

Physics Colloquium, University of South Florida

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# **Terahertz technology and future applications**

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Terahertz research has taken many forms over the years as scientists and engineers have tried to capitalize on this underutilized spectral band. One very promising direction was electromagnetic (EM) metamaterials. These are synthetic materials that exhibit exotic and useful EM properties not found in natural materials. This nicely complements terahertz technology, where natural materials have not provided a suitable foundation for commercial usage. In this lecture, I will cover some of the basics of metamaterials and the research I conducted with respect to metamaterials in the terahertz regime. I will review some of the more impactful results from that work and how they led to directions in nonlinear metamaterials, a research topic that opens up entirely new and hopeful application possibilities. I will also discuss some new trends in modern technology, and how these have opened new avenues of terahertz research.

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John O'Hara received the B.S.E.E. degree from the University of Michigan in 1998, and the Ph.D. degree in electrical engineering from Oklahoma State University (OSU) in 2003. He was a Director of Central Intelligence Post-doctoral Fellow at Los Alamos National Laboratory (LANL) until 2006. From 2006 to 2011, he was with the Center for Integrated Nanotechnologies (LANL) and developed and led numerous projects involving terahertz sources and detectors, plasmonics, metamaterials, imaging through scattering environments, ultrafast materials studies, and nonlinear ultrafast and terahertz studies. In 2011, he joined OSU as an Adjunct Professor, and also began an electrical engineering company, Wavetech, LLC in Stillwater, OK. In 2017, he joined the faculty at OSU as an Assistant Professor. He has over 100 publications in journals and conference proceedings.