DIRECTOR’S INTRODUCTION

The Annual Progress Report (APR) is published by the Electromagnetics Laboratory (EML) and the Center for Computational Electromagnetics (CCEM) to provide information about research activities conducted during the past year. It contains brief research articles from each faculty member’s research group to showcase the progress on selected research topics. It also lists journal and conference publications to provide a glimpse of the breadth of research conducted in the EML and CCEM.

In 2007, we conducted research in various areas, which included antennas, high-speed circuits, electromagnetics, acoustics, subsurface sensing, and optoelectronics. In antenna research, progress was made in smart and reconfigurable antennas, antenna arrays, antennas for wireless and various sensing applications. In computational electromagnetics, research has been performed on the modeling and simulation of phased-array antennas, antenna-platform interactions, high-speed circuits and interconnects, subsurface sensing, and photonic crystals as a result of demand in the area. In the optoelectronics area, progress has been achieved on slow-light and quantum cascade lasers.

The current research activities in the EML and CCEM can be divided roughly into seven categories.

- Computational electromagnetics and applications (Cangellaris, Chew, Jin, Schutt-Aine)
- High-frequency circuit simulation and modeling (Cangellaris, Chew, Jin, Schutt-Aine)
- Optics, photonics, photonic crystals and optoelectronic devices (Chuang, Jin)
- Broadband antennas, reconfigurable antennas, and wireless communication (Bernhard, Chew, Jin)
- Inverse scattering subsurface sensing and imaging (Chew)
- Physics modeling and macro-modeling of MEMS and NEMS (Cangellaris)
- Electromagnetic scattering, radiation and propagation (Chew, Jin)

Besides conducting the state-of-the-art research, the EML and CCEM faculty members are also actively engaged in teaching activities, which offer the following undergraduate courses:

- Lines, Fields, and Waves
- Automated Microwave Measurements
- Electromagnetic Waves
- Antennas
- Sensors and Instrumentation
- Microwave Devices and Circuits

and the following graduate courses:

- Electromagnetic Waves and Radiating Systems
- Analytic Foundations of Electromagnetic Theory
- Integrated Optics and Optoelectronics
- Theory of Microwave and Optical Waveguides
- Waves and Fields in Inhomogeneous Media
- Advanced Antenna Theory
- Advanced Electromagnetic Diffraction and Radiation
- Computational Electromagnetics
- Electromagnetic Modeling and Simulation of Electronic Packaging
The undergraduate courses provide a balanced education for undergraduate students. The graduate courses contain two types: some provide basic and advanced electromagnetic training to graduate students both inside and outside of our area and some are related to the research topics of the faculty. Students are often required to do a term project to gain first-hand experience in the field.

Our faculty members have been widely recognized during 2007. Professor Jennifer Bernhard served as the President-Elect of Antennas and Propagation Society and was selected to participate in the U.S. Frontiers of Engineering Symposium. Professor Andreas Cangellaris was endowed as the first M. E. Van Valkenburg Professor in Electrical and Computer Engineering. Also, he was selected by the IEEE Microwave Theory & Techniques Society to serve as one of its Distinguished Lecturers. Professor Weng C. Chew was appointed the Dean of Engineering at the University of Hong Kong. Professor Shun-Lien Chuang received the 2007 William Streifer Scientific Achievement Award from IEEE Lasers and Electro-Optics Society (LEOS) and was endowed with the Robert C. MacClinchie Distinguished Professorship in Electrical and Computer Engineering. Professor Jose Schutt-Aine was appointed the Editor-in-Chief of the IEEE Transactions on Advanced Packaging and elected as an IEEE Fellow for contributions to modeling and simulation of distributed circuits with applications to signal integrity.

Jianming Jin