

# RMOSA

Rocky Mountain Section of the Optical Society of America

## Joint RMOSA/IEEE-LEOS Seminar & Meeting

Thursday, March 20, 2008

Refreshments: 7 p.m. :: Seminar: 7:30 p.m.

CSU Ft. Collins,  
[Lory Student Center](#) Rm 220-2

### Nanolasers: Approaching the Ultimate Size Limit



#### Dr. Cun-Zheng Ning

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**Abstract:** Rapid progress in various areas of nanotechnology has been seriously challenging the optical community to develop ever smaller lasers and other optoelectronic devices. This has led to the demonstration of lasing capability of a single semiconductor nanowire of  $\sim 100$  nanometers in diameter and a few microns in length. The question of ultimate challenge is: can one make a laser that is smaller than the half-wavelength in all 3 dimensions, or what is the ultimate size limit of a laser? To answer this and related questions, my talk will start with an overview of impressive recent progress in growth, fabrication, and characterization of semiconductor nanowires and demonstration of lasing activities. We will show how this new type of miniaturized lasers differs from the conventional semiconductor lasers. We will also show that a proper design of a metal coated semiconductor nanowire can achieve lasing threshold despite significant metal loss, allowing further size reduction of a nanowire laser. Experiment results demonstrating this idea will also be presented. Finally some recent novel ideas involving surface plasmonic excitations at metal-semiconductor interface will be discussed where much smaller lasers could be potentially made, with size independent of wavelengths of light emitted.

**Bio-Sketch:** Dr. Ning obtained his PhD in Physics from University of Stuttgart, Germany. He was a Senior Scientist, group leader, or task manager at NASA Ames Research Center from 1997-2006. He joined Arizona State University in 2006, where he is Professor of Electrical Engineering and Affiliate Professor of Physics and Materials. Dr. Ning's research interest has included laser physics, geometric phase in lasers, stochastic resonances, semiconductor lasers, optoelectronic device modeling and simulation for the last 20 years. Recently, his group has been involved in growth and optical characterization of semiconductor nanowires and was the first to grow antimonide nanowires and to demonstrate the first single-nanowire infrared laser... He was Associate Editor of IEEE J. Quantum Electronics (2001-2003) and a special topic editor for IEEE J. Special Topics in Quantum Electron., J. Opt. Soc. Am., Optics Express, etc. For his research at NASA, he has won several NASA and NASA contractor awards, including NASA Group Achievement (1999) award and CSS Technical Excellence Award (2003). He was recently awarded the IEEE/LEOS Distinguished Lecturer (2007/2008).

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