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## Abstract

**Title:** *Coherence Phenomena in Coupled Optical Resonators*

Quantum coherence effects in atomic media such as electromagnetically-induced transparency and absorption, lasing without inversion, super-radiance and gain-assisted superluminality have become well-known in atomic physics. But these effects are not unique to atoms, nor are they uniquely quantum in nature, but rather are fundamental to systems of coherently coupled oscillators. In this talk I will review a variety of analogous *photonic* coherence phenomena that can occur in passive and active coupled optical resonators. Specifically, I will examine the evolution of the response that can occur upon the addition of a second resonator, to a single resonator that is side-coupled to a waveguide, as the coupling is increased, and discuss the conditions for slow and fast light propagation, coupled-resonator-induced transparency and absorption, lasing without gain, and gain-assisted superluminal pulse propagation. Finally, I will discuss the application of these systems to laser stabilization and gyroscopy.

## Biography

**DR. SMITH** has worked at NASA for over 15 years. He has conducted space-flight experiments on STS-93 and STS-95, served as an Assistant Mission Scientist for USMP-4, and Project Scientist on four microgravity flight experiments. He has received numerous awards for service to NASA, including the MSFC Science Excellence Award in 2002, 2004, and 2005, and a NASA Special Service Award in 2006 for the development of micro-ring resonator technologies and applications. Dr. Smith is a NASA Administrator's Fellow. In this capacity served as a Visiting Scientist at the University of New Mexico, the University of Rochester, and Oklahoma State University, developing research in laser gyroscopy, slow and fast light, and whispering-gallery-mode micro-resonators for NASA applications. His research interests also include local field effects in composite nonlinear optical materials, spontaneous emission in dielectrics, and photonic bandgap materials. Additionally, he serves as an Adjunct Professor of Physics at the University of Alabama in Huntsville, and is currently located in the Weapons Sciences Laboratory on the Redstone Arsenal where he works on technologies of interest to both NASA and the Army. Dr. Smith has written two book chapters, published over 20 research papers, and is a member of the Optical Society of America.