College of Arts and Sciences **Department of Mathematics**
University of South Carolina

Math News

October 8-12, 2012

Published by and for the Department of Mathematics

ACM Seminar

Linear & Nonlinear Waves Formed in Granular Crystals & Their Engineering Applications

Jinkyu Yang, USC Mechanical Engineering

Tuesday October 9th 2:30-3:30 PM
LeConte 312

Granular crystals are composed of ordered elastic particles in periodic architectures, which exhibit remarkable versatility in their acoustic spectra from linear to highly nonlinear regimes. Dr. Yang's research focus resides in the development of tunable and lightweight structural materials based on granular crystals to identify external impacts and mitigate noise and vibration in a selected range of frequencies. These novel acoustic structures are feasible by exploiting dispersion and nonlinearity effects resulting from the close interplay among granular particles. Such material systems could be used for several engineering applications, including self-sensing and protective structures and tunable acoustic filtering devices. Dr. Yang is also interested in the design of new sensor and actuator instruments based on nonlinear solitary waves in granular crystals. Preliminary studies show that these sensors can successfully characterize bone mechanical properties for biomedical applications and detect hidden delaminations and cracks in military structures for aerospace applications. These novel sensor devices may offer a new perspective beyond the conventional linear-wave based structural health monitoring and nondestructive evaluation schemes.

Analysis Seminar

γ-boundedness does not imply $\mathcal{R}$-boundedness.

Lutz Weis, Karlsruhe Inst. of Technology

Wednesday October 10th 1:15-2:15 PM
LeConte 312

It is known that γ-boundedness and $\mathcal{R}$-boundedness are the same in spaces of finite cotype. However, we will show that this is not the case in ∞. The counterexample is part of a joint paper with S. Kwapien and M. Veraar.

Combinatorics Seminar

Threshold Functions for Distinct Parts: Revisiting Erdős-Lehner

László A. Székely, USC

Wednesday October 10th 3:30-4:30 PM
LeConte 312

We study four problems: put n distinguishable/non-distinguishable balls into k non-empty distinguishable/non-distinguishable boxes randomly. What is the threshold function $k=k(n)$ to make almost sure that no two boxes contain the same number of balls? The non-distinguishable ball problems are essentially equivalent to the Erdős-Lehner asymptotic formula for the number of partitions of the integer n into k parts with $k=o(n^{1/3})$ The problem is motivated by the statistics of an experiment, where we only can tell whether outcomes are identical or different. This is joint work with É. Czabarka and M. Marsili.

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IMI Distinguished Lecture

Curvature Singularities on the Surface of Water Waves

Gregory Baker, The Ohio State University

Thursday October 11th 3:30-4:30 PM
LeConte 412

Boundary integral methods are naturally suited for tracking the motion of free surfaces in incompressible, inviscid flows. An important example is the propagation of waves on the surface of water, deep or shallow. Not only is the method naturally adaptive when fluid particles are tracked by following their motion, but also spectrally accurate numerical methods ensure high enough resolution that important mathematical behavior can be discerned. A pleasing viewpoint arises when the curvature of the surface location is considered as a complex-valued function of the complex-valued arclength. Pole singularities are found that move around the complex plane as the wave progresses. Of special interest is whether these singularities reach the real axis when the curvature singularity becomes physically real. We report on singularity behavior in general, but particularly when the water waves break.

Algebra & Logic Seminar

The Finite Lattice Representation Problem and intervals in Sub Group Lattices of Finite Groups

William DeMeo, USC

Friday October 12th 3:30-4:30 PM
LeConte 312

A long-standing open problem in universal algebra is to characterize those lattices that are isomorphic to congruence lattices of finite algebras. This week, I will conclude this series of lectures on this topic by discussing in greater detail our new method for expanding and extending a finite algebra so that its congruence lattice grows in predictable ways. In particular, I will prove two basic theorems about such expansions, and demonstrate these results with some examples using the Universal Algebra Calculator.

Sudoku Puzzle of the Week:

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

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