Analytical Seminar

The ability to understand modern biological or medical phenomena be it the conformational dynamics of proteins, cellular division or tumor progression requires sophisticated methods that would allow interrogation in a variety of environments across multiple time and size scales. Imaging is the method of choice, but its success requires the ability to not only image the structure, but also the associated electronic, magnetic, optical, chemical and behavioral properties. There are great challenges and opportunities of scale in imaging, not only in spatial and temporal but non-spatial dimensions.

Rationale: Over the last thirty years the field of Biophotonics, the study of the interaction between light and biological material, has exploded with the advent of advanced labeling and optical imaging technologies that allow for unprecedented imaging resolution with high specificity in cellular and animal models. Prominent examples include the fluorescence microscope, the confocal microscope, optical spectroscopy and optical microsurgery. A major strength of optical imaging is the broad range of scales that are possible, from single molecules to cells. Moreover, the modern tools of fluorescence and bioluminescence imaging are able to bridge cellular studies in a dish to cells and molecules in animal models. These optical tools can readily be multiplexed with each other or within a single modality by taking advantage of multiparametic measurements, such as assaying all the dimensional properties of fluorescence over a range of wavelengths. These strengths have made optical imaging one of the most prominent tools in basic cancer research, with techniques such as multiphoton laser scanning microscopy (MPLSM) allowing for deep imaging of fluorescence in in vivo models with good viability. However, with the notable exception of Optical Coherence Tomography (OCT), optical approaches have largely failed to translate to the clinical setting. While this is partially due to the emerging nature of these approaches, the majority of these techniques either do not yet have the depth penetration needed for clinical imaging, or require exogenous labels that are not yet validated in the clinical environment. Despite the clear complementary potential . . . ***attend the talk to hear the rest of the story!***

Kevin Eliceiri

Director, Laboratory for Optical & Computational Instrumentation
Depts. of Cell & Molecular Biology and Biomedical Engineering
UW-Madison

"Multiscale biological imaging . . . from micro to macro . . . from animal to clinical models"

Thursday, 2-19-15
12:15 p.m. Seminar Hall