

Microsystems Technology Laboratories

The mission of the MIT Microsystems Technology Laboratories (MTL) is to foster world-class research, education, and innovation at the nanoscale to help solve some of the world's greatest problems in energy, communications, water, health, information, and transportation. In all these important areas of human concern, researchers at MIT are engineering new materials, structures, devices, circuits, and systems using MTL's facilities and services in search of new solutions to persistent problems. MTL's research program is highly interdisciplinary and encompasses integrated circuits, systems, electronic and photonic devices, MEMS, bio-MEMS, molecular devices, nanotechnology, sensors, and actuators. MTL core faculty, and the students and researchers in their labs, are conducting breakthrough research on a scale from 1 nm to 1 μm , in areas encompassing nanoscale transistors, medical devices, microfluidics, organic lasers, and perovskite photovoltaics, among other content.

At present, MTL's core faculty comprises 51 members representing seven departments across the Schools of Engineering and Science. While MTL faculty are principally drawn from the Departments of Electrical Engineering and Computer Science (EECS), Mechanical Engineering (MechE), and Materials Science and Engineering, MTL continues to see expanding interest and engagement from faculty in the Departments of Biological Engineering, Chemical Engineering, Chemistry, and Physics. Because circuits, sensors, and devices are integral to a virtually unlimited range of applications, MTL has built, and continues to strengthen, collaborations and interactions with many other research labs and centers across the Institute, including the Research Laboratory of Electronics, the MIT Energy Initiative, the Institute for Medical Engineering and Sciences (IMES), the Materials Processing Center, the Materials Research Laboratory, the Computer Science and Artificial Intelligence Laboratory, the Koch Institute for Integrative Cancer Research, and the Institute for Soldier Nanotechnology. MTL core faculty serve MIT and the global community in significant leadership positions across the Institute. MTL is honored to note that its core faculty include MIT president Rafael Reif, the provost Martin Schmidt, the associate provost Karen Gleason, the School of Engineering's dean Anantha Chandrakasan, the MechE's department head Evelyn Wang, and the MIT.nano's founding director Vladimir Bulović.

MTL has historically managed a set of shared experimental facilities in Buildings 39 and 24. These facilities currently host more than 150 fabrication and analytical tools. A significant milestone for MTL was the transfer of administrative management of these fabrication facilities to MIT.nano at the end of fiscal year 2018. The physical transfer of the fabrication environment and tools into the newly renovated Building 12 will begin in FY2019. During this transition period, the fabrication capabilities—including diffusion, lithography, deposition, etching, and packaging—will continue to be available to the entire MIT community and the outside world.

MTL also manages an information technology infrastructure that supports state-of-the-art computer-aided design tools for device, circuit, and system design. MTL has fostered strong relationships with major semiconductor manufacturers, enhancing the ability to provide the community with some of the most advanced commercially-integrated

circuit fabrication processes available in the world today. In all, nearly 600 MIT students and postdocs from 21 different departments, laboratories, and centers carried out their research in MTL's facilities, or used MTL's design services, in the last fiscal year. In addition, many researchers from for-profit companies, government research laboratories, and domestic and international universities use MTL's facilities annually.

End of an Era: Fabrication Facilities transfer to MIT.nano

On June 30, 2018, the MTL Fabrication Service Center administration was formally transferred to MIT.nano, including the appointments of all sponsored research and service staff who manage the facilities and tools, and all of the financial activity of the facilities. MTL leadership and staff worked very closely with the MIT.nano team to coordinate this administrative transition and to prepare for the physical transfer of tools and equipment from MTL to MIT.nano, which will commence in FY2019.

Industry Engagement

MTL partners with industry through the Microsystems Industrial Group (MIG) consortium. The member companies within the MIG support MTL research and operations through a membership fee and, in some cases, by providing access to the state-of-the-art semiconductor fabrication design tools and processes and donating equipment. Members of the MIG's [Industrial Advisory Board \(IAB\)](#) provide guidance in shaping the vision of MTL.

