



## Weekly Calendar

Summer Summary, 2016

### LSU Physics & Astronomy in the News

- The LIGO Scientific Collaboration and the Virgo collaboration identify a second gravitational wave event in the data from Advanced LIGO detectors. On December 26, 2015 at 03:38:53 UTC, scientists observed gravitational waves-ripples in the fabric of spacetime-for the second time. The gravitational waves were detected by both of the twin Laser Interferometer Gravitational-Wave Observatory (LIGO) detectors, located in Livingston, Louisiana, and Hanford, Washington, USA.  
[http://www.lsu.edu/physics/news/2016/06/2nd\\_gravitational\\_waves\\_detected.php](http://www.lsu.edu/physics/news/2016/06/2nd_gravitational_waves_detected.php)
- Physical Review Letters paper: [GW151226: Observation of Gravitational Waves from a 22-Solar-Mass Binary Black Hole Coalescence](#)
- Extreme light from frozen argon: LSU physicists **Mette Gaarde, Mengxi Wu, Kenneth Schafer**, and **Dana Browne**, in collaboration with a team of researchers at SLAC/Stanford University have directly compared the ultrafast, extreme ultraviolet radiation emitted by argon atoms when they are in their gas phase or in their weakly bound solid phase and found significant differences between them, as reported today in the journal **Nature**. The results yield new clues about how energetic electrons in a solid behave, and may yield new compact sources of short wavelength radiation  
<http://www.lsu.edu/physics/news/2016/06/20160606-frozen-argon.php>
- The CALorimetric Electron Telescope (CALET), launched from the Tanegashima Space Center off the southern coast of Japan to the International Space Station in August 2015, has now detected over a hundred million cosmic ray events above 10 GeV. The 1400 lb CALET experiment is the first instrument specifically designed to identify electrons at energies above  $10^{12}$  electron volts, and will spend the next 2-5 years measuring very high energy cosmic ray electrons, nuclei, and gamma rays. At LSU, **John Wefel, Mike Cherry, Greg Guzik, Amir Javid, Nick Cannady, Bethany Broekhoven, Doug Granger, Michael Stewart**, and a team of undergraduates are working with collaborators at over 30 institutions in Japan, Italy, and the US to analyze the CALET data. <http://cerncourier.com/cws/article/cern/64666>
- The research of LSU Physicist **James Matthews** and an international team of scientists is featured in the CERN Courier. The world's largest cosmic-ray experiment, the Pierre Auger Observatory in Mendoza Province, Argentina, is embarking on its next phase, named AugerPrime.  
[http://www.phys.lsu.edu/newwebsite/downloads/CCJun16\\_AUGERPRIME.pdf](http://www.phys.lsu.edu/newwebsite/downloads/CCJun16_AUGERPRIME.pdf)

- **Dr. William O. Hamilton** was inducted into LSU College of Science Hall of Distinction on April 22, 2016. Dr. Hamilton, a Professor Emeritus in Physics & Astronomy, is considered the "father of gravitational physics at LSU." Over his career, Hamilton made seminal contributions to low-temperature experimental physics that have had major impacts in astronomy and cosmology. His pioneering work was instrumental in attracting the Laser Interferometric Gravitational Wave Observatory (LIGO) facility to Livingston, Louisiana. <http://www.lsu.edu/physics/resources/photo-gallery/2016-hall-of-distinction.php>

## New Publications

- **Rob Hynes, Brad Schaefer, undergrad Zach Baum, Ching-Cheng Hsu, Mike Cherry** et al. present a multi-wavelength study of the low-mass X-ray binary Sco X-1 in "Kepler K2 Observations of Sco X-1: Orbital Modulations and Correlations with Fermi GBM and MAXI" in Monthly Notices of the Royal Astronomical Society. <http://mnras.oxfordjournals.org/content/459/4/3596>
- "Scaled plane-wave Born cross sections for atoms and molecules," H. Tanaka, M. J. Brunger, L. Campbell, H. Kato, M. Hoshino, and **A. R. P. Rau**. Rev. Mod. Phys. 88, 025004 (45 pp) (2016). The Born approximation, as applied and extended by Bethe in the 1930s, has been dominant and useful for calculating scattering cross sections of electrons from atoms and molecules. In the intermediate energy region of 10 to 300 eV, detailed calculations are cumbersome and computationally expensive so that for a variety of applications of radiation penetration in matter, simpler scaled cross sections are valuable. This article critically reviews such cross sections, their theoretical justification and comparison with available experimental data, and provides analytical expressions for a number of atoms and small molecules relevant to astronomy, plasmas, and medicine <https://journals.aps.org/rmp/abstract/10.1103/RevModPhys.88.025004>
- Raman scattering is a powerful technique to probe optical phonons in solids. It usually involves electron-mediated process, involving photon, electron and phonon interactions. In principle, manipulating electrons, for instance by applying a magnetic field, should affect Raman phonon intensity, yet there is no direct experimental measurement. Recently **Prof. Ward Plummer** and **Prof. Jiandi Zhang**, through a collaboration with Prof. Qingming Zhang's group at Renmin University in Beijing, China, reported the first realization of the idea in a prototype material, MoS<sub>2</sub>. From monolayer and bilayer to bulk MoS<sub>2</sub> they observed a dramatic modification of Raman phonon intensity induced by magnetic field. Such a giant magneto-optical effect appearing at a monoatomic layer level and its technological implications for magnetic-optical devices should inspire a new branch of inelastic light scattering. For detail, read the related published article in Proceedings of the National Academy of Sciences. <http://www.lsu.edu/physics/news/2016/04/20160430-research-plummerzhang.php>

- Yin Wang, **Feng Pan**, **Kristina D. Launey**, Yan-An Luo, and **J. P. Draayer**, "Angular momentum projection for a Nilsson mean-field plus pairing model", Nucl. Phys. A 950 (2016) 1; doi:10.1016/j.nuclphysa.2016.03.012. The paper explores the interplay of pairing and deformation in intermediate-mass nuclei based on a new method for restoring the rotational invariance of a general nuclear pairing-plus-deformation Hamiltonian. The pairing term is exactly solved by using the Richardson Gaudin methods, while the deformation enters through an axially deformed mean field of the Nilsson model. Such a general nuclear Hamiltonian breaks the rotational symmetry. To remedy this, we carry out an angular momentum projection for the intrinsic deformed Hamiltonian, which is then applied to low-lying states of good angular momentum. Applications to oxygen, neon, and magnesium isotopes demonstrate the suitability of the method.  
<http://www.sciencedirect.com/science/article/pii/S0375947416001809>

## Events

### Max Goodrich Distinguished Lecture Series

#### Colloquium

S. Alan Stern, PI, NASA's New Horizons Mission / Southwest Research Institute

Fri., Sept. 2 at 10 am room 435 Nicholson Hall

[Major Results from the Exploration of the Pluto System](#)

#### Public Talk

S. Alan Stern, PI, NASA's New Horizons Mission / Southwest Research Institute

Fri., Sept. 2 at 2 pm in the Hill Memorial Library

[The Exploration of Pluto by NASA's New Horizons](#)