

## Seminar Announcement

**Dr. Keith Bennett**  
**Consultant**  
**Hamamatsu Photonics**



Tuesday, May 3, 2016  
Green Hall, Room 0120  
10:10 AM

### Scientific Camera Capabilities and Limitations, including Considerations for Single Molecule Localization and Lightsheet Microscopies

**Abstract:** No scientific camera is perfect and no camera is ideal for every application; there are always tradeoffs between noise, field of view, resolution, speed and throughput, full well capacity, dynamic range, quantum efficiency, modulation transfer function and pixel uniformity. A “scientific” camera is similar to an instrument and understanding the precision and accuracy of measurements facilitates high quality research.

Dr. Bennett will review the architectures and limitations of CCD, EMCCD and sCMOS camera technologies emphasizing the relevance of these differences for life science research, and present detailed quantitative measured characteristics for Hamamatsu’s ORCA – Flash4.0V2 camera covering uniformity of dark offset, dark current and read noise and linearity. Both pixel response non-uniformity and pixel and signal-dependent variance are important in obtaining proper results from statistical analysis methods, such as weighted least squares and maximum likelihood estimation; therefore particular attention will be given to pixel response non-uniformity and characterization of individual pixel signal-dependent variance, including verification of calibrations. Localization microscopy will be used as an example to show how understanding camera noise characteristics can be used to improve results in computational imaging.

New functionality for controlling and synchronizing the camera shutter with illumination and excitation in scientific CMOS cameras (sCMOS), such as light-sheet mode<sup>TM</sup>, and global exposure timing bring previously unavailable capabilities to researchers.