MTL hosted its annual IAB meeting on January 31, 2018, with representatives from 12 MIG member companies in attendance. Select members of the core faculty presented their current research initiatives, and the IAB representatives participated in a wide-ranging and thoughtful discussion on the current state and the future of nanofabrication research and facilities at MIT. StartUP@MTL, which was introduced in FY2017, was again a highlight of the meeting, with participation of eight MTL-related startups, whose senior leadership presented their technologies, future products, and business plans to the MIG members in attendance. MIG company representatives attending the IAB meeting included: Susan Feindt (Analog Devices [ADI]), Chorn-Ping Chang (Applied Materials), David Carter (Draper), Pieter Wolters (DSM), Neil Condon (Edwards Vacuum), Vivek Dave (HARTING), Yoshito Nejime (Hitachi), Dirk Pfeiffer (IBM), Nerissa Draeger (Lam Research), Shinichi Yozoru (NEC), Anand Venkatesan (Qualcomm), and Doug Yu (Taiwan Semiconductor Manufacturing Company).

MIG member companies engage with MTL core faculty, students, and researchers in many ways, including online access to the MTL resume site, assistance with recruiting events on campus, exclusive access to MTL's annual research conference, faculty visits, and priority access to MTL resources. One of the unique benefits that member companies receive is the opportunity to have a scientist or engineer in residence on campus as an active participant in the research activities of an MTL-affiliated faculty member or research center. This past year, there have been eight visitors from MIG member companies:

- James Fiorenza (ADI) with Professor Tomas Palacios
- Tom O'Dwyer (ADI) with Professor Charles Sodini

- Sam Fuller (ADI) with Professor Charles Sodini
- Anthony Taylor (Edwards Vacuum) with Luis Fernand Velasquez-Garcia
- Vivek Dave (HARTING) with Professor Jesus del Alamo
- Masahiro Sakuta (Hitachi) with Professor Duane Boning
- Dennis Buss (Texas Instruments) with MTL
- Chiraag Juvekar (ADI) with Professor Anantha Chandrakasan

In November 2017, MTL hosted the annual Lam Day at MIT event in a new format at an offsite venue that included both a panel discussion among Lam researchers who are MIT alumni, and time for networking and socializing. This event drew more than 100 members of the MTL community.

In October 2017, Lam Research organized a Lam Technical Conference in Fremont, CA, in which two MTL professors—Eugene Fitzgerald and Jeehwan Kim—and two MTL graduate students—Xiaowei Cai and Wenjie Lu—participated.

Also in October 2017, two undergraduate students, Professors del Alamo and Jeffrey Lang, participated at the HARTING Business Conference.

Research Centers

Four centers affiliated with MTL provide the opportunity for MIG member companies and other companies to become engaged in focused research initiatives. These are the Center for Integrated Circuits and Systems (CICS), the MIT GaN Energy Initiative (MIT GaN), the Medical Electronic Device Realization Center (MEDRC), and the MIT-MTL Center for Graphene Devices and 2D Systems (MIT-CG).

The mission of the CICS is to promote new research initiatives in circuits and systems design, as well as a tighter technical relationship between MIT's research and relevant industry. CICS investigates a wide range of circuits and systems, including wireless and wireline communication, high-speed and RF circuits, microsensor/actuator systems, imagers, digital and analog signal processing circuits, biomedical circuits, and power conversion circuits, among others. In FY2018, MTL supported CICS in hosting two Research Reviews on campus, one held in November 2017 and the other in May 2018.

