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IEEE Lasers and Electro-Optics Society Presents

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**A tutorial on strained quantum-well and
quantum-dot lasers: What do those
experiments really mean?**

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Rice University
Duncan Hall, Room 1064

Abstract

Since the invention of semiconductor lasers in 1962, significant progress has been made in terms of high performance in many applications including telecommunications and optical storage. Most modern semiconductor lasers operate based on quantum mechanical effects. Quantum-well lasers have been used with impressive performance, while novel quantum-dot lasers, a subject of intense research, show a great promise.

In this talk, I will describe the physics of strained quantum-well and quantum-dot lasers, and demonstrate how theory can explain experimental observations such as polarization (TE and TM) dependent optical gain spectra and their dependence on the type of strain. The concept of quasi-Fermi level separation and its experimental determination will be discussed. I will then present our most recent theoretical and experimental results on a new tunneling injection quantum-dot coupled quantum-well laser, which has potential advantages such as low threshold, high temperature stability, low-chirp, and high-speed performance. Novel devices using quantum wells and quantum dots to slow light with applications to optical buffers will be presented.