

Katherine Calabro, Boston University

Abstract: Monte Carlo (MC) simulation of photon propagation in tissue is one of the most important tools used in the field of biomedical optics. From photodynamic therapy, to *in vivo* disease diagnostics (a.k.a 'optical biopsy'), MC modeling provides the means to investigate complicated relationships between light measurements and tissue optical properties, which is nearly impossible to do experimentally due to biological complexities. As a stochastic method, MC relies on sampling of known probability distributions to simulate scattering and absorption events. To improve computational efficiency, a variance reduction technique known as the albedo-weighting method (describing photons as packets with fractional weights that are attenuated to account for absorption) was developed nearly three decades ago and still forms the basis of most MC algorithms used today. However, recent advancements, particularly in high performance computing on graphical processing units (GPUs), have drastically reduced computation time, and hence a critical examination and re-evaluation of several alternative absorption algorithms is now warranted. In this talk, the GPU enabled MC code is described, particularly as it relates to the alternative absorption algorithms. The equivalency of the algorithms is evaluated from the perspectives of diffuse reflectance and absorption distribution maps, and recommendations are presented for conditions under which each method is ideally suited.

Biography: Katherine Calabro received BS and MS degrees from the department of Engineering Science and Mechanics at Pennsylvania State University in 2005 and 2005, respectively. She recently completed her PhD this August here at Boston University in the Biomedical Engineering department, in the Biomedical Optics group under the supervision of Dr. Irving Bigio. Katherine has been awarded numerous research fellowships, including the National Science Foundation Graduate Research Fellowship, the CIMIT Fellowship for Translational Research, and the BU Photonics Center Fellowship. She has authored numerous journal publications, and has presented work at several conferences, including an invited talk at SPIE Photonics West. Currently, Katherine is continuing as a postdoc in the Biomedical Optics lab, but will be soon starting a position as a R&D software developer at Synopsis.