Curriculum Vitae

Janet D. Scheel

Occidental College
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Recent Positions

Professor of Physics, Occidental College, 2020-

Physics Department Chair, Occidental College, 2016-2019, 2024-

Associate Professor of Physics, Occidental College, 2014-2020

Assistant Professor of Physics, Occidental College, 2008-2014

Visiting Associate, California Institute of Technology, 2006-2018

Assistant Professor of Physics, Calif. Lutheran University, 2006-2008

Education

Ph. D. California Institute of Technology, Pasadena, CA.
August 2001–August 2006
Doctor of Philosophy in Physics
Thesis: *Rotating Rayleigh-Bénard Convection*
Graduate Advisor: Michael C. Cross

M. S. Cornell University, Ithaca, NY.
August 1991–May 1994
Master of Science in Theoretical Physics
Thesis: *Diffraction tutorial with computer projects for the undergraduate physics curriculum*
Graduate Advisor: Saul A. Teukolsky

M. A. Cornell University, Ithaca, NY.
August 1993–May 1995
Master of Arts in Teaching

B. S. University of Illinois, Urbana, IL.
October 1987–June 1991
Bachelor of Science in Engineering Physics

Teaching Experience

Professor, Occidental College, Los Angeles, CA, 2008-
Physics 490/491: Senior Seminar
Physics 350: Statistical Physics
Physics 340: Quantum Mechanics
Physics 320: Analytical Dynamics

Physics 267: Engineering Physics
Physics 250: Thermal and Statistical Physics
Physics 240L: Modern Physics Lab
Physics 201: Simulations in Physics
Physics 117: Waves and Thermal Physics
Physics 117L: Waves and Thermal Physics Laboratory
Physics 115/125: General Physics I/II
Physics 115L/125L: General Physics I/II Laboratory
Physics 110: Introductory Mechanics
Physics 110L: Introductory Mechanics Laboratory
Physics 106: Waves
Physics 106L: Waves Laboratory
Physics 104: Light
First Year Seminar: Chaos

Assistant Professor, California Lutheran University, Thousand Oaks, CA, 2006-2008

Physics 420: Classical Electrodynamics
Physics 415: Thermodynamics and Kinetic Theory
Physics 410: Dynamics and Chaos
Physics 212: Electricity, Magnetism, and Optics
Physics 211: Mechanics and Thermodynamics
Physics 100: Introduction to Astronomy

Visiting Lecturer, Wells College, Aurora, NY, 2000-2001

Physics 213: Electricity and Magnetism
Physics 112: Fundamentals of Physics II
Math 211: Multivariable Calculus
Math 109: Elementary Functions
Math 105: Contemporary Math

Lecturer, Cornell University, Ithaca, NY, Summers 2000 and 2001

Physics 103: General Physics

Lecturer, State University of New York, Cortland, 1998-1999

Physics 430: Statistics and Thermal Physics
Physics 422: Applied Mechanics
Physics 420: Classical Mechanics
Physics 201: Laboratory for Electricity, Light and Sound
Physics 106: Laboratory for Principles of Physics
Science 350: Science in the Social World

Teaching Associate, Cornell University, Ithaca, NY, 1996-1998

Physics 318: Honors Classical Mechanics
Physics 214: Waves and Optics
Physics 209: Chaos and Special Relativity
Physics 205: Probability and Statistics in Physics

Physics 101/102: General Physics

Peer-reviewed Publications Since Receiving Tenure

1. Roshan J. Samuel, Mathis Bode, Janet D. Scheel, Katepalli R. Sreenivasan and Jörg Schumacher, "No sustained mean velocity in the boundary region of plane thermal convection", Journal of Fluid Mechanics, **996**, doi:10.1017/jfm.2024.853, 2024.

2. Philipp P. Vieweg, Janet D. Scheel, Rodion Stepanov and Jörg Schumacher, "Inverse cascades of kinetic energy and thermal variance in three-dimensional horizontally extended turbulent convection", Physical Review Research, **4**, 043098, 2022.

3. Philipp P. Vieweg, Janet D. Scheel and Jörg Schumacher, "Supergranule aggregation for constant heat flux-driven turbulent convection", Physical Review Research, **3**, 013231, 2021.

4. Kartik P. Iyer, Janet D. Scheel, Jörg Schumacher and Katepalli Sreenivasan, "Classical 1/3 scaling of convection holds up to $Ra = 10^{15}$", Proc. Nat. Acad. Sci., doi:10.1073/pnas.1922794117, 2020.

5. A. Pandey, J. D. Scheel and J. Schumacher, "Turbulent superstructures in Rayleigh-Bénard convection", Nat. Comm. **9**, 2118, 2018.

6. J. D. Scheel and J. Schumacher "Predicting transition ranges to fully turbulent viscous boundary layers in low Prandtl number convection flows ", *Phys. Rev. Fluids*, **2**, 123501, 2017.

7. Joshua Yu, Adam Goldfaden, Mary Flagstad and Janet D. Scheel, "Onset of Rayleigh-Bénard convection for intermediate aspect ratio cylindrical containers", Phys. of Fluids, **29**, 024107, 2017.