The MIT GaN is an interdepartmental program focused on the advancement of the science and engineering of GaN-based materials and devices for energy applications. The GaN Energy Initiative provides a holistic approach to GaN research for energy applications, and it coordinates work on the growth, technology, novel devices, circuits, and systems to take full advantage of the unique properties of GaN. The GaN Energy Initiative is especially interested in developing new beyond-state-of-the-art solutions to system-level applications in RF power amplification, mixed-signal electronics, energy processing, power management, and advanced optoelectronics. Most of the work is done on GaN materials and devices that are compatible with Si fabrication technologies, in close collaboration with industrial partners to accelerate the insertion of these devices into systems. In December 2017, the GaN Energy Initiative held its annual review with support from MTL.

The vision of the MEDRC is to revolutionize medical diagnostics and treatments by bringing healthcare directly to the individual and to create enabling technology for the future information-driven healthcare system. This vision will, in turn, transform the medical electronic device industry. Specific areas that show promise are wearable or minimally invasive monitoring devices, medical imaging, portable laboratory instrumentation, and the data communication from these devices and instruments to healthcare providers and caregivers. MEDRC embodies the interdisciplinary focus of MTL's research through its close association with IMES, which has been charged to serve as a focal point for researchers with medical interest across MIT. MEDRC has been able to create strong connections with the medical device and microelectronics industry, venture-funded startups, and the Boston medical community. With the support of MTL and IMES, MEDRC serves as the catalyst for the deployment of medical devices that will reduce the cost of healthcare in both the developed and developing worlds. In May 2018, MTL supported MEDRC in hosting their tenth annual research conference, featuring workshops with physicians, healthcare professionals, engineers, and researchers in nanotechnology, electronics, medical devices, and systems.

The MIT-CG brings together MIT researchers and industrial partners to advance the science and engineering of graphene and other two-dimensional materials. Specifically, the center explores advanced technologies and strategies that enable 2D materials, devices, and systems to provide discriminating or breakthrough capabilities for a variety of system applications, ranging from energy generation/storage and smart fabrics/materials to optoelectronics, RF communications, and sensing. In all these applications, the MIT-CG supports the development of the science, technology, tools, and analysis for the creation of a vision for the future of new systems enabled by 2D materials. In November 2017, the center held its annual review with support from MTL.

2018 Research Highlights

MTL's notable research results are highlighted below, and the [MTL website](#) holds more comprehensive details on MTL activities, people, awards, and research accomplishments.

Professor Vivienne Sze

Navion: A Fully Integrated Energy-Efficient Visual-Inertial Odometry Accelerator for Autonomous Navigation of Nano Drones. This paper presents Navion, an energy-efficient accelerator for visual-inertial odometry (VIO) that enables autonomous navigation of miniaturized robots (e.g., nano drones), and virtual/augmented reality on portable devices. The chip uses inertial measurements and mono/stereo images to estimate the drone's trajectory and a 3D map of the environment. This estimate is obtained by running a state-of-the-art algorithm based on non-linear factor graph optimization, which requires large irregularly structured memories and heterogeneous computation flow. To reduce the energy consumption and footprint, the entire VIO system is fully integrated on-chip to eliminate costly off-chip processing and storage. This work uses compression and exploits both structured and unstructured sparsity to reduce on-chip memory size by 4.1x. Parallelism is used under tight area constraints to increase throughput by 43%. The chip is fabricated in 65nm complementary metal-oxide-semiconductor (CMOS) and can process 752x480 stereo images at up to 171 fps and inertial measurements at up to 52 kHz while consuming an average of 24mW. The chip

is configurable to maximize accuracy, throughput and energy-efficiency across different environments. This is likely the first fully integrated VIO system in an application-specific intergrated circuit (ASIC).

