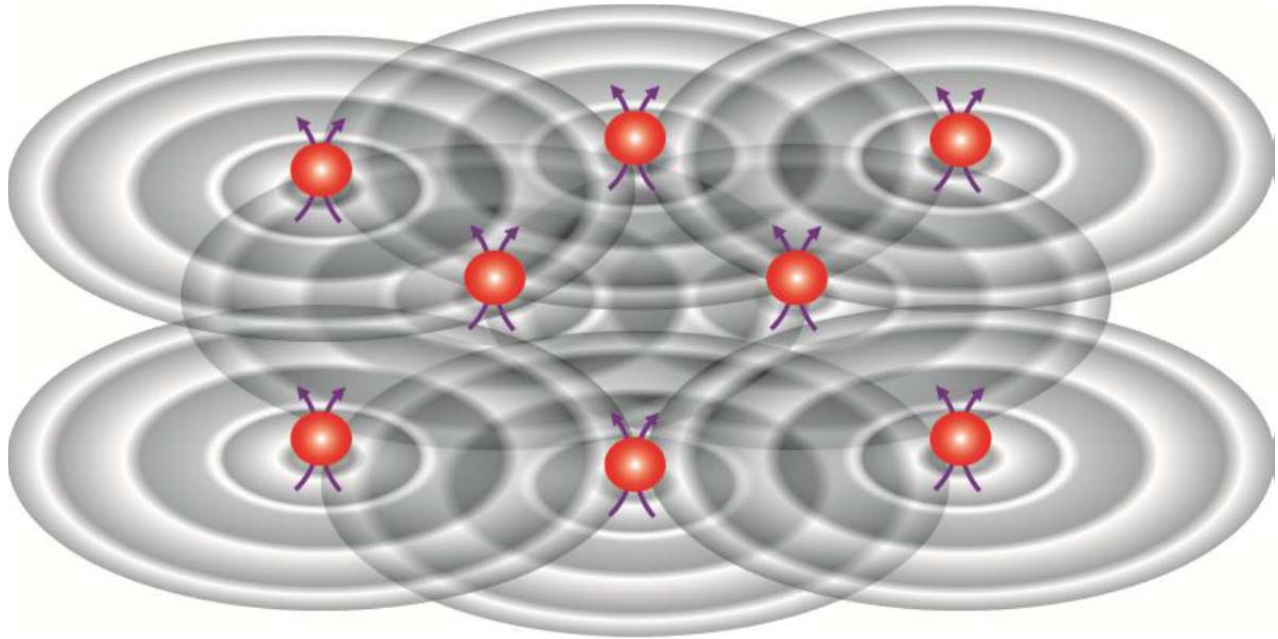


**Mike Manfra
Purdue University**

**Physics General Colloquium
Thursday, August 30th
Room 203 at 4:00 pm**



Creating order in a disordered world: MBE's role in condensed matter physics

A race car can zip along on a clean, empty track much faster than on one littered with debris and filled with slow-moving cars. The same is true of electrons in semiconductor crystals. The closest approximation we have to the ideal racetrack for electrons in a solid material is the high mobility two-dimensional electron gas (2DEG) confined in a thin layer of gallium arsenide (GaAs) sandwiched between two layers of aluminum gallium arsenide (AlGaAs). The GaAs 2DEG displays spectacular behavior associated with many electrons moving in concert. Recently, the 2DEG in GaAs has been a model system for the discovery of unique phases of electron matter, some of which are now leading candidates for implementations of quantum information processing. The study of topological phases possessing non-Abelian quasiparticles now permeates condensed matter physics and has its origin in attempts to understand subtle interactions in the 2DEG at high magnetic fields. In this talk, I will describe a more basic process – how we actually create such physical systems in the laboratory using molecular beam epitaxy (MBE). In particular I will discuss how our group attempts to push the limits of MBE technology to coax new physics at ever finer energy scales. Our recent efforts to understand the role of residual disorder, ever present in real samples, have led to some surprising results that we believe will shape the future of sample design and lead to exciting new developments in the study of correlated electrons.