

John F. Wambaugh

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EDUCATION

Duke University, Department of Physics, Durham, North Carolina, 2001-2006
PhD Candidate in Experimental Physics with Nonlinear and Complex Systems Certificate
Dissertation Title: "The Physics of Dense Granular Matter"
Advisor: Robert Behringer

Duke University, Department of Computer Science, Durham, North Carolina 2004-2005
MS in Computer Science with focus on Scientific Computing
Project Title: "Graph Percolation as an Analog to Granular Force Networks"
Advisor: Robert Behringer

Georgia Institute of Technology, School of Physics, Atlanta, Georgia 1999-2001
MS in Physics

University of Michigan, Ann Arbor, Michigan 1995-1999
BS in Physics with Highest Honors
Thesis Title: "Magnetic Flux Dynamics in Superconducting Channels"
Advisor: Franco Nori

RESEARCH INTERESTS

Computational and experimental investigation of non-linear, non-equilibrium systems including:

- Force propagation in granular materials
- Statistical mechanics of networks
- Dense granular flows
- Stochastic ratchet phenomena

RESEARCH EXPERIENCE

Duke University, Durham, North Carolina 2002-2006
Graduate Research Assistant in Department of Physics and Center for Non-Linear and Complex Systems – Experimental investigations of non-linear phenomena in static and flowing granular materials. Principal Investigator: Prof. Robert Behringer

Los Alamos National Laboratory, Los Alamos, New Mexico Summer 2001
Visiting Graduate Student in the Center for Nonlinear Studies – Constructed computer simulation to investigate stochastic ratcheting phenomena of granular materials.
Principal Investigators: Dr. Charles Reichhardt and Dr. Cynthia Olson-Reichhardt

University of Michigan, Ann Arbor, Michigan 1997-1999
Undergraduate Research Assistant in Department of Physics and Program for the Study of Complex Systems – Constructed several computer models to investigate magnetic flux vortex interactions in high temperature superconductors. Principal Investigator: Prof. Franco Nori

University of Michigan, Ann Arbor, Michigan 1995-1999
Undergraduate Research Assistant in the College of Architecture and Urban Planning – Developed software user interface and integration of data tables for thermal architectural simulation. Principal Investigator: Prof. Ali Malkawi

TEACHING EXPERIENCE

- 2001-2003 **Duke University, Department of Physics, Durham, North Carolina**
Teaching assistant for graduate quantum mechanics, undergraduate thermal physics and undergraduate laboratory courses.
- 1999-2001 **Georgia Institute of Technology, School of Physics, Atlanta, Georgia**
Teaching assistant for undergraduate electromagnetism laboratory courses.

MEMBERSHIPS

1. American Physical Society: Division of Fluid Dynamics, Statistical and Nonlinear Physics Topical Group, Forum on Graduate Student Affairs
2. American Association of Physics Teachers

SERVICE

1. Member of Graduate Curriculum Committee of Duke Physics Faculty, 2005
2. President of the Duke Physics Graduate Student Organization, 2002-2004

PUBLICATIONS

1. "Graph Percolation as an Analog to Granular Force Networks", J. F. Wambaugh and R. P. Behringer, *in preparation*
2. "Response to Perturbations in Granular Flow", J. F. Wambaugh, J. V. Matthews, P. A. Gremaud and R. P. Behringer, *in preparation*
3. "Shear and Loading in Channels: Oscillatory Shearing and Edge Currents of Superconducting Vortices", J. F. Wambaugh, F. Marchesoni and F. Nori, *Physical Review B* 67, 144515 (2003)
4. "Ratchet-Induced Segregation and Transport of Non-Spherical Grains", J. F. Wambaugh, C. Reichhardt and C. J. Olson, *Physical Review E* 65, 031308 (2002)
5. "Superconducting Fluxon Pumps and Lenses", J. F. Wambaugh, C. Reichhardt, C. J. Olson, F. Marchesoni and F. Nori, *Physical Review Letters* 83, 5106 (1999)

PROCEEDINGS

1. "Asymmetry-induced circulation in granular hopper flows", J. F. Wambaugh and R. P. Behringer, *Powders & Grains 2005*, pages 915-918 (2005)
2. "Platform Independent Simulations: Thermal Simulation as an Object", A. M. Malkawi and J. F. Wambaugh, *Proceedings of the Sixth International Building Performance Simulation Association*, Volume 1, pages 37-42 (1999)
3. "A New System for Accessing Transfer Function Coefficients for an Architectural Computer-Aided Thermal Optimization Tool", A. M. Malkawi and J. F. Wambaugh, *Proceedings of the Fifth International Building Performance Simulation Association*, Volume 2, pages 157-163 (1997)
4. "A User Friendly Computer-Aided Thermal Design Tool Utilizing Transfer Functions", A. M. Malkawi and J. F. Wambaugh, *Proceedings of Third International Thermal Energy & Environment Congress*, Volume 2, pages 421-426 (1997)

CONTRIBUTED PRESENTATIONS

1. “Square Amplitude Granular Waves”, Dynamics Days 2006 Meeting in Bethesda, Maryland, January 2006 (talk)
2. “Sensitivity of Granular Hopper Flows to Boundary Conditions”, APS Division of Fluid Dynamics Annual Meeting in Chicago, Illinois, November 2005 (talk)
3. “Asymmetry-induced circulation in granular hopper flows”, Powders and Grains 2005, Stuttgart, Germany, June 2005 (poster)
4. “Circulation in Asymmetric Granular Hoppers”, APS Division of Fluid Dynamics Annual Meeting in Seattle, Washington, November 2004 (talk)
5. “Observed Deviations from Janssen Model in Granular Silos”, Dynamics Days 2004 Meeting in Chapel Hill, North Carolina, January 2004 (poster)
6. “Elastic Effects in Granular Pressure Profiles”, APS Division of Fluid Dynamics Annual Meeting in East Rutherford, New Jersey, November 2003 (talk)
7. “Asymmetry-Induced Circulation in Conical Granular Flows”, APS Division of Fluid Dynamics Annual Meeting in East Rutherford, New Jersey, November 2003 (talk)
8. “Ratchet-Induced Segregation and Transport of Non-Spherical Grains”, APS March Meeting in Indianapolis, Indiana, March 2002 (talk)
9. “A New System for Accessing Transfer Function Coefficients for an Architectural Computer-Aided Thermal Optimization Tool”, Fifth International Building Performance Simulation Association Meeting, Prague, Czech Republic, September 1997 (poster)

UNDERGRADUATES MENTORED

Annie Thebprasith, Mount Holyoke College:

Studying the impact of particle elasticity on force propagation in photoelastic experiments