



## PHYSICS & ASTRONOMY WEEKLY CALENDAR

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### WEEKLY CALENDAR

December 1, 2008

"Phase transitions and disorder: from Harris criterion to infinite randomness and smearing"

3:40 PM, December 4, 2008  
109 Nicholson Hall

**Thomas Vojta**  
Missouri University of Science and Technology

**Host: Ilya Vekhter**

• *Refreshments served at 3:15 PM in 201 Nicholson Hall* •

Phase transitions are fascinating phenomena in nature with consequences ranging from the large scale structure of the universe to exotic quantum phases at low temperatures. Many realistic systems contain impurities, defects and other forms of quenched disorder. This talk explores the consequences of such randomness on the properties of phase transitions. At zero-temperature quantum phase transitions, randomness can have particularly peculiar and strong effects. Often, rare strong disorder fluctuations and the rare spatial regions that support them dominate the physics close to the transition. They give rise to strong singularities in the free energy, the so-called quantum-Griffiths singularities. In some systems such as metallic magnets, the effects of rare fluctuations can be even stronger, leading to a destruction of the phase transition by smearing. We suggest a classification of these rare region effects based on the effective dimensionality of the defects, and we illustrate it using examples from classical, quantum, and nonequilibrium phase transitions.

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#### **Congratulations To:**

Dr. Jonathan Dowling who has been elected a jolly good Fellow of the American Physical Society.

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#### **Publications:**

- "An excess of cosmic ray electrons at energies of 300-800 GeV," J. Chang, J.H. Adams, H.S. Ahn, G.L. Bashindzhagyan, M. Christl, O. Ganel, **T.G. Guzik**, **J. Isbert**, K.C. Kim, E.N. Kuznetsov, M.I. Panasyuk, A.D. Panov, W.K.H. Schmidt, E.S. Seo, N.V. Sokolskaya, J.W. Watts, **J.P. Wefel**, J. Wu, & V.I. Zatsepin, Vol 456, 20 November 2008, doi:10.1038, Nature 07477.