

Tuesday, October 18th, 2022, at 2:30pm in PSE 317

Speaker: Caroline Boudoux

Institution: Norwich University/ Case Western

Title: Improving optical imaging one fiber at a time

Abstract:

OCT and fiber-based microscopy imaging techniques may benefit from novel light delivery and detection geometries. Prof. Boudoux's lab focuses on designing novel fiber optics components and demonstrating improved signal collection, novel contrast mechanisms, and features such as speckle reduction or 3d flow measurement. In this seminar, Prof. Boudoux will present three innovations and their applications to biomedical imaging: double-clad fiber couplers, wideband multimode circulators, and modally-specific photonic lanterns (MSPL).

Dual-clad fiber couplers combine coherent imaging and diffuse sensing within the same instrument. Since the technology's lab-to-market transfer, several groups reported on its application to OCT, confocal microscopy, and hyperspectral imaging, to name a few. Wideband multimode circulators are all-fiber components allowing multimode light to travel from a source to a sample, then from a sample to a detector, and are used in single fiber reflectance spectroscopy and optogenetics. Finally, MSPLs are modal (de)multiplexers that, placed in an OCT setup, allow interferometry with the first few fiber propagation modes, increasing signal collection, sensitivity to sub-resolution scatterer geometries, and 3d flow measurements. While these devices were designed for biomedical optics applications, many have also found applications in remote sensing, as discovered during their commercialization through Castor Optics—a spin-off from Polytechnique and strategic partner of Thorlabs.