

Title: Physics and applications of optical frequency combs and microresonators

Abstract:

Frequency combs are having a broad impact on science and technology because they provide a way to coherently link radio/microwave-rate electrical signals with optical-rate signals. A new, miniature realization, the microcomb, that uses chip-based microresonators can potentially revolutionize instrumentation, time keeping, spectroscopy, and navigation. In this talk, I will start by reviewing the fundamentals of optical frequency combs and microresonators. Our recent progress demonstrating mode-locked soliton microcombs in silica microresonators will then be presented. This demonstration creates a rich landscape for research in nonlinear optical phenomena as well as frequency comb applications. Some of these results will be described, including the discovery of a new type of soliton, astronomical calibration for exoplanet studies, optical frequency division and microwave synthesis.