



TEL: 225-578-2261  
FAX: 225-578-5855  
<http://www.phys.lsu.edu>

202 NICHOLSON HALL  
Louisiana State University  
Baton Rouge, Louisiana 70803-4001

## WEEKLY CALENDAR

September 15 - 19, 2014

### DEPARTMENTAL COLLOQUIUM

**"Testing Einstein's gravity with black holes"**

3:30 PM September 18, 2014  
109 Nicholson Hall

**Chris Done**  
University of Durham

**Host: Robert Hynes**

• *Refreshments served at 3:10 PM in 232 (Library) Nicholson Hall* •

Black hole binary systems give us some of the best tests of Einstein's gravity in the strong field limit, with their disc spectra giving clear evidence for the existence of the innermost stable circular orbit. However, not all spectra look like discs, pointing to complexity in the accretion flow which can be best explained by a transition to a radiatively inefficient (advection dominated) flow at low mass accretion rates. Similar physics should occur in the neutron star systems, and indeed this transition in the accretion flow is seen, but there are systematic differences compared to the black holes, consistent with the difference expected between an event horizon and a solid surface. Another feature of Einstein's gravity is that orbits which are tilted with respect to a spinning compact object will precess vertically (Lense-Thirring precession). I will show how this can explain the properties of the low frequency quasi-periodic oscillation seen in both black hole and neutron star binary systems, and how the correlated spectral and timing properties can be explained by the evolution of the accretion flow with mass accretion rate.

#### **PUBLICATIONS:**

1. "The  $SL(2, \mathbb{R})$  totally constrained model: three quantization approaches", Rodolfo Gambini and **Javier Olmedo**, *General Relativity and Gravitation* (2014) 46:1768.