

Department of Physics & Astronomy

PHYSICS EVENTS

Nobel Laureate to Speak on the Discovery of the Binary Pulsar

April 17, 2006

Nobel Prize-winning physicist Russell A. Hulse will deliver a special colloquium at the University of Tennessee on April 19. He will describe the work that led to his sharing the 1993 Nobel Prize in Physics with Joseph Taylor for "... the discovery of a new type of pulsar, a discovery that has open up new possibilities for the study of gravitation."

The Discovery of the Binary Pulsar

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Abstract

Pulsars are rapidly rotating neutron stars that are observed using radio telescopes as pulsed, short-duty-cycle radio sources with typical periods on the order of 1 second or less. The mechanism underlying this pulsed emission is analogous to that of a lighthouse beacon, in that the observed pulses are the result of a tightly beamed pattern of radio radiation from the star which periodically sweeps across the earth as the star rotates. In 1974, a high sensitivity search to discover previously unknown pulsars using the 1000' Arecibo radio telescope discovered 40 new pulsars in our galaxy, including the 59 ms period pulsar PSR 1913+16. Puzzling and unexpected variations in the observed pulsation period of this object were ultimately understood to be the result of doppler shifts associated with the orbital motion of this pulsar around a companion star. Discovery of this "binary pulsar" has provided an almost textbook-perfect laboratory for studying effects predicted by Einstein's theories of relativity, by combining high orbital velocities and gravitational fields with the measurement capabilities afforded by use of the pulsar as an extremely precise clock. Continued high precision observations by Prof. Joseph Taylor and his colleagues of this orbiting pulsar clock over the 30 years since its discovery have led to ever more accurate confirmation of these relativistic effects, including decay of the pulsar's orbit due to the emission of gravitational radiation.

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Refreshments: 3:00 p.m.
Talk: 3:30 p.m.