Principal Research Scientist Luis Velásquez-García

3D Printed Multiplexed Electrospinning Sources for Large-Scale Production of Aligned Nanofiber Mats with Small Diameter Spread. A report on the design, fabrication, and characterization of novel, low-cost, and modular miniaturized nanofiber electrospinning sources for the scalable production of non-woven aligned nanofiber mats with low diameter variation. The devices are monolithic arrays of electrospinning emitters made via stereolithography; the emitters are arranged so each element has an independent line of sight to a rotating collector surface. Linear and zigzag emitter packing were evaluated using a PEO solution with the aim of maximizing the throughput of nanofibers with the smallest diameter and narrowest distribution. Current versus flowrate characterization of the devices showed that for a given flowrate a zigzag array produces more current per emitter than a linear array of the same emitter pitch and array size. In addition, the data demonstrate that larger and denser arrays have a net gain in flow rate per unit of active length. Visual inspection of the devices suggests uniform operation in devices with as many as 17 emitters with 300 μm inner diameter and 1.5 mm emitter gap. Well-aligned nanofiber mats were collected on a rotating drum and characterized; the 17-emitter device produced the same narrow nanofiber distribution (~ 81 nm average diameter, ~ 17 nm standard deviation) for all tested flow rates, which is strikingly different to the performance shown by 1-emitter sources where the average fiber diameter significantly increased, and the statistics notably widened when the flowrate increases. Therefore, the data demonstrate that massively multiplexing the emitters is a viable approach to greatly increase the throughput of non-woven aligned nanofiber mats without sacrificing the statistics of the nanofibers generated. The production of dry nanofibers by the 17-emitter array is estimated at 33.0 mg min^{-1} (1.38 mg min^{-1} per mm of active length), which compares favorably with the reported multiplexed electrospinning arrays with emitters distributed along a line.

Professor Anantha Chandrakasan

An Energy-Efficient Reconfigurable DTLS Cryptographic Engine for End-to-End Security in IoT Applications. End-to-end security protocols, like Datagram Transport Layer Security (DTLS), enable the establishment of mutually authenticated confidential channels between edge nodes and the Cloud, even in the presence of untrusted and potentially malicious network infrastructure. While this makes DTLS an ideal solution for IoT, the associated computational cost makes software-only implementations prohibitively expensive for resource-constrained embedded devices. This challenge is addressed through three key contributions: reconfigurable cryptographic accelerators enable two orders of magnitude energy savings, a dedicated DTLS engine offloads control flow to hardware reducing program code, and memory usage by $\sim 10\times$, and an on-chip RISC-V core exercises the flexibility of the cryptographic accelerators to demonstrate security applications beyond DTLS.

Professors Jesús del Alamo and Eugene Fitzgerald

Sub-10 nm Diameter InGaAs Vertical Nanowire MOSFETs. The first sub-10 nm diameter vertical nanowire transistors of any kind in any semiconductor system have been achieved. These devices are InGaAs MOSFETs fabricated by a top-down approach using reactive ion etching, alcohol-based digital etch, and Ni alloyed contacts. A record I_{on} of $350 \mu\text{A}/\mu\text{m}$ at $I_{off} = 100 \text{ nA}/\mu\text{m}$ and $V_{dd} = 0.5 \text{ V}$ is obtained in a 7 nm diameter device. The same device exhibits a peak transconductance ($g_{m,pk}$) of $1.7 \text{ mS}/\mu\text{m}$ and minimal subthreshold swing (S) of $90 \text{ mV}/\text{dec}$ at $V_{ds} = 0.5 \text{ V}$, achieving the highest quality factor (defined as the ratio $g_{m,pk}/S$) of 19 reported in vertical nanowire transistors. Excellent scaling behavior is observed with $g_{m,pk}$ and I_{on} increasing as the diameter is shrunk down to 7 nm.

