A Tutorial on Strained Quantum-Well and Quantum-Dot Lasers: What do those experiments really mean?

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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.

Biography
Shun-Lien Chuang received the Ph.D. degree from MIT in 1983. He then joined the University of Illinois at Urbana-Champaign, where he is currently a Professor and the director of the Illinois Program for Photonics and Optoelectronics. He was a visitor at a few institutions including Bell Laboratories (1989); University of Tokyo (1996), NTT (1997), NASA Ames Research Center (1999), and Cavendish Laboratory at Cambridge University (2002). He is conducting research on optoelectronic devices such as strained semiconductor lasers, modulators, and infrared detectors. He is the author of Physics of Optoelectronic Devices, Wiley, 1995. He was an Associate Editor of the IEEE Journal of Quantum Electronics (1997 - 2003). He is a Fellow of the APS, IEEE and OSA. He received the Engineering Excellence Award from OSA in 2004 and is an IEEE LEOS Distinguished Lecturer in 2004-2005.

Date: February 25th, 2005
Location: Arizona State University, Main Campus, Gold Water Center (GWC) Room 487
Enter the facility through the main (south) lobby and take the elevator to the fourth floor. Go north down the west hallway, the conference room is on the right. See http://www.asu.edu/map/

Time: 5:00-6:00 pm Presentation
6:00 pm Discussion
Refreshments and pizza with be severed