



2020/2021 IEEE UFFC Distinguished Lecture



Prof. Matt O'Donnell

Frank and Julie Jungers Dean Emeritus, College of Engineering
Professor, Department of Bioengineering
University of Washington, Seattle, WA 98195

Light and Sound: Integrating Photonics with Ultrasonics

Abstract:

Coherent light and sound have become essential tools in modern medicine. Lasers are routinely used for both therapeutic and diagnostic applications, and real-time ultrasound scanning has become the dominant biomedical imaging modality in the world. Starting over thirty years ago, scientists and engineers have combined these modalities for applications ranging from non-contact sensing to novel molecular imaging techniques. In this talk, I will explore the history of integrated photonic-ultrasonic systems, focusing on examples where light generates sound, light detects sound, and sound “tickles” light. I will also present specific applications of integrated photonic-ultrasonic techniques, including photoacoustics for molecular imaging, non-contact laser ultrasound systems for medical and non-medical applications, and optical coherence elastography (OCE) in which air-coupled ultrasound stimulates propagating shear waves in the eye and skin tracked with real-time, 3-D optical coherence tomography (OCT). The talk will conclude by discussing current barriers to clinical translation of these systems and possible ways to overcome the obstacles.