Professor Ruonan Han

Molecular Detection for Unconcentrated Gas with ppm Sensitivity using 220-to-320-GHz Dual-Frequency-Comb Spectrometer in CMOS. Millimeter-wave/terahertz rotational spectroscopy of polar gaseous molecules provides a powerful tool for complicated gas mixture analysis. In this paper, a 220-to-320-GHz dual-frequency-comb spectrometer in 65-nm bulk CMOS is presented, along with a systematic analysis on fundamental issues of rotational spectrometer, including the impacts of various noise mechanisms, gas cell, molecular properties, detection sensitivity, and more. The comb spectrometer, based on a high-parallelism architecture, probes gas sample with 20 comb lines simultaneously. It does not only improve the scanning speed by 20x, but also reduces the overall energy consumption to $90 \text{ mJ}/\text{point}$ with 1 Hz bandwidth (or 0.5 s integration time). With its channelized 100-GHz scanning range and sub-kHz specificity, wide range of molecules can be detected. In the measurements, state-of-the-art total radiated power of 5.2 mW and single sideband noise figure of 14.6–19.5 dB are achieved, which further boost the scanning speed and sensitivity. Finally, spectroscopic measurements for carbonyl sulfide (OCS) and acetonitrile (CH_3CN) are presented. With a path length of 70 cm and 1 Hz bandwidth, the measured minimum detectable absorption coefficient reaches $\alpha_{\text{gas, min}} = 7.2 \times 10^{-7} \text{ cm}^{-1}$. For OCS that enables a minimum detectable concentration of 11 ppm. The predicted sensitivity for some other molecules reaches ppm level (e.g., 3 ppm for hydrogen cyanide), or 10 ppt level if gas preconcentration with a typical gain of 105 is used.

2018 Program Highlights

In February 2018, Professor Jeewan Kim organized the MIT-University of Massachusetts joint mini-workshop on neuromorphic computing hardware, co-hosted by MTL and RLE. This day-long event included presentations from 22 MIT and University of Massachusetts faculty.

On April 26–27, 2018, MTL honored its founding director Dimitri A. Antoniadis on the occasion of his retirement with a formal dinner followed by a day-long symposium The Future of Nanoscale Electronics. Invited speakers and guests addressed a variety of topics including the future of transistor integration and whether field-effect transistors will be challenged as the foundation of digital logic, 3-D integration, and the future role of photonics, 2D materials, quantum computing, exotic materials, and artificial intelligence.



Professor Dimitri Antoniadis, shown fourth from right, first row, stands with several generations of his former group members at the day-long symposium held in honor of his retirement on April 27, 2018. Photo, Paul McGrath/MTL.

In May 2018, Professor Tomas Palacios chaired the Compound Semiconductor Week (CSW) conference at MIT, attended by almost one thousand researchers from around the world. As in previous years, CSW 2018 brought together the 45th International Symposium on Compound Semiconductors and the 30th International Conference on Indium Phosphide and Related Materials.

In FY2018, MTL welcomed the third cohort of visiting faculty, postdocs, and students under the formal relationship MIT had established with Tecnológico de Monterrey in FY2015. Two faculty members, three postdoctoral fellows, and two graduate and undergraduate students were hosted by faculty in five labs across MIT and at the Brigham & Women's Hospital for stays of one semester to one year. The visiting researchers' interests ranged from 3D printing for biomedical sensing applications to the study of thermally conducting polymers for electronic packaging. Again this year, the work of program participants resulted in several papers submitted for publication or for presentation in peer-reviewed journals and conferences. As a further component of this program, MTL hosted 32 students, postdocs, and faculty this year in four separate one-week sessions of the MTL nanoLab hands-on course on nanotechnology.

MTL engages the community in a number of technical events and programs. In both fall and spring of each academic year, the laboratory hosts a seminar series spanning diverse technical areas. The seminars are organized by a committee chaired by Dr. Luis Velasquez-Heller, and all seminars are open to the public. In addition to these regular seminars, MTL hosts one Doctoral Dissertation Seminar (DDS) each semester featuring a recent MTL PhD graduate, as well as occasional Executive Seminars featuring senior leaders from the MIG member companies. In October 2017, CEO Vincent Roche of Analog Devices, Inc. delivered an MTL executive seminar *Semiconductor Innovation: Game Over or Next Level?* In December 2017, Dr. Sarvesh Varma's dissertation, "A Microfluidic System for Modeling Human Atherosclerosis and Pathophysiology" was selected for DDS presentation, and in May 2018, the DDS award winner was Dr. Olivia Hentz, who presented her dissertation "The Uncommon Nature of Point Defects in Organic-Inorganic Perovskite Solar Cells."

