

INTRODUCTION

Welcome to the 2009 Microsystems Technology Laboratories (MTL) Annual Report. This report summarizes the research from 115 faculty and senior research staff associated with the MTL. The report covers diverse research areas related to electronic device fabrication, integrated circuits and systems, photonics, and micro-electromechanical systems (MEMS), as well as molecular and nano-technologies. These investigators come from more than 38 different departments, labs, and centers across the Institute.

MTL is an interdepartmental laboratory at MIT with a mission to foster research and education in semiconductor process and device technology, and integrated circuits and systems design. MTL provides micro- and nano-fabrication and computer aided design (CAD) infrastructure to the entire campus. Last year, more than 550 researchers, primarily graduate students, conducted research using the MTL infrastructure. MTL also provides access to other educational /research institutes and the industrial community through its outreach program.

MTL's fabrication environment includes three clean rooms: the Class 10 Integrated Circuits Laboratory, the Class 100 Technology Research Laboratory, and the flexible Exploratory Materials Laboratory. The computational environment provides access to advanced electronic design automation (EDA) for device, circuit and system design. The fabrication and computation facilities of MTL are maintained and operated by approximately 20 full-time technical staff members.

MTL partners with industry through the Microsystems Industrial Group (MIG), who provide significant support, both financial and technical, for MTL's research and research infrastructure. This year, two new members, Qualcomm and Veeco, have joined the MIG. The members of the Industrial Advisory Board (one member from each of our MIG companies) provide guidance in shaping the vision of MTL. The current IAB can be found at the following website: <http://mtlweb.mit.edu/mig/iab.html>.

A number of committees set strategies and direction for the lab. The MTL Seminar Series Committee has put together an excellent seminar series open to the public. MTL's flagship event is the MTL Annual Research Conference (MARC) held annually. The most recent MARC was held on campus in January of 2009. The conference is run by MTL graduate students in collaboration with a steering committee chaired by Professor Joel Voldman. The conference has grown substantially over the past few years and is widely attended by industry, faculty, students and staff. MARC 2009 had more than 200 attendees. MTL also organized a highly successful workshop on next generation medical electronics (December 2008). We expect to significantly expand in the medical electronics area in the coming years. MTL Days at MIG companies, where MTL graduate students and faculty present leading-edge results to our industry partners, have also been popular.

Research conducted at MTL (as organized in the Annual Report) can be broadly classified into eight categories: Circuits & Systems, Electronic Devices, Energy, Materials, Medical Electronics, MEMS & BioMEMS, Nanotechnology, and Photonics. MTL has four affiliated industrial research centers with more focused interests: the Center for Integrated Circuits and Systems (CICS), the Intelligent Transportation Research Center (ITRC), MEMS@MIT, and the Center for Integrated Photonic Systems (CIPS).