8. J. Schumacher, V. Bandaru, A. Pandey and J. D. Scheel, "Transitional boundary layers in low-Prandtl-number convection", Phys. Rev. Fluids, **1**, 084402, 2016.

9. J Schumacher and J. D. Scheel, "Extreme dissipation event due to plume collision in a turbulent convection cell", Phys. Rev. E, **94**, 043104, 2016.

10. J.D. Scheel and J. Schumacher, *Global and local statistics in turbulent convection at low Prandtl numbers*, Journal of Fluid Mechanics, **802**, p. 147-173, 2016.

11. J. Schumacher, P. Götzfried, and J. D. Scheel, *Enhanced enstrophy generation for turbulent convection in low–Prandtl number fluids*, Proc. Natl. Acad. Sci. USA, doi/10.1073/pnas.1505111112, 2015.

12. J.D. Scheel and J. Schumacher, *Local boundary layer scales in turbulent Rayleigh-Bénard convection*, Journal of Fluid Mechanics, **758**, p. 344-373, 2014.

13. J. Schumacher, J.D. Scheel, D. Krasnov, D. A. Donzis, V. Yakhot, and K. Sreenivasan, *Small-scale universality in fluid turbulence*, Proc. Nat. Acad. Sci., doi:10.1073/pnas.1410791111, 2014.

Peer-reviewed Publications Before Tenure

1. J.D. Scheel, M. S. Emran and J. Schumacher, *Resolving the fine-scale structure in turbulent Rayleigh-Bénard convection*, New Journal of Physics, **15**, 113063, 2013.

2. J.D. Scheel, E. Kim and K. R. White, *Thermal and viscous boundary layers in turbulent Rayleigh-Bénard convection*, Journal of Fluid Mechanics, **711**, p. 281-305, 2012.

3. J.D. Scheel, P. Mutyaba and T. Kimmel, *Patterns in Rotating Rayleigh-Benard Convection at high rotation rates*, Journal of Fluid Mechanics, **659**, p. 24-42, 2010.

4. Francois Hebert, Ryan Hufschmid, Janet Scheel, and Guenter Ahlers, *Onset of Rayleigh-Benard convection in cylindrical containers*, Phys. Rev. E, **81** 046318, 2010.

5. J.D. Scheel, *The Amplitude Equation for Rotating Rayleigh-Bénard Convection*, Phys. of Fluids, **19** 104105, 2007.

6. J.D. Scheel and M.C. Cross, *Lyapunov exponents for small aspect ratio Rayleigh-Bénard Convection*, Phys. Rev. E, **74**, 066301, 2006.

7. A. Jayaraman, J.D. Scheel, H.S. Greenside and P.F. Fischer, *Characterization of the Domain Chaos Convection State by the Largest Lyapunov Exponent*, Phys. Rev. E, **74**, 016209, 2006.

8. N. Becker, J.D. Scheel, M.C. Cross and G. Ahlers, *Effect of the Centrifugal Force on Domain Chaos in Rayleigh-Bénard convection*, Phys. Rev. E, **73**, 066309, 2006.

9. J.D. Scheel, and M.C. Cross, *Scaling Laws for Rotating Rayleigh-Bénard Convection*, Phys. Rev. E, **72**, 053615, 2005.

10. J.D. Scheel, M.R. Paul, M.C. Cross, and P.F. Fischer, *Traveling Waves in Rotating Rayleigh-Bénard Convection: Analysis of modes and mean flow*, Phys. Rev. E, **68**, 066216, 2003.

11. J.D. Finch[1] and L.N. Hand, *Using an E-mail tutorial and student seminars to improve an intermediate-level undergraduate physics course*, Am. J. Phys., **66**, 914-919, 1998.

[1]This was published under my maiden name, Janet D. Finch.

Books and Proceedings

Roshan J. Samuel, Prafulla P. Shevkar, Mathis Bode, Janet D. Scheel, Katepalli R. Sreenivasan and Jörg Schumacher, "Unraveling the Boundary Layers of High Rayleigh Number Convection Through Direct Numerical Simulation", from proceedings of ParCFD 2024, 35th International Conference on Parallel Computational Fluid Dynamics, Sep. 02-04, 2024, Bonn, Germany.

J. Scheel and J. Schumacher, *Numerical Simulations in low-Prandtl number convection*, from Advances in Computation, Modeling and Control of Transitional and Turbulent Flows, edited by T. K. Sengupta, S. K. Lele, K. R. Sreenivasan and P. A. Davidson, World Scientific Publishing, Singapore, 2015

L.N. Hand and J.D. Finch[1] *Analytical Mechanics*, Cambridge University Press, New York, NY, 1998.

Grants for Supercomputing Time

J. D. Scheel, J. Schumacher, Roshan Samuel, Kartik Iyer and Katelappi Sreenivasan, *Exascale Simulations of Rayleigh-Bénard Convection*, DOE INCITE award for 800 million GPU node-hours on Aurora and Polaris at Argonne National Laboratory (ANL), October 2024.

J. D. Scheel and J. Schumacher, *Towards Ultimate Rayleigh-Bénard Convection*, DOE INCITE award for 200 million CPU hours on Mira (BG/Q) at ANL, October 2018.

J. D. Scheel and J. Schumacher, *Convective Turbulence in Liquid Sodium*, DOE INCITE award for 80 million CPU hours on Mira at ANL, October 2017.

J. D. Scheel and J. Schumacher, *Convective Turbulence in Liquid Gallium and Sodium*, DOE INCITE award for 80 million CPU hours on Mira at ANL, October 2015.

J. D. Scheel and J. Schumacher, *Turbulent Rayleigh-Bénard Convection at High Rayleigh and Low Prandtl Numbers*, DOE INCITE award for 40 million CPU hours on Mira at ANL, October 2013.

Grants

NSF S-STEM grant for $1,500,000, from 2021-2026 on "Creating Opportunities for Science and Mathematics for Occidental Students", Gretchen North (PI), Ron Buckmire (Co-Pi), Justin Li (Co-PI), Janet Scheel (Co-PI), Alexsandra Sherman (Co-Pi).

NSF MRI grant for $493,878 from 2019-2021 on "Acquisition of a High-Performance Computing Cluster for Occidental College", Justin Li (PI), Jeff Cannon (Co-PI), Diana Ngo (Co-PI), Janet Scheel (Co-PI), Amanda Zellmer (Co-Pi).

Mercator Fellowship, Priority Programme SPP 1881 of the Deutsche Forschungsgemeinschaft 2017-2019. Renewal for 2020-2022, extended to 2023.

KITP (Kavli Intstitute for Theoretical Physics) Scholar, 2009-2011.

Cottrell College Science Award #7968 from Research Corporation, *Numerical Simulations of Turbulent Thermal Convection: Investigations of the Large-Scale Circulation and its Reorientations*, 2008-2010.

Professional Organizations:

American Physical Society

Professional Activities Since Receiving Tenure

2024 Jüelich Supercomputing Center, Nek users meeting, *Calculating Lyapunov Exponents with Nek5000*, invited talk.

2021 Transport and Mixing in Complex and Turbluent Flows, IPAM, UCLA (Virtual), *High Rayleigh Number Convection in a Slender Cylinder for Prandtl Number of 1*, invited talk.

2019 71st Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Seattle, WA, *High Rayleigh Number Convection in a Slender Cylinder for Prandtl Number of 1*, contributed talk.

2019 University of Michigan, Ann Arbor, Center for the Study of Complex Systems and Michigan Institute for Computational Discovery and Engineering, *Numerical Simulations of Turbulence in Heated Fluids*, invited seminar.

2019 17th European Turbulence Conference, Torino, Italy, *Convective Turbulence in Liquid Sodium*, contributed talk.

2019 International Symposium on From Pattern Formation to Turbulence, Kloster Banz, Germany, *Time Evolution of superstructures in turbulent Rayleigh-Bénard Convection*, invited talk.

2019 University of Southern California, *Numerical Simulations of Turbulence in Heated Fluids*, invited talk.

2019 Cal Poly San Luis Obispo, *Numerical Simulations of Turbulence in Heated Fluids*, invited talk.

2018 New York University, New York, NY, *Low Prandtl Number Convection*; invited talk.

2018 International Conference on Rayleigh-Bénard Turbulence, University of Twente, the Netherlands, *Low Prandtl Number Convection*; invited talk.

2017 70th Annual Meeting of the DFD, APS, Denver, CO, *Boundary layers in turbulent convection for air, liquid gallium and liquid sodium*; contributed talk.

2017 Euromech Colloquium 586, Erfurt Germany, *Transitional Boundary Layers in low-Prandtl-number convection*, contributed talk.

2016 69th Annual Meeting of the DFD, APS, Portland, OR, *High-amplitude dissipation event in a turbulent convection cell*; contributed talk.

2016 5th Nek5000 users and developers meeting, Massachusetts Institute of Technology, Cambridge, MA *Transitional boundary layers in low-Prandtl-number convection at high Rayleigh number*, contributed talk.

2016 Technische Universität Ilmenau, Germany, *Resolving the fine-scale structure in turbulent Rayleigh-Bénard convection*; invited talk.

2016 Arizona State University, Tempe AZ, *Turbulent Rayleigh-Bénard Convection*; invited talk.

2015 68th Annual Meeting of the DFD, APS, Boston, MA, *Global and local statistics in turbulent convection at low Prandtl numbers*; contributed talk.

2015 Turbulence Workshop, Harvard University, Cambridge, MA, *Turbulent Rayleigh-Benard Convection*, invited talk.

2015 Argonne National Lab, Chicago, IL, Nek5000 users meeting, *Resolving the fine-scale structure in turbulent Rayleigh-Benard Convection*, invited talk.

2015 Technische Universität Ilmenau, Germany, *Turbulent Rayleigh-Bénard convection in low-Prandtl-number fluids*; invited talk.