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Donald J. Douglass Centennial Professorship in Engineering



## ***"The diversity of lipid-coated nanoparticles in Biomedical applications"***

### Abstract:

Lipids are extremely versatile biomolecules capable of encapsulating nanoparticles composed of gas, liquid, or solid. The diversity of lipid-coated nanoparticles that can be produced has enabled the development of innovative approaches to diagnosing and treating life-threatening or debilitating medical conditions. In this talk I will present two nanoparticles that are being explored in the Diverse Engineering Applications Laboratory (D.E.A.L.) at UT Austin. First, I will review the development and utility of pressure-sensitive nanoemulsions (PSNE), which can be vaporized with high amplitude acoustic pulses. Vaporization produces microbubbles that can be driven to collapse energetically, radiating broadband emissions that are rapidly absorbed by surrounding tissue or generating intense stresses capable of fragmenting cells. We have taken advantage of PSNE vaporization with focused ultrasound for thermal and nonthermal ablation of solid tumors. Second, I will discuss the generation and characterization of indocyanine green (ICG) J-aggregates packaged within lipid vesicles. While free ICG can be utilized for near infrared (NIR) imaging of blood vessels, its absorbance spectrum overlaps significantly with hemoglobin. ICG J-aggregates absorb more photons at longer wavelengths than soluble ICG, which is advantageous for in vivo multispectral photoacoustic imaging as well as photothermal therapy. The versatility of lipid-coated nanoparticles makes the technology accessible to scientists and students from various disciplines, which can lead to many fruitful multidisciplinary collaborative projects.

### Bio:

Dr. Tyrone Porter is Professor and Chair of Biomedical Engineering and holder of the Donald J. Douglass Centennial Professorship in Engineering at The University of Texas at Austin. After receiving a Ph.D. in Bioengineering at the University of Washington and a postdoctoral fellowship at the University of Cincinnati, Dr. Porter started his academic career at Boston University in 2006. Over the course of his career, Dr. Porter has made significant contributions to the use of ultrasound for therapeutic applications. For these contributions, he was elected a Fellow of the ASA in 2017 and a Fellow of the American Institute for Medical and Biological Engineering (AIMBE) in 2021. In addition to advancing biomedical ultrasound as a field, Dr. Porter actively works to broaden representation and participation in the biomedical sciences.