

Microsystems Technology Laboratories

The Microsystems Technology Laboratories (MTL) conduct research and education with an intellectual core of semiconductor industry process and device technology and integrated circuits and systems design. MTL also leverages its infrastructure to foster new initiatives at the Institute and to support the general micro- and nanofabrication needs of MIT.

MTL carries out graduate and undergraduate research activities in circuits and systems that are built using microsystems technology for applications such as wireless sensing networks and intelligent vision systems. Additionally, researchers are investigating the fabrication and study of small (micrometer to nanometer) structures and their use for implementation of interesting integrated devices from nanometer-scale electronic devices to optical switches, displays, biosensors, and micropower generators. MTL facilities include laboratory space for electronics testing and assembly, computation and communication, and microfabrication. The MTL microfabrication facilities include three clean rooms totaling 6,500 sq ft: the state-of-the-art class-10 Integrated Circuits Laboratory, the flexible process environment Technology Research Laboratory, and the Exploratory Materials Laboratory. The equipment in MTL facilities has a replacement value far in excess of \$60 million. In AY2005, more than 450 students and staff used MTL fabrication facilities. The Laboratory manages a contract research volume of approximately \$12 million per year. Approximately \$40 million of contract research (primarily managed in other departments, labs, and centers) relied on the MTL facilities as an integral part of that research. The fabrication and computation facilities of MTL are maintained and operated by a full-time staff of more than 25 professionals.

Beyond the research programs, MTL supports several educational initiatives that leverage the research infrastructure of the labs. Chief among them is the undergraduate microfabrication laboratory, a lecture/laboratory course in which 120 students a year are afforded the opportunity to micro- and nanofabricate electronic, mechanical, and biochemical devices in state-of-the-art MTL facilities. We also offer a project laboratory for team-based design of microfabricated structures. Lastly, via the iCampus initiative, Professor Jesus del Alamo is developing a series of web-based laboratory tools that permit testing of microfabricated structures.

MTL maintains a strong and vibrant interaction with industries that value not only the research output but also the students who are educated in state-of-the-art microsystems technology. The MTL facilities are supported in part by industry through the MIT Microsystems Industrial Group, whose current members include Advanced Micro Devices, Analog Devices, Applied Materials, Hewlett-Packard, IBM, Intel Corporation, National Semiconductor, Novellus Systems, Samsung, and Texas Instruments. Four industry-funded centers are affiliated with MTL, as noted below.

Highlights

The research activities of MTL can be viewed online by exploring our annual report at the lab's website. This comprehensive reference is updated annually and provides a

full look at the entirety of MTL research. MTL research spans an extraordinarily broad set of activities. If one were to identify a unifying theme associated with these projects, it would be the system-level interest in micro- and nanotechnology. MTL represents a community that brings experimentalists skilled in materials and technology at the micro- and nanolevels together with circuits/systems researchers to realize visions for new systems that are enabled by the integration of these disciplines.

Beyond the detailed research activities summarized in our annual report, the laboratory focused its efforts in three areas: recruiting new industrial partners, undertaking major renovations and expansions of the existing infrastructure, and developing new programs for facilities access by outside companies. This year we are pleased to add NEC and NEC Electronics as members of our flagship consortium, The Microsystems Industrial Group. We also completed detailed design for a cleanroom expansion and facilities renovation, which will position MTL well to serve the campus community into the future. We anticipate initiation of construction shortly. Finally, we fully rolled out our Fabrication Facilities Access program, which is designed to give local companies the ability to access state-of-the-art MTL fabrication facilities. We have already enrolled more than eight companies in this program.

Many MTL personnel were recognized with awards this year. We are particularly proud of those who received awards in recognition for their service to the community. In February, Dr. Martin Luther King Jr. Leadership Awards were given to Acia Adams-Heath, fiscal officer in the Microsystems Technology Laboratories, and MTL/Electrical Engineering and Computer Science (EECS) graduate student Oluwamuyiwa Olubuyide. The Institute-wide Excellence Awards in Creating Connections were awarded to a team that included MTL's Mara Karapetian and Anne Wasserman. Finally, the School of Engineering awarded Infinite Mile Awards to MTL associate directors Samuel Crooks and Vicky Diadiuk.

We are pleased to welcome the newest addition to the MTL resident faculty. Dr. Tomas Palacios joins us as an assistant professor in EECS, having completed his PhD at the University of California–Santa Barbara.

Finally, in July 2006, Dean Thomas Magnanti announced the appointment of Professor Anantha Chandrakasan as the new director of MTL, effective September 1, 2006. We look forward with excitement to the future of MTL under Professor Chandrakasan's leadership.

Martin A. Schmidt
Director
Professor of Electrical Engineering and Computer Science

More information about the Microsystems Technology Laboratories can be found at <http://www-mtl.mit.edu/>.