounos
Assistant Director of Infrastructure, MIT.nano

Nicholas P. Menounos received his Bachelors of Engineering (B.E.) degree in Mechanical Engineering from McGill University in 2008, obtained a LEED Associate Professional accreditation from the USGBC in 2009 and has held a Professional Engineering (P.E.) license in the state of Massachusetts since 2012. Over the course of his career he has worked on a wide range of industrial, commercial and infrastructure projects, including; nuclear, defense, biopharmaceutical, higher education R&D and semiconductor manufacturing. Nicholas was the lead process engineer on the MIT.nano building design team and officially joined MIT in 2017, to support building startup and turnover. As the Assistant Director of Infrastructure for MIT.nano, he is responsible for tool installation projects within the facility and ensuring the environmental conditions and utilities meet the research needs of the community.

Jorg Scholvin
Assistant Director User Services - Fab.nano, MIT.nano

Jorg Scholvin grew up in Germany and came to MIT as an undergraduate in computer science. A fascination with microfabrication resulted in a switch to electrical engineering, and a Ph.D. with Prof. Jesus del Alamo on CMOS technology for RF power applications. After working as a derivatives trader at UBS in CT for three years, Jorg returned to MIT, joining Prof. Ed Boyden's lab to work on research combining microfabrication and neuroengineering. Jorg co-founded Neural Dynamics Technologies, an SBIR-funded company that currently commercializes this new technology. In 2018, Jorg joined MIT.nano as the Assistant Director of User Services at Fab.nano, where he assists with transitioning labs and users into the new building, and acts as technical consultant to researchers using the fabrication facility. For the past 3 years, Jorg also has been co-lecturing 6.152J, MIT's micro/nano undergraduate lab class.



Sixian You
Assistant Professor, Department of Electrical Engineering & Computer Science

Sixian You is an Assistant Professor in the MIT EECS department, and the Principal Investigator of the Computational Biophotonics Laboratory at MIT RLE. Her research focuses on developing microscopy technologies for biomedical problems through the lens of optical physics, instrumentation, and algorithms. Sixian earned her Ph.D. and M.S. on microscopy from University of Illinois at Urbana-Champaign, and did her postdoc on computational imaging in University of California at Berkeley. Between PhD and postdoc, she worked in Apple on optical sensing technologies in consumer electronics.

MTL LEADERSHIP BIOGRAPHIES

Stacy McDaid
Administrative Officer, MTL

Stacy McDaid assumed the position of MTL Administrative Officer in July 2018. Ms. McDaid brings a multi-disciplinary background and more than 20 years of administrative and financial management experience. She has a BS from Northeastern University. Ms. McDaid started her career at Draper Laboratory, where she worked as an administrative assistant and then a program administrator. Stacy has now been at MIT for 13 years, with years of service as a Senior Fiscal Officer at both the Media Laboratory and the Mechanical Engineering Department, as well as a Contract Administrator in MIT's Office of Sponsored Programs.

Duane S. Boning
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Vicky Diadiuk
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Jing Kong
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Jeffrey Lang
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Hae-Seung (Harry) Lee
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MTL MICROSYSTEMS TECHNOLOGY LABORATORIES

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