CIMIT Center for Integration of Medicine & Innovative Technology

Wellman Center for Photomedicine

Massachusetts Institute of Technology

April 17, 2007
Massachusetts General Hospital, Richard B. Simches Research Center, Room 3110
185 Cambridge Street, Boston
4:00 – 6:00PM, Refreshments 3:30PM

Lester Wolfe Workshop in Laser Biomedicine
Optical Methods in Breast Cancer

Early diagnosis, management and therapy of breast cancer are important problems, and there is interesting science as well. Optical methods hold much promise. The Workshop will begin with an overview, to be followed by presentations of optical methodologies in forefront areas.

4:00PM Welcome
***Moderator: Michael Hamblin**, PhD, Associate Professor, Department of Dermatology, Harvard Medical School; Member of Affiliated Faculty, Harvard-MIT Division of Health Sciences and Technology; Associate Chemist, Wellman Center for Photomedicine, Massachusetts General Hospital, mhamblin@partners.org*

4:05PM Introduction and Clinical Overview
***Barbara L. Smith**, MD, PhD, Director, Breast Program of the Cancer Center and Co-Director of the Women's Cancers Program, Massachusetts General Hospital; Assistant Professor of Surgery, Harvard Medical School and MGH; Chief of Breast Surgical Services, Gillette Centers for Women's Cancers, Dana-Farber Cancer Institute, blsmith1@partners.org*

4:20PM Shedding Light on Breast Cancer: Advances in Optical Spectroscopy Diagnosis of Breast Cancer
***Maryann Fitzmaurice**, MD, PhD, Associate Professor of Pathology and Oncology, Case Western Reserve University, maryann.fitzmaurice@case.edu*

Despite recent clinical advances, there remain challenges to early diagnosis and effective therapy of breast cancer. Among these are mammographic "false positives" (mammographically suspect lesions that are benign on biopsy) and operative "false negatives" (positive margins missed at breast cancer surgery that necessitate re-operation for complete resection). Optical spectroscopy holds promise for both improving the accuracy of breast cancer diagnosis and enabling breast cancer diagnosis to be made in a less invasive and more timely fashion. Recent work on the optical spectroscopy of breast cancer will be reviewed, and results presented for *ex vivo* pre-clinical studies using a multi-modality technique that combines diffuse reflectance, fluorescence and Raman spectroscopy to provide more robust spectroscopic breast cancer diagnosis.

4:50PM Breast Imaging and Characterization with Diffuse Optics
***Arjun Yodh**, PhD, James M. Skinner Professor of Science, Department of Physics & Astronomy, University of Pennsylvania, yodh@physics.upenn.edu*

This talk is oriented towards functional imaging and spectroscopy of breast cancer. Professor Arjun Yodh will focus on several recent studies, summarize the tumor contrast results obtained in a pilot clinical investigation employing diffuse optical tomography (DOT), and discuss the next generation instrument. He will present first in-vivo *fluorescence* diffuse optical tomography (FDOT) of breast cancer, describe the measurement of tumor blood flow and oxygenation of breast cancer during chemotherapy, and, if time permits, present multi-modal measurements combining DOT with positron emission tomography (PET).

Continued on reverse

5:20PM Intra-operative Optical Biopsy of Breast Cancer
***Stephen Boppart**, MD, PhD, Director, Mills Breast Cancer Institute, Carle Foundation Hospital; Associate Professor, Electrical Engineering, Bioengineering, and Medicine, University of Illinois at Urbana-Champaign, boppart@uiuc.edu*

Traditionally, the microscopic evaluation and diagnosis of tissue biopsy specimens has occurred remote from the point-of-care, since tissue processing, sectioning, and staining must be performed. Coherent optical imaging techniques such as optical coherence tomography (OCT) enable real-time intra-operative visualization of tissue architecture at cellular resolution, with the potential to perform volumetric microscopy and computer-automated classification over large regions. OCT has been used intraoperatively to assess margin status of lumpectomy specimens, and to assess lymph nodes for evidence of metastases. Fiber-optic beam delivery within needle probes facilitates guiding needle biopsies of breast masses. These methods enable real-time, point-of-care feedback during surgical procedures and interventions in the treatment of breast cancer.

Lester Wolfe Biography

Lester Wolfe was an inventor with a special interest in optics and photography. He died in 1983 at the age of 86. He was a benefactor of MIT, and his will provided funds "for fellowships for studies in molecular biology and for research using optical methods in the investigation of the structure and properties of matter." Lester was born in Boston in 1897 to a family of modest means. He enrolled at MIT as physics undergraduate and graduated in the class of 1919 -- well before the advent of quantum mechanics, the atomic bomb or lasers! During World War I he served in the armed forces as an inventor, and received a commendation for design of the "fuel quantity gauge", which used a radioactive source to measure the supply of fuel stored in the wings of an airplane. After the war he became active in industry, and he made his fortune in the field of containerized shipping between the United States and Japan. He became an expert in pre-Colombian art and technology, and a collector in this field and several others. Toward the end of his life Lester became interested in furthering research in biology and medicine as well as in the area that he loved most, optics. That is how he developed an interest in the research projects of the Spectroscopy Laboratory.

The Lester Wolfe Workshop in Laser Biomedicine is a series of talks dedicated to a particular aspect in biomedical optics. The panel of speakers of the Workshop is chosen from expert researchers in academia, medical profession and industry. Held twice a year, the Lester Wolfe Workshop is sponsored by the George R. Harrison Spectroscopy Laboratory, MGH Wellman Center for Photomedicine, Harvard—MIT Division of Health Sciences and Technology, and CIMIT (Center for the Integration of Medicine and Innovative Technology). Information obtained from the MIT Spectroscopy Website: http://web.mit.edu/spectroscopy/events/wolfe.html.