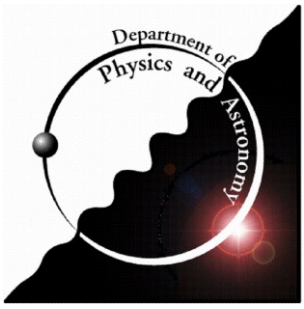

PHYSICS AND ASTRONOMY
COLLOQUIUM

Dr. Francis Everitt

Stanford University

"Frame-Dragging, Cryogenics, and Space: The Gravity Probe B Experiment"

Abstract

Space research makes intense demands, but opens ways to physics experiments impossible on Earth. The NASA/Stanford Gravity Probe B experiment, launched in 2004, displays both along with the fascinating intersection of physics and engineering in a real-life flight experiment. This critical collaboration has produced 86 Stanford doctorates and 14 from other universities, over an extraordinary range of topics. According to Einstein, a gyroscope in a 640 km polar orbit around the Earth is subject to two non-Newtonian precessions, a 6.6 arc-s/yr geodetic effect in the plane of the orbit and a 0.039 arc-s/yr frame-dragging effect due to the rotation of the Earth. Gravity Probe B measured both. To determine these tiny effects required a gyroscope 10^7 times better than the best Earth-based inertial navigation gyroscopes and a reference telescope 10^3 times better than any prior star tracker. The talk will describe the unique combination of cryogenics and space technologies that made this possible, and also some on-orbit surprises and how they were overcome.

Space makes new physics possible in 8 distinct ways. GP-B has been the largest of a series of NASA missions in Fundamental Physics. The flight experience will inform the development of several important future missions including LISA and STEP.

Wednesday, September 21, 2011
3:30 p.m.
Bob Wright Centre
Room A104