

University of Houston - Biomedical Engineering Seminar

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Health 1, Room 203

Advanced Optical Endoscopes for Early Cancer Detection



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ABSTRACT

Optical methods of investigating tissue have the advantages of high sensitivity, high resolution, relatively low cost, and ability to sense both structural and biochemical characteristics of tissue. Their limited penetration depth into the body can be mitigated by endoscopic methods. Optical techniques hold the promise of directing, minimizing, or perhaps even eliminating traditional destructive biopsy by providing diagnostic information in a harmless manner. Complimentary optical modalities hold excellent promise for early cancer detection: optical coherence tomography (OCT), fluorescence imaging (FI), and multiphoton microscopy (MPM). OCT provides micron-scale cross-sectional imaging up about 1 mm deep in scattering tissue, whereas FI and MPM provide information about the concentration and distribution of fluorescent and optically active biomolecules. When packaged into endoscopes ranging from 0.8 – 4 mm in diameter, the colon, ovary and fallopian tubes (among other organs) can be accessed. Intriguing images of early stage cancer have been obtained with OCT, while FI has provided information both on the metabolic activity of tissues and has resolved possible confounders in OCT. MPM is emerging in endoscopic form and holds promise for sub-cellular imaging.

Biosketch

Jennifer Kehlet Barton received her Ph.D. in BME from UT Austin. Previously she worked for McDonnell Douglas on the International Space Station program. She is currently the Thomas R. Brown Distinguished Professor of Biomedical Engineering at the University of Arizona. She has served as chair of BME, Associate Vice President for Research, Interim Vice President for Research, and is currently Director of the BIO5 Institute, a collaborative research institute dedicated to solving complex biology-based problems affecting humanity. Barton develops miniature endoscopes that combine multiple optical imaging techniques, particularly optical coherence tomography and fluorescence spectroscopy. She evaluates the suitability of these endoscopic techniques for detecting early cancer development in patients and pre-clinical models. She has a particular interest in the early detection of ovarian cancer, the most deadly gynecological malignancy.