Speaker: Dr. Ionel Tifrea
Department of Physics and Astronomy, Cal State Fullerton.

Abstract: I will present an investigation of the dynamic nuclear polarization and resulting hyperfine and dipolar fields of nuclei resulting from the coupling between nonequilibrium electronic spins and nuclear spins via the hyperfine interaction in semiconductor nanostructures. We derived the time and position dependence of the induced nuclear spin polarization, hyperfine, and dipolar magnetic fields. In GaAs quantum wells the induced nuclear spin polarization can be as high as 80% from an initial 50% nonequilibrium electronic spin polarization.

The induced magnetic fields vary between tens of tesla for the electronic hyperfine field acting on nuclei, to hundreds of gauss for the nuclear hyperfine field acting on electrons, to a few gauss for the induced nuclear dipolar fields that act both on nuclei and electrons. These fields are position and time dependent and their intensity should be measurable in optically induced nuclear magnetic resonance or time resolved Faraday rotation experiments. I will discuss the implications of our calculations for the case of low-dimensional semiconductor nanostructures and analyze possible effects related to these fields on nuclear magnetic resonance and time resolved faraday rotation experiments in semiconductor nanostructures.

Biography: Dr. Ionel Tifrea joined the department of physics and astronomy at CSU Fullerton in 2006, prior to that he was at the University of Iowa from 2004-2006. Dr. Tifrea received his degrees from the University of Cluj in Romania where he also served as a professor. His research involves many aspects of manipulating quantum coherence in solid state systems.