LSU College of Science Department of Physics & Astronomy

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Weekly Calendar

April 4 – April 8, 2016

Departmental Colloquium

"Critical Matter, Chiral Symmetry Breaking and Emergent Higgs Mechanism"

3:30 PM Thursday, April 7, 2016

109 Nicholson Hal

Leo Radzihovsky
University of Colorado

Host: Dan Sheehy/Ilya Vekhter

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

The upshot of extensive studies of fluctuations is that their qualitative importance typically confined to isolated critical points of continuous transitions between phases of condensed matter. This conventional wisdom also predicts the number of low energy Goldstone modes based on the pattern of symmetry breaking. I will discuss condensed matter systems, that violate this standard paradigm via an emergent Higgs mechanism. Even more spectacularly, these systems exhibit critical ordered phases, with universal power-law properties reminiscent of continuous phase transition, but without any fine-tuning and extending throughout the ordered phase. The most interesting recent example is the twist-bend nematic liquid crystal a homogeneous liquid that spontaneous breaks chiral symmetry.

LSU Physics & Astronomy in the News

Professors work to incorporate 3-D printers into cancer treatment:
Wayne Newhauser is partnering with architecture assistant professor Jason Crow to incorporate 3-D printing into cancer treatment programs. Read more:
http://www.lsunow.com/daily/professors-work-to-incorporate--d-printers-into-cancer-treatment/article_e7f73348-f608-11e5-9073-0733b7d803e4.html

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Radiation Oncology Seminar

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Speaker: Dr. Terry Wu, PhD
Chief Physicists, Radiation Oncology Department
Willis Knighton Cancer Center
Shreveport, LA

Seminar Title: Proton Therapy Research at Willis-Knighton Cancer Center

Date: Friday, April 8, 2016

Time: 12:30 – 1:30 PM

Location: Louisiana State University
435 Nicholson Hall

Host: Wayne Newhauser, Ph.D.,
Professor and Director
LSU Medical Physics and Health Physics Program

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Abstract: Willis-Knighton Cancer Center (WKCC) has installed the 1st pencil beam scanning (PBS) compact proton system in the world, IBA ProteusOne (Ion Beam Application Inc., Belgium). The ProteusOne possesses a C230 cyclotron with a new design of gantry and beam line. The system is equipped with oblique stereotactic imaging system, kV-kV OBI and CBCT. With the full IGRT techniques, the 6D robotic couch is able to correct patient setup with 1mm accuracy. Because of its unique compact design of the system with partial gantry rotation (220 degree), limited useful field size (20x24cm) and PBS only treatment modality, also create some challenges for clinical usage for treating various body sites.
This talk provides an overview of current clinical research at WKCC. Most topics are targeted on enhancing the effective of treatment technique to overcome the limitation of compact design.

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LACNS

Louisiana Consortium for Neutron Scattering

SEMINAR SERIES 2016

Monday, April 4
3:00pm
1008B Digital Media Center
Louisiana State University

How to identify and resolve beyond-geometrical frustration

In this talk, we will discuss recent theoretical developments triggered by the experimental discoveries of iridium oxides α,β,γ-Li_2IrO_3. In these polytypes, spin-orbit-coupled J=1/2 moments form 2D and 3D lattices (honeycomb, hyperhoneycomb and stripyhoneycomb) which generalize the 2D honeycomb lattice. Scattering experiments on all three of these compounds have uncovered a peculiar non-coplanar incommensurate magnetic order, involving spirals which counter-rotate across neighboring sites. We discuss the emergence of this ordering, and the striking similarities visible across the three Li_2IrO_3 structures.

The model Hamiltonians that capture the materials indicate strong magnetic frustration, which arises from spin-orbit coupling. Tuning the frustration, perhaps by just a 10% Hamiltonian perturbation, exposes a fractionalized phase: Kitaev's three-dimensional quantum spin liquid (QSL). What is its range of stability to the competing Hamiltonian terms which occur in the materials, such as antiferromagnetic Heisenberg exchange? The frustration prohibits direct computations. Instead, we demonstrate a viable approach by numerically solving the model in a fully quantum infinite-dimensional approximation, which captures both the magnetically ordered and the QSL phases. Finally, we discuss the phenomenology of the QSL phase, including the role of its emergent magnetic-like field lines in stabilizing its deconfined fermion excitations to finite temperatures. The resulting phase transition is a signature unique to three-dimensional fractionalization.

Guest Speaker

Dr. Itamar Kimchi

Pappalardo Postdoctoral Fellow

Department of Physics, MIT

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