Every January, MTL holds the Microsystems Annual Research Conference (MARC) run by MTL graduate students. The 2018 MARC was co-chaired by students Preet Garcha (from Professor Chandrakasan's group) and Ben Lienhard (from Professor Englund's group). MARC is broadly attended by industry, faculty, students, and staff, as it provides a unique opportunity to learn about research in the diverse areas encompassed by MTL while fostering interactions among the MTL community. The event was held on January 29–30, 2018 at the Omni Mount Washington Resort in Bretton Woods, New Hampshire. Approximately 215 students, postdocs, faculty, staff, and industry partners were in attendance, including 22 MIG company guests and 32 student / postdoc organizers. MTL students, postdocs, and researchers presented more than 100 posters and three plenary-featured talks. The MARC agenda also featured a dinner keynote by MIT alumna Marina Hatsopoulos, "The Decisions of an Entrepreneur," and a conference-opening technical keynote delivered by University of Maryland Professor Christopher Monroe, "Quantum Computing with Trapped Atomic Ions."

Facilities Update

During the past year, MTL continued to replace aging tools, extended the usefulness of existing tools, and acquired new capabilities, while keeping in mind the needs of fab. nano. The MLA-150 direct-write exposure system, acquired at the end of 2017 with support provided through a replacement fund from the Office of the Vice President for Research (VPR). It replaced an aging mask aligner and quickly became the most heavily used optical lithography tool and it has complemented the ebeam writer, allowing optimal utilization of both systems. With approval from the VPR, MTL used replacement funds for the next three years to purchase two SAMCO systems, a PECVD and an RIE, to replace the failing Plasmatherm PECVD-RIE in the 5th-floor lab. This will be the cornerstone of the transition of the 5th- floor fab in Building 39 to Building 12. These tools are expected to arrive in early 2019 and will be installed directly in Building 12.

In addition to equipment renewal, MTL supported the RLE-managed renovation of Max Shulaker's lab space in Room 38-327. The lab has been outfitted with an additional fume hood and biosafety cabinet capacity, as well as HEPA filtration units and non-linting ceiling tiles to control the particle count in the lab. MTL also made space on the second floor of Building 39 available for Associate Professor Jeehwan Kim to install a graphene CVD reactor (a tool required by his research group). He will share that space with Associate Professor Luqiao Liu, who also has a need for facilitated lab space. In this regard, Building 39 is already beginning to function as the "private lab space" that is expected to be its role after the fabs physically move into MIT.nano, accommodating faculty who need space that is not otherwise available at MIT.

Outreach and Educational Activities

In support of MTL's mission to provide access to advanced fabrication technologies, MTL makes its facilities available to industry users through the Fabrication Facilities Access Program and to users from academia and government agencies through the Outreach Program. In the period of reporting, MTL supported the activities of half a dozen different companies, including two startups founded by MTL alumni and/or faculty.

MTL supports MIT's educational mission by providing \$3,000 of subsidized access to MTL computational or fabrication facilities for any MIT undergraduate students, and through three courses held at the laboratory, namely: Micro/Nano Processing Technology (6.152J), which introduces the theory and technology of micro/nano fabrication; Materials Project Laboratory (3.042), which provides student project teams the capabilities to design and fabricate a working prototype using materials processing technologies; and Projects in Microscale Engineering (6.07J), which is a project-based introduction to manipulating and characterizing cells and biological molecules using microfabricated tools for the life sciences.

MTL also actively engages in initiatives by the School of Engineering: the Women's Technology Program and the Super UROP Program.

Women's Technology Program

The Women's Technology Program (WTP) was created in 2002 to encourage high school-aged women with strong math, science, and analytical abilities to pursue studies in engineering and computer science. The program provides these women with positive female role models, college-level computing and engineering experience, and an understanding of what engineers and scientists do and how they work. WTP participants, in collaboration with EECS, have an opportunity during the summer for a hands-on experience in the microfabrication facilities of MTL, under the guidance of a female graduate student whose research depends heavily on using the MTL fabrication facilities. These young women go through the fabrication steps needed to transfer a group photograph onto a silicon wafer. Each student receives a wafer that displays the image of the group. Feedback from students has been very positive, and the "picture wafers" are a great reminder of their summer at MIT.

SuperUROP Program

SuperUROP engages MIT undergraduate students in a year-long research experience in which they participate in the course Preparation for Undergraduate Research. SuperUROP promotes direct interaction with faculty and industry sponsors, cultivates student creativity and professional development, and encourages students to consider the ethical and entrepreneurial aspects of their work. In FY2018, there were 42 undergraduate students in the program working in MTL, of which, 20 were qualified to work in the MTL fabrication facilities as part of their SuperUROP project, and 14 made use of the MTL CAD services.

Core Faculty Appointments and Promotions

Appointments and promotions of MTL faculty include:

- Evelyn Wang, former associate director of MTL, was appointed department head of the Department of Mechanical Engineering
- Jing Kong, professor of electrical engineering, was named associate director of MTL
- Dirk Englund was promoted to associate professor with tenure in EECS
- Ruonan Han was promoted to associate professor without tenure in EECS
- Jeehwan Kim was promoted to associate professor without tenure in MechE

Awards and Honors

MTL affiliated faculty, staff, and students regularly receive recognition for their research contributions and accomplishments with numerous national and international awards. They received the following awards and distinctions:

- Sze received an Emmy Award for the High-Efficiency Video standard as part of the joint collaborative team on video coding.
- Liu was selected for the 2017 McMillan Award. The citation reads, “for the demonstration of a large spin transfer torque and magnetic switching in metals induced by the spin Hall effect.”
- Liu was selected as the recipient of the 2017 Young Scientist Prize in the field of Magnetism by the International Union of Pure and Applied Physics. The award will be presented at the next International Conference on Magnetism, which will take place in San Francisco, CA, on July 15–20, 2018.
- Sze’s group received Best Invited Paper Award at the 2018 IEEE Custom Integrated Circuits Conference.
- PhD student Shireen Warnock was given the Best Student Paper Award for “OFF-state TDDB in High-Voltage GaN MIS-HEMTs” — a 2017 International Reliability Physics Symposium (IRPS) paper she co-authored with Professor del Alamo — at the 2018 IEEE IRPS, which took place in Burlingame, CA, in March.
- PhD student Priyanka Raina received the European Solid-State Circuits Conference (ESSCIRC) 2016 Best Young Scientist Paper Award at the 2017 IEEE ESSCIRC held in Leuven, Belgium.
- PhD student Wenjie Lu received the Next Generation Workforce Recognition at the 2018 SEMI Industry Strategy Symposium in Half Moon Bay, CA, on January 17, 2018.

Administrative Update

MTL staff is integral to its success and infrastructure, and had the following staffing updates:

- Debroah Hodges-Pabon, MTL’s HR administrator, left MIT in February 2018 after almost twenty-three years of service to MIT, all of which were with MTL.
- Sherene Aram, MTL’s administrative officer, retired from MIT in July 2018 after more than fifteen years of service to MIT. Prior to her retirement, Sherene was selected as a recipient of the MIT School of Engineering’s 2018 Infinite Mile Award.
- Stacy McDaid was hired in June 2018 as administrative officer. McDaid comes to MTL from the MIT Media Lab where she served as senior fiscal officer.

Jesús A. del Alamo

Director

Donner Professor and Professor of Electrical Engineering