SHARON J. GERBODE

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EDUCATION

2007 – present **Ph.D. candidate in Physics, Cornell University**. Thesis advisor: Professor Itai Cohen.

2007 **M.S. in Physics, Cornell University**

2003 **B.S. in Physics, Minor in Astrophysics, UC Santa Cruz** – *College Honors*

RESEARCH

2005 – present **Defects in Colloidal Crystals:** Graduate research with Professor Itai Cohen at Cornell University**.** My thesis research is focused on defect formation and motion in colloidal crystals, with an emphasis on their implications for bulk properties. Using holographic optical tweezers integrated with a confocal microscope to locally perturb crystals of colloidal dimers, I have uncovered novel plasticity mechanics caused by geometric constraints on dislocation glide.

2007 – present **Plant Root Biomechanics:** NSF IGERT fellowship collaboration with Professor Maria Harrison at Cornell University. I developed an original 3D laser sheet imaging technique for recording plant root growth in response to heterogeneous soil environments. I am modeling the observed helical growth response to stiff barriers as passive mechanical buckling in twisted filaments, similar to plectoneme formation in supercoiled DNA.

Summer 2007 **Self Organization in Sheared Sedimenting Suspensions:** NSF-funded internship with Professor David Pine at New York University. I studied sedimenting particle suspensions under shear in a self-organized perpetually critical state. This work has uncovered a new class of physical systems exhibiting self-organized criticality.

2001 – 2003 **Selectron Detection:** Undergraduate research in particle physics with Professor Bruce Schumm at UC Santa Cruz.

PUBLICATIONS

- **S. J. Gerbode** and I. Cohen, "Glassy Dislocation Dynamics in Crystals of Colloidal Dimers" *(in preparation)*
- L. Corte, **S. J. Gerbode**, W. Man, and D. J. Pine, "Self-Organized Criticality in Sheared Suspensions" *(in review)*
- R. Ganapathy, M. Buckley, **S. J. Gerbode**, and I. Cohen, "Direct Measurements of Island Growth and Step-Edge Barriers in Colloidal Epitaxy" ***Science*** *(in review)*
- **S. J. Gerbode**, S. Lee, C. Liddell, and I. Cohen, "Restricted Dislocation Motion in Crystals of Colloidal Dimer Particles" ***Physical Review Letters*** **101**, 058302 (2008).
- S. Lee, **S. J. Gerbode**, B. John, A. Wolfgang, I. Cohen, F. Escobedo, and C. Liddell, "Synthesis & Assembly of Nonspherical Hollow Silica Colloids Under Confinement" ***Journal of Material Chemistry***, **18**(41), 4912– 4916 (2008). (***Cover Art***)
- **S. J. Gerbode**, H. Holguin, T. Lau, P. Moser, A. Pearlstein, J. Rose, and B. Schumm, "Selectron Mass Reconstruction and the Resolution of the Linear Collider Detector," ***International Linear Collider Workshop***, **0214** (2005).

AWARDS, HONORS, FELLOWSHIPS

September 2009 **Best User Presentation Award, Cornell Nanoscience and Technology Facility (CNF)**

November 2008 **NNIN International Winter School in India**

One of 15 from the US selected to visit India to study the application of technologies in developing countries

April 2008 **Robinson-Appel Humanitarian Award, Cornell University**

Awarded for my weekly tutoring program at Lansing Residential Center, see Outreach Experience, below

March 2008 **Finalist, GSNP Student Speaker Award, APS March Meeting**

One of five finalists invited to present talks at a special March Meeting session

2006 – 2008 **NSF Integrative Graduate Education and Research Traineeship (IGERT), Cornell University**

Fellowship focusing on complex systems, encouraging interdisciplinary research

July 2007 **Nellie Whetten Memorial Award, Cornell Nanoscience and Technology Facility (CNF)**

Annual award presented to an outstanding female CNF researcher

TECHNICAL EXPERIENCE

Nanofabrication

Fabricated colloidal crystallization templates using photolithography (standard & grayscale), electron beam lithography, reactive ion etching, chemical vapor deposition, and sputter deposition.

Optics

Integrated a holographic optical tweezer system with a 1064 nm laser source with a confocal microscope; designed and built a laser sheet imaging system for 3D observations of growing plant roots.

Particle Synthesis

Synthesized colloidal particles, both micron-sized PMMA spheres and temperature-sensitive NIPA spheres.

Equipment Design and Machining

Designed and built experimental devices including a microscope-mounted compression and shear cell for simultaneous imaging and mechanical perturbation of colloidal suspensions.

Computer Programming

Wrote Monte Carlo and Molecular Dynamics simulations of colloidal particles in Python and Matlab, particle-tracking routines in Matlab and IDL, and Labview control software for automated data acquisition.

INVITED PRESENTATIONS

2009 **Cornell NanoScale Facility Annual Meeting:** "Novel Features of Epitaxially Grown Colloidal Thin Films"
Columbia University: "Mechanical Buckling in Twisting Plant Roots"

2008 **NSF IGERT Project Meeting *(poster)*:** "Image Slice Reconstruction across Disciplines"
APS March Meeting, Student Award Section: "Restricted Defect Dynamics in Colloidal Peanut Crystals"
Physics Graduate Society: "Complex Matter Physics: Colloids to Biolocomotion"

2006 **NSF IGERT Seminar Talk:** "2D Melting of Colloidal Peanuts: Simulating dimer molecular dynamics"

TEACHING AND SUPERVISING EXPERIENCE

2005 – present ***Research Supervisor*, Cornell University:** Supervised two Cornell undergraduates and two NNIN REU students.

Summer 2009 ***Co-instructor*, college-level conceptual physics at Auburn Correctional Facility** (a nearby max. security prison)

2004 – 2005 ***Graduate Teaching Assistant*, Cornell University Physics Department**

2003 – 2004 ***Physics Instructor*, Academic Excellence (ACE) Program, UC Santa Cruz**

1999 – 2000 ***Instructional Assistant*, University of California Santa Cruz**

OUTREACH EXPERIENCE

2009 – present ***Conference Chair*, Expanding Your Horizons (EYH), Cornell University**
I am the conference chair for the EYH program at Cornell University, a non-profit organization whose mission is to encourage young women to pursue science-related careers.

2005 – present ***Leader*, Lansing Residential Center Tutoring Program**
I lead a weekly tutoring program at Lansing Residential Center, a nearby juvenile detention facility for girls.

2007 – present ***Chair of EYH at Lansing*, Expanding Your Horizons (EYH), Cornell University**
I coordinate a smaller version of EYH for the residents at the Lansing Residential Center.

2004 – 2005 ***Volunteer*, Center for Nanoscale Systems Institute for Physics Teachers, Cornell University**
In collaboration with a high school physics teacher, I co-developed a high school physics lab activity on waves.

REFERENCES

- **Professor Itai Cohen:** Physics Department, Cornell University, ic64@cornell.edu
- **Professor David Pine:** Center for Soft Matter Research, New York University, dp82@nyu.edu
- **Professor Chekesha Liddell:** Materials Science and Engineering, Cornell University, cliddell@ccmr.cornell.edu
- **Professor Bruce Schumm:** Physics Department, University of California Santa Cruz, schumm@scipp.ucsc.edu