THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF ELECTRONIC AND COMPUTER ENGINEERING

AND

IEEE LEOS (HONG KONG CHAPTER)

JOINT SEMINAR

New Trends in Photonics: From Green Photonics to Biophotonics, and Beyond

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Abstract

The unrelenting expansion in the field of photonics over the past half-century has been leading to ubiquitous applications, ranging from telecommunications to medicine. To keep up such momentum, new photonic technologies should be able to provide versatile tools not only in the realm of advanced sciences, but more importantly, in our common lives. To this end, this talk will encompass various new approaches in the context of *green photonics* and *biophotonics* – the two disciplines which emerge rapidly nowadays and may permeate all aspects of our lives, e.g. energy efficiency and human health, in the future.

In the first part, I will introduce a technique, based on two-photon photovoltaic effect, which delivers electrical power by harvesting the optical energy lost in silicon photonic devices. As power dissipation is a pressing problem in VLSI industry, this technique addresses the "true" CMOS compatibility issue of silicon photonics and paves the path towards "green" integrated photonics.

I will also present a new technology in silicon photonics, in which integrated piezoelectric transducers are used to electrically alter silicon's optical properties. It opens a new paradigm to explore myriad optical functionalities in silicon which once was thought impossible. More notably, such capability represents a "green" approach for adaptive control of the optical response using electronic intelligence.

In the second part, two new technologies in biophotonics will be introduced. They are: (1) a new spectroscopic technique which allows ultra-fast real-time spectroscopy and imaging with an unprecedented speed. Using this technique, world's fastest barcode reader and camera have been demonstrated. This enables us to capture ultrafast biological and chemical dynamics. It is also applicable to high-throughput flow cytometry in hematology and immunology. (2) An endoscope-compatible microsurgery technique which is able to perform simultaneous high-precision laser microsurgery and microscopy without mechanical scanning of the probe. The fact that this technology can be miniaturized makes it very useful for endoscopic surgery, e.g. deep brain surgery, and spinal surgery.

Biography

Kevin Tsia received the B.E. and M.Phil. degrees in Electronic & Computer Engineering from the Hong Kong University of Science and Technology, Hong Kong, in 2003 and 2005, respectively. He is currently working toward the Ph.D. degree at the Electrical Engineering Department, at University of California, Los Angeles. His Ph.D. research covers a broad range of subject matters, including silicon photonics, ultra-fast real-time spectroscopy and microscopy, and endoscopic microsurgery. His researches, such as energy harvesting in silicon photonics and the World's fastest barcode reader, have attracted worldwide press coverage and featured in many prestigious science and technology review magazines such as MIT Technology Review, EE Times and Science News. Mr. Tsia was the recipient of a fellowship by the California Nanosystems Institute (CNSI) from 2005 to 2006. He is the reviewer for Optics Letters, Optics Express, Applied Optics. He is also the author or coauthor of over 20 journal and conference publications, book chapters and 2 pending US patents.

DATE : **5 February 2009 (Thursday)**

TIME : **4:00 – 5:00 pm**

VENUE : **Room 2404, 2/F (lift 17, 18)**
Academic Complex, HKUST

~ ALL ARE WELCOME ~