

# **Quantum Optics: What Is and What Should Be**

Dr. Joseph Lukens

Wigner Fellow in Quantum Information Science

Oak Ridge National Laboratory

Quantum mechanics has fundamentally altered our understanding of how particles behave at their most basic level. In particular, the study of light quanta – or photons – has played a leading role in motivating, articulating, and ultimately answering questions on the essential features of quantum theory, such as superposition and entanglement. In this talk, I will introduce both what quantum optics is, through a historical overview of foundational experiments, and what quantum optics should be: the role it can play in bringing about the second quantum revolution – quantum information. I will also describe our current work at Oak Ridge on quantum information processing based on the frequency of light, and how this can contribute to the development of a quantum internet.

Joseph M. Lukens is a Research Scientist and Wigner Fellow at Oak Ridge National Laboratory. He graduated with a BS from the University of Alabama in 2011 and completed a PhD at Purdue University in 2015, where he conducted research in ultrafast photonics. Currently Lukens studies quantum information, with a focus on systems for optical-fiber-based quantum information processing. He has published seventeen journal articles and one book chapter, and given several conference presentations, including first-place poster at the inaugural Siegman International School on Lasers, a feature abstract at the CLEO 2013 press luncheon, and top selection at the 2011 IEEE Region 3 Southeastcon Student Paper Competition. For his contributions to telecommunications research, Lukens was awarded the Paul Baran Young Scholar Award from the Marconi Society in 2015. He is a member of the Optical Society (OSA).