Karen E. Daniels

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EDUCATION

2000 – 2002 **Cornell University, Ithaca, NY**
PhD in Experimental Condensed Matter Physics
Thesis title: *Pattern Formation and Dynamics in Inclined Layer Convection*
Advisor: Dr. Eberhard Bodenschatz

1997 – 2000 **Cornell University, Ithaca, NY**
MS in Physics

1990 – 1994 **Dartmouth College, Hanover, NH**
AB in Physics with high honors; minor in Mathematics
Thesis title: *Atmospheric Electroglow in the Equatorial Region of Jupiter*
Advisor: Dr. Mary Hudson

PROFESSIONAL EXPERIENCE

July 2005 – **Department of Physics, North Carolina State University, Raleigh, NC**
Assistant Professor

2002 – 2005 **Department of Physics, Duke University, Durham, NC**
Postdoctoral Research Associate (Dr. Robert Behringer)

1994 – 1997 **Saint Ann's School, Brooklyn, NY**
Physics teacher

TEACHING EXPERIENCE

Fall 2004 **Duke University, Durham, NC**
Recitation instructor, Physics 53, *General Physics I*.

1998 – 1999 **Department of Physics, Cornell University, Ithaca, NY**
Teaching assistant training program instructor (1998), chair (1999).

1997 **Department of Physics, Cornell University, Ithaca, NY**
Teaching Assistant, Physics 201, *Why the Sky is Blue*.

RESEARCH INTERESTS

Experimental studies of nonequilibrium and nonlinear systems, including:

- pattern formation and dynamics in Raleigh-Bénard convection
- dynamics and statistical mechanics of granular materials
- geological implications of granular physics (earthquakes, meteor impacts)
- morphological instabilities in spreading droplets, thin films and complex materials

MEMBERSHIPS

American Physical Society: Division of Fluid Dynamics, Division of Condensed Matter Physics, Statistical and Nonlinear Physics Topical Group, Forum on Physics Education, Forum on Physics and Society, and Southeastern Section

American Association of Physics Teachers

Sigma Xi

SERVICE

Reviewer for *Physical Review Letters*, *Physical Review E*, *Physica A*, *Physica D*, *Review of Scientific Instruments*, *Granular Matter*, *Canadian Journal of Physics*

PUBLICATIONS

* *denotes undergraduate coauthor*

1. K. E. Daniels, S. Mukhopadhyay, and R. P. Behringer. "Starbursts and Wispy Drops: Surfactants Spreading on Gels." In preparation.
2. K. E. Daniels, O. Brausch, W. Pesch, and E. Bodenschatz. "Undulations and undulation chaos in inclined layer convection." In preparation.
3. N. S. Oblath*, K. E. Daniels, R. Ragnarsson, W. Bertsche*, A. Frankel*, and E. Bodenschatz. "Parting the Wax Sea." In preparation.
4. K. E. Daniels and R. P. Behringer. "Hysteresis and competition between disorder and crystallization in sheared and vibrated granular flow." To appear in *Physical Review Letters*. Preprint: `cond-mat/0410087`
5. C. Huepe, H. Riecke, K. E. Daniels, and E. Bodenschatz. "Statistics of Defect Trajectories in Spatio-Temporal Chaos in Inclined Layer Convection and the Complex Ginzburg-Landau Equation." *Chaos*, **14**: 864 (September 2004).
6. K. E. Daniels, C. Beck, and E. Bodenschatz. "Defect turbulence and generalized statistical mechanics." *Physica D*, **193**: 208 (15 June 2004).
7. K. E. Daniels, R. J. Wiener, and E. Bodenschatz. "Localized transverse bursts in inclined layer convection." *Physical Review Letters*, **91**: 114501 (12 Sep 2003).
8. K. E. Daniels and E. Bodenschatz. "Statistics of defect motion in spatiotemporal chaos in inclined layer convection." *Chaos*, **13**: 55 (March 2003).
9. K. E. Daniels and E. Bodenschatz. "Defect turbulence in inclined layer convection." *Physical Review Letters*, **88**: 034501 (21 Jan 2002).
10. K. E. Daniels, B. B. Plapp, and E. Bodenschatz. "Pattern formation in inclined layer convection." *Physical Review Letters*, **84**:5320 (5 June 2000).

PROCEEDINGS

1. K. E. Daniels and R. P. Behringer, "Characterization of a Freezing/Melting Transition in a Vibrated and Sheared Granular Medium." *Powders and Grains 2005.* Balkema, 2005.
2. K. E. Daniels, J. E. Coppock*, and R. P. Behringer. "Dynamics of Meteor Impacts." Gallery of Nonlinear Images, *Chaos*, **14**: S4, (December 2004).
3. K. E. Daniels, B. B. Plapp, and E. Bodenschatz. "Inclined layer convection." *Proceedings of the International Congress of Theoretical and Applied Mechanics, Chicago, IL, 27 August – 1 September 2000.* Kluwer Academic Publishers, 2000.

INVITED TALKS

1. "Freezing and melting in granular materials." Department of Mechanical Engineering and Materials Science, Duke University, Durham, NC, March 2005.
2. "Freezing and melting in granular materials." Solid State Seminar, Physics Department, Cornell University, Ithaca, NY, March 2005.
3. "Fluids, Strange and Beautiful." Physics Department, Occidental College, Los Angeles, CA, February 2005.
4. "Freezing and melting in granular materials." Colloquium, Physics Department, North Carolina State University, Raleigh, NC, February 2005.
5. "Fluids, Strange and Beautiful." Physics Department, Vassar College, Poughkeepsie, NY, February 2005.
6. "Fluids, Strange and Beautiful." Physics Department, Mount Holyoke College, South Hadley, MA, February 2005.
7. "Freezing and melting in granular materials." Colloquium, Physics Department, University of Utah, Salt Lake City, UT, January 2005.
8. "Fluids, Strange and Beautiful." Physics Department, Guilford College, Greensboro, NC, January 2005.
9. "Freezing and melting in granular materials." Special Colloquium, Physics Department, The Ohio State University, Columbus, OH, January 2005.
10. "Freezing and melting in granular materials." Condensed Matter Physics Seminar, Physics Department, University of California, San Diego, CA, January 2005.
11. "Hysteresis and competition between disorder and crystallization in granular flow." Southeastern Section of the American Physical Society Annual Meeting, Oak Ridge, TN, November 2004.
12. "Freezing, melting, and novel dynamics in granular materials." Condensed Matter Seminar. Physics Department. Duke University, Durham, NC, October 2004.
13. "Freezing, melting, and novel dynamics in granular materials." Joint Applied Math/Condensed Matter Seminar. University of North Carolina, Chapel Hill, NC, September 2004.
14. "Pattern Formation in Inclined Layer Convection." Physics Department Colloquium, Dartmouth College, Hanover, NH, February 2004.
15. "Shearing and Disorder in a Vibrationally Fluidized 3D Granular Flow." Workshop on Multi-scale Challenges in Soft Matter Materials, Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, NC, February 2004.
16. "Pattern Formation in Inclined Layer Convection." Physics Department Colloquium, Dickinson College, Carlisle, PA, October 2003.
17. "Shearing and Order in Vibrationally Fluidized 3D Granular Media." Flow Regimes, Transitions, and Segregation in Granular and Particle-Laden Flows Conference. Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, September 2003.
18. "Order, Chaos, and Defect Statistics in Inclined Layer Convection." Trends in Pattern Formation: From Amplitude Equations to Applications Conference, Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany, August 2003.
19. "Order, Chaos, and Defects in Inclined Layer Convection." Pattern Formation in Physics and Biology Conference. Kavli Institute for Theoretical Physics, Santa Barbara, CA, August 2003.
20. "Pattern formation in Inclined Layer Convection." Center for Nonlinear Dynamics, University of Texas at Austin, February 2002.

21. "Pattern Formation and Defect Turbulence in Inclined Layer Convection." Condensed matter and statistical physics seminar, Department of Physics, Syracuse University, October 2001.

22. "Pattern Formation in Inclined Layer Convection." Center for Nonlinear and Complex Systems, Duke University, March 2001.

CONTRIBUTED PRESENTATIONS

1. "Starbursts and Wispy Drops: Surfactants Spreading on Gels." Gallery of Nonlinear Images. American Physical Society Meeting. March 2005 (poster, awarded Honorable Mention).

2. "Hysteresis and competition between disorder and crystallization in sheared and vibrated granular flow" Gordon Research Conference on Granular and Granular Fluid Flow. June 2004 (poster).

3. "Dynamics of Meteor Impacts." Gallery of Nonlinear Images. American Physical Society Meeting. March 2004 (video, awarded 2^{nd} place).

4. "A disordering transition in vibrationally fluidized 3D granular flow." Dynamics Days 2004. Chapel Hill, NC. January 2004 (poster, awarded 2^{nd} place).

5. "Shearing and order in vibrationally fluidized 3D granular flows." Division of Fluid Dynamics Meeting, American Physical Society. Meadowlands, NJ. November 2003 (talk).

6. "Energy Dissipation Mechanisms in 2D Meteor Impacts." Division of Fluid Dynamics Meeting, American Physical Society. Meadowlands, NJ. November 2003 (talk).

7. "Statistics of Defect Motion in Spatiotemporal Chaos in Inclined Layer Convection." Anomalous Distributions, Nonlinear Dynamics and Nonextensivity Conference. Santa Fe, NM. November 2002 (poster).

8. "Defect turbulence and undulation chaos in inclined layer convection." Thin Films Seminar, Department of Mathematics. Duke University. October 2002 (talk).

9. "Transverse bursts in inclined layer convection." Division of Fluid Dynamics Meeting, American Physical Society. San Diego, CA. November 2001 (talk).

10. "Pattern formation in inclined layer convection." Cargèse International School: Dynamical barriers, stirring and mixing in geophysical flows. Cargèse, Corsica, France. August 2001 (poster).

11. "Defect-turbulence in inclined layer convection." Gordon Research Conference on Nonlinear Science. Mount Holyoke, MA. June 2001 (poster).

12. "Defects in Inclined Layer Convection Patterns" Summer Mumbles, Dept. of Physics. Cornell University. June 2001 (talk).

13. "Pattern Formation in Inclined Layer Convection." Stability, Transition, and Turbulence Seminar, Sibley School of Mechanical Engineering. Cornell University. April 2001 (talk).

14. "Comparison of Inclined Layer Convection Simulations and Experiment." American Physical Society Meeting. Seattle. March 2001 (talk).

15. "Wavenumber and Defect Distributions in Undulation Chaos." Division of Fluid Dynamics Meeting, American Physical Society. Washington, DC. November 2000 (talk).

16. "Inclined Layer Convection." International Congress of Theoretical and Applied Mechanics. Chicago, IL. August 2000 (talk).

17. "Defect Statistics in Undulation Chaos." American Physical Society Meeting. Minneapolis, MN. March 2000 (talk).

18. "Pattern Formation in Inclined Layer Convection." American Physical Society Centennial Meeting. Atlanta, GA. March 1999 (talk).

19. "Undulations and Defect Turbulence in Inclined Layer Convection." Division of Fluid Dynamics Meeting, American Physical Society. Philadelphia, PA. November 1998 (talk).

OUTREACH EXPERIENCE

2002 – present **Duke University, Durham, NC**
Developed and presented inquiry-based units on electricity and energy to meet science standards for local fourth, fifth grade classes. Mentored high school and undergraduate student projects on granular media. Science mentor to troop of middle/high school girls, Pines of Carolina Girl Scout Council.

1999 – 2002 **Expanding Your Horizons, Cornell University, Ithaca, NY**
Organizing committee for science and math conference for middle school girls. Created and led hands-on physics workshops for EYH attendees.

1997 – 2002 **Cornell Center for Materials Research, Cornell University, Ithaca, NY**
Designed activities/curricula for Research Experience for Teachers summer workshop (2000, 2001). Presented various science lessons at local schools, youth groups, and juvenile detention center (1997 – 2002). Mentored undergraduate researchers (1998 – 2002).

UNDERGRADUATE STUDENTS MENTORED

Joyce Coppock, Duke University: laboratory-scale modeling of meteor impacts using photoelastic granular materials (2004–2005).

David Marks, Duke University: developing a direct experimental test of Edwards entropy postulates (2004).

Noah Oblath, Adam Frankel, and William Bertsche, Cornell University: physical (wax) modeling of dynamics of mid-ocean ridge spreading (1998 – 2002).

POPULAR PRESS

Minkel, JR. “Grain Freeze”, *Scientific American* (News Scan item), July 2005, p. 26