

SCHOOL OF PHYSICS

UNIVERSITY OF NEW SOUTH WALES



COLLOQUIUM

4-5 p.m., Tuesday, 8 September 2009

School of Physics Common Room
Room 64, Old Main Building

Dr Julian Berengut
UNSW School of Physics

“Observing Variations in Coupling Constants and Fundamental Mass Ratios”

The remarkably successful Standard Model of elementary particles contains a large number of dimensionless "constants" that cannot be derived from the theory and must be measured. These include coupling constants such as the fine-structure constant, as well fundamental mass ratios. Many well-motivated extensions to the Standard Model include variation of these fundamental constants as a possibility, or even as a necessity in an expanding Universe.

In this talk I will review recent attempts to find variation of the fine structure constant, strong interaction, and fundamental masses (Higgs vacuum). The measurements cover the lifespan of the Universe from a few minutes after Big Bang to the present time. Hints of variation have been seen in data from quasar absorption spectra and Big Bang nucleosynthesis, however a majority of works give limits on variation. I will discuss some of the most promising new atomic, nuclear and molecular systems where huge enhancements of the effects may occur. Such enhancements may be due to transitions between very close energy levels, or near resonances.

The audience is invited to meet the speaker beforehand at 3.45 p.m. over coffee and biscuits in the Common Room.

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