

# This Week in Physics

SYRACUSE UNIVERSITY  
*College of Arts & Sciences*

Week of  
February 16, 2009

[http://www.phy.syr.edu/  
SeminarsEvents.htm](http://www.phy.syr.edu/SeminarsEvents.htm)

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## MONDAY, FEBRUARY 16

Condensed Matter/Biological Physics Seminar

11:00 AM, Rm 202

**Dr. Jared Hertzberg (Cornell University)**

*Back-action Cooling and Back-action Evading Measurements of Nanomechanical Motion Approaching Quantum Limits*

Joint Relativity/Cosmology/High Energy Physics Seminar

1:30 PM, Rm 202

**Dr. Scott Watson (University of Michigan)**

*TBA*

## TUESDAY, FEBRUARY 17

Colloquium

4:00 PM, Rm 202 (refreshments 3:30 PM, Rm 204)

**Dr. Scott Watson (University of Michigan)**

*Cosmology as a Probe of Physics Beyond the Standard Model*

Cosmological observations provide overwhelming evidence that our universe is almost entirely comprised of dark energy and dark matter, both of which have no theoretical explanation within the standard model of particle physics. The former is responsible for a current period of cosmic acceleration, much like that which occurred in the earliest moments of the universe. The early period of cosmic acceleration, known as inflation, was vital in providing the primordial seeds from which galaxies and clusters formed, whereas the late time acceleration could eventually lead to the vanishing of most structure in the universe. The driving force behind cosmic acceleration, as well as dark matter, still remains elusive from the point of view of a microscopic theory.

Combined with fundamental questions, such as the origin of particle mass and how electroweak symmetry is broken, these conundrums require physics beyond the standard model.

In this talk I will review both the theoretical and observational status of these issues with an emphasis on the excitement surrounding current and upcoming experiments.

## THURSDAY, FEBRUARY 19

Colloquium

4:00 PM, Rm 202 (refreshments 3:30 PM, Rm 204)

Dr. Sam Waldman (MIT)

*Attometer Astrophysics: Gravitational wave astronomy with LIGO*

The direct detection of gravitational waves will provide a revolutionary new probe of the most energetic processes in the universe. The 4 km long LIGO interferometers have demonstrated the sub-attometer displacement sensitivity ( $< 10^{-18}$  m/ Hz<sup>1/2</sup>) required to place upper limits on the neutron star/neutron star merger out to the Virgo galaxy cluster. Such mergers are thought to be the progenitors of short gamma-ray bursts and provide an ideal "golden event" signal for direct GW detection. Compact binary coalescences also offer one of direct tests of the neutron star equation of state, of the internal dynamics of supernovae, and of strong field general relativity. An aggressive R&D program, Advanced LIGO, is underway to increase the interferometer stored power 30-fold (to 750 kW), develop new low noise readouts, and increase the detector sensitivity by an order of magnitude. In the next 5 years, Advanced LIGO will observe neutron star mergers and other gravitational wave events regularly, beginning a new era of gravitational astronomy.

## FRIDAY, FEBRUARY 20

LIGO Seminar

10:00 AM, Rm 202

Dr. Sam Waldman (MIT)

*DC Readout for Enhanced LIGO*

