Job Opportunity

Postdoctorial positions in Theoretical Condensed Matter Physics

Possibly one or two postdoctoral positions in my group, available in January 2018. The funding for these positions comes from the NSF and DOE and is to support theoretical research in condensed-mater physics, in collaboration with several experimental groups here at UCSD and at Columbia.

We seek candidates with expertise in the following fields: low-dimensional systems, graphene and other 2D materials, excitons in semiconductors, polaritons, superconductivity, Josephson junctions, non-equilibrium dynamics, nonlinear optics, near-field optics, and plasmonics.
Title: Brave the Elements: Understanding How Stellar Abundances Affect Planets and Their Structure

Speaker: Natalie Hinkel, Vanderbilt

Date: Tuesday, November 7

Time/Location: 134 Astronomy at 3:45 pm

Abstract: Stars are the furnaces that produced most of the elements within the Periodic Table. It is by studying these basic elements within the Hypatia Catalog, the largest stellar elemental abundance dataset for stars near to the Sun, that we can understand those events that must have taken place prior to the formation of the Solar System. Additionally, because stars and planets are formed at the same time, we can make meaningful connections between the chemical properties of stars and their orbiting planets. The current techniques for discovering exoplanets, for example the radial velocity, transit, and microlensing methods, depend entirely on the physical properties between the planet and star relative to the Earth. However, it has been shown by dozens of groups that [Fe/H]-rich stars are more likely to host giant planets. I will discuss how non-Fe stellar abundances may be used to determine planetary composition and mineralogy. I will also describe a Netflix-esque recommendation algorithm to determine which stars in the solar neighborhood are likely to host to-date undetected giant exoplanets, based on the abundances of specific elements within stars. The ability to understand not only the physical relationship but also the chemical relationship between stars and planets will help narrow the observational field for truly habitable, Earth-like planets.
Astrophysics, Gravitation and Cosmology Seminar

**Title:** Deep Learning Techniques for Real-Time Gravitational Wave and Multimessenger Astrophysics

**Speaker:** Daniel George, U. of Illinois

**Date:** Wednesday, November 8  
**Time/Location:** 3:45pm/134 Astronomy

Abstract: A new era of gravitational wave (GW) astronomy has begun with the recent Nobel-prize winning detections by LIGO. Current data analysis pipelines are, however, limited by the extreme computational costs of template-matching, thus facing significant delays and inability to detect all types of GW sources. I will start with an introduction to deep learning with artificial neural networks. I will then describe a highly scalable technique, based on two 1D convolutional neural networks, that I developed to resolve these issues, which allows real-time detection and parameter estimation of GW signals whose amplitudes are much weaker than the background noise. This uses data derived from high-performance physics simulations on supercomputers, including Blue Waters, to train artificial intelligence algorithms that exploit emerging hardware architectures such as deep-learning-optimized GPUs. I will also discuss my recent work on applying transfer learning and unsupervised clustering methods for classifying anomalous noise transients in spectrograms of LIGO data. I will conclude by discussing my ongoing research including new deep learning methods for denoising LIGO data with recurrent neural network auto-encoders and generative modeling of GW signals. These deep learning techniques for low-latency analysis of the raw big data collected by observational instruments can enable real-time gravitational wave and multimessenger astrophysics, which promises groundbreaking insights about the universe.
CALENDAR OF EVENTS http://physics.illinois.edu/bluesheet.asp

Tuesday, November 7: Astronomy Colloquium; “Brave the Elements: Understanding How Stellar Abundances Affect Planets and Their Structure” Natalie Hinkel, Vanderbilt University; 134 Astronomy at 3:45 pm


Wednesday, November 8: Physics Colloquium: "Hearing the Stars: New Insights into Stellar Interiors from Asteroseismology”; Lars Bildsten, UCSB; 141 Loomis at 4 PM

Thursday, November 9: Special ICMT Seminar: “Fermionic spinon theory of square lattice spin liquids near the Néel state” Alex Thomson, KITP, in 3110 ESB at 11:00 am

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Job Opportunity

Tenured Faculty Position in Experimental Condensed Matter Physics at the Department of Physics and Astronomy at Western Washington University

The Department of Physics and Astronomy at Western Washington University is conducting a faculty search this year, aiming to fill a tenure track position in the area of experimental condensed matter physics, broadly defined. Given your expertise in this area, we would very much appreciate your help in getting the word out about this position. I have attached the text of the full ad to this email. The job posting from our HR site can be found at: https://jobs.wwu.edu/JobPosting.aspx?JPID=7594. Our Department website can be found here: https://cse.wwu.edu/physics.

Review of applications began on October 20, 2017, but we will actively review any applications that come in prior to December 1, 2017.

This search is part of the Provost's hiring initiative to boost diversity and inclusion at the University at all levels. We are therefore particularly interested in reaching out to candidates who are currently underrepresented among Western's faculty (women, persons of color, first generation, etc.). In addition, we are requiring for this position that applicants have demonstrated an ability to promote inclusivity and diversity in their working environment. The search committee chair, Dr. Janelle Leger, would be happy to discuss this requirement and our college's efforts to promote equity and inclusivity in STEM with interested candidates.

Dr. Leger would be happy to provide more information about this position and our institution, either to you or to any candidates who might be interested in learning more. Please do not hesitate to contact her via email, phone [360-650-4830]
**Title:** Hearing the Stars: New Insights into Stellar Interiors from Asteroseismology

**Speaker:** Lars Bildsten, U. of California, Santa Barbara

**Date:** Wednesday, November 8

**Time/Location:** 4:00 pm/141 Loomis

Abstract: Long-term and sensitive space-based photometry from the Kepler and CoRoT satellites has allowed us to finally 'hear' the stars. These remarkable data have yielded accurate measurements of masses, radii and distances for more than 30,000 stars across the Milky Way. More profoundly, these observations are revealing the interior conditions of the star, clearly differentiating those that are undergoing helium burning in their cores to those that are only burning hydrogen in a shell. Moreover, interior rotation rates for hundreds of post-main sequence stars have now been measured, probing the uncertain physics of angular momentum transport that is important to the progenitors of core collapse supernova. Most recently, the prevalence of red giants with very low dipolar oscillation amplitudes appears to be a consequence of strong magnetic fields deep in the helium cores of these red giants.
**Special ICMT Seminar**

**Title:** “Fermionic spinon theory of square lattice spin liquids near the Néel state"

**Speaker:** Alex Thomson, KITP

**Date:** Thursday, November 9  **Time/Location:** 11:00 am/3110 ESB

Abstract: Quantum fluctuations of the Néel state of the square lattice antiferromagnet are usually described by a CP1 theory of bosonic spinons coupled to a U(1) gauge field, and with a global SU(2) spin rotation symmetry. Such a theory also has a confining phase with valence bond solid (VBS) order, and upon including spin-singlet charge 2 Higgs fields, deconfined phases with Z2 topological order possibly intertwined with discrete broken global symmetries. We present dual theories of the same phases starting from a mean-field theory of fermionic spinons moving in π-flux in each square lattice plaquette. Fluctuations about this π-flux state are described by 2+1 dimensional quantum chromodynamics (QCD3) with a SU(2) gauge group and Nf = 2 flavors of massless Dirac fermions. It has recently been argued by Wang et al. (arXiv:1703.02426) that this QCD3 theory describes the Néel-VBS quantum phase transition. We introduce adjoint Higgs fields in QCD3, and obtain fermionic dual descriptions of the phases with Z2 topological order obtained earlier using the bosonic CP1 theory. We also present a fermionic spinon derivation of the monopole Berry phases in the U(1) gauge theory of the VBS state. The global phase diagram of these phases contains multicritical points, and our results imply new boson-fermion dualities between critical gauge theories of these points.