



**THE CHINESE UNIVERSITY OF HONG KONG**  
Department of Information Engineering

*Seminar*

**In vivo optical virtual biopsy of human skin  
by using multi-harmonic generation microscopy**  
by  
**Professor Chi-Kuang Sun**  
**National Taiwan University**

**Date : 7 August, 2012 (Tuesday)**  
**Time : 2:30pm - 3:30pm**  
**Venue : Room 833, Ho Sin Hang Engineering Building**  
**The Chinese University of Hong Kong**

Abstract

Biopsy is a medical procedure involving the removal of tissue samples from a living subject for pathological examination to determine the presence or extent of a disease, especially life-threatening diseases like cancer. The tissue is generally examined under a microscope by a pathologist, after extensive preparation procedure, including time-consuming fixing, embedding, sectioning and staining. This biopsy procedure is not only invasive and painful, but also risk the sampling error as only few representative areas in a given lesion were taken for examine and only few sections were observed.

In this talk, I will review work on in vivo optical virtual biopsy to replace or assist the above-mentioned physical biopsy. We have recently successfully developed a state-of-the-art optical virtual biopsy system based on the least invasive multi-harmonic generation microscopy (HGM). The system aimed to detect subclinical life-threatening disease and to assist diagnostic decision making for clinically evident diseases. Pre-scanning of the lesion with this system also reduces sampling errors in physical biopsy and helps surgeons to determine the safety margins. Our in vivo clinical study indicated that the multi-harmonic generation biopsy system outperforms current confocal and two-photon based techniques in providing higher penetration depth, higher spatial resolution, minimized photodamage and phototoxicity, reduced dye-toxicity due to minimized use of external fluorophores, and lowest photobleaching. This system enables 3D subsurface imaging in vivo without the need for surgical approach.

Biography

Chi-Kuang Sun received the Ph.D. degrees in applied physics from Harvard University in 1995. He was a Visiting Scientist at MIT between 1992 and 1994, working on ultrafast optics, and was with the NSF Center of Quantized Electronics Structures (QUEST), University of California, Santa Barbara, from 1995 to 1996 as an assistant research engineer, conducting research on quantum dots, GaN, microcavity, high speed communication devices and systems. In 1996, he joined the Graduate Institute of Photonics and Optoelectronics and Department of Electrical Engineering at National Taiwan University (NTU), Taipei, Taiwan, where he is now a life distinguished professor. He served as the Deputy Dean of College of Electrical Engineering and Computer Science and is currently the Chief Director of Molecular Imaging Center, National Taiwan University. He is an adjunct research fellow at the Institute of Physics and Research Center for Applied Sciences, Academia Sinica, Taipei, Taiwan since 2010 and 2006, respectively. He leads the NTU Ultrafast Optics Group and his research interest is primarily concerned with nano-acoustics, femtosecond laser technology, THz optoelectronics, and biomedical optics. Dr. Sun is a fellow of the Optical Society of America, a fellow of the International Society for Optical Engineering (SPIE), and a fellow of the IEEE Photonics Society.

**\*\* ALL ARE WELCOME \*\***