Wearable Diffuse Optics for Personalized Cancer Therapy

**Abstract:** Despite an ever increasing set of chemotherapeutic and targeted therapies for patients suffering from cancer, individual responses and resistance patterns remain highly variable. Standard-of-care imaging modalities (MRI, PET-CT, etc.) have limited ability to detect response and resistance early and often during treatment due to access, cost, and safety concerns. In order to move towards truly adaptive chemotherapeutic regimens, near real-time in vivo measurements of key response metrics are needed. Towards this goal, there has been significant interest in chemotherapy monitoring in breast cancer patients using diffuse optical technologies. Multiple groups, including ours, have demonstrated prognostic changes in endogenous chromophores after days, weeks or months of treatment. In order to translate these early findings to the standard of care, it’s necessary to 1. Validate optical signatures of treatment response and resistance in larger patient populations, 2. Screen unexplored treatment timepoints using new, more clinically versatile optical technologies, and 3. Identify causative associations between and diffuse optical measurements and specific molecular events. In order to meet these challenges, our group is developing a variety of new clinical and preclinical diffuse optical measurement platforms including a new wearable continuous-wave infusion monitor and a portable all-digital frequency-domain Diffuse Optical Spectroscopy (DOS) system to access patients at the point-of-care including in the infusion suite and the doctor’s office. Additionally, in order to explore these rapid and early metabolic changes in a controlled preclinical setting, we are utilizing Spatial Frequency Domain Imaging (SFDI) and intravital multiphoton imaging to track treatment response and explore adaptive therapies in prostate and breast tumor models.

**Biography:** Darren Roblyer is an assistant professor in the Department of Biomedical Engineering at Boston University. His research is based on the development of near-infrared Diffuse Optical Spectroscopy (DOS) systems to both predict and better understand tumor response and resistance to chemotherapy in cancer patients and in preclinical models. After receiving a B.S. in Biomedical Engineering from Johns Hopkins University in 2004, Darren received his Ph.D. as a HHMI fellow in 2009 from the Bioengineering Department at Rice University where he studied under Professor Rebecca Richards-Kortum. Prior to starting his faculty position, Darren was a Department of Defense Postdoctoral Fellow at the Beckman Laser Institute at the University of California, Irvine studying under Professor Bruce Tromberg.