

# Foreword

The 2014 Annual Report of the Microsystems Technology Laboratories highlights the research and educational activities of faculty, staff and students associated with MTL during MIT Fiscal Year 2014.

MTL's mission is to foster world-class research and education in Microsystems, broadly construed. As showcased in this report, MTL's activities encompass integrated circuits, systems, electronic and photonic devices, MEMS, bio-MEMS, molecular devices, nanotechnology, sensors and actuators, to name a few. MTL's research program is largely interdisciplinary. MTL's facilities are open to the entire MIT community and beyond. Over 600 MIT students and postdocs from 18 different Departments, Laboratories or Centers carried out their research in MTL's facilities in the last fiscal year.

To accomplish its mission, MTL manages a set of experimental facilities in Bldgs. 39 and 24 that host in excess of 150 processing and analytical tools. We strive to provide a flexible fabrication environment that is at the same time capable of long-flow integrated processes that yield complex devices, as well as low-barrier access to fast prototyping of structures and devices. Our fabrication capabilities include diffusion, lithography, deposition, etching, packaging and many others. Our lab can handle substrates from odd-shaped small pieces to 6-inch wafers. The range of materials continues to expand beyond Si and Ge to include III-V compound semiconductors, nitride semiconductors, carbon-based materials, polymers, glass, organics and others.

MTL also manages an information technology infrastructure that supports state-of-the-art computer-aided design (CAD) tools for device, circuit and system design. Together with a set of relationships with major semiconductor manufacturers, this provides access for our users to some of the most advanced commercial integrated circuit processes available in the world today.

MTL could not accomplish its mission without the vision, commitment and generosity of a number of companies that comprise the Microsystems Industrial Group (MIG). The MIG supports the operation of MTL's facilities but it also provides counsel to the faculty on research directions, trends and industrial needs. The list of current MIG members can be found in the Acknowledgement section of this report.

In the Fall of 2014, we will celebrate the 30<sup>th</sup> anniversary of the creation of MTL. From an initial emphasis on semiconductors and electronics, over the 30 years of its life, the technologies that underpin MTL's activities and their domains of application have greatly expanded. The 2014 Annual Report is the broadest in scope to date with abstracts describing research on nanofibers, medical devices, microfluidics, photonic phased arrays and quantum dot photovoltaics, among many exciting research projects.

The research activities described in these pages would not be possible without the dedication and passion of the fabrication, IT and administrative staff of MTL. Day in and day out, they strive to help MTL users to accomplish their goals. They do this in an unassuming manner. Their names do not usually end up in the research papers, but that does not diminish the significance of their contributions. To them and to all of you who support, in one way or another, the activities of MTL, a heartfelt thank you!

Jesús A. del Alamo  
Director, Microsystems Technology Laboratories  
Donner Professor, Department of Electrical Engineering and Computer Science  
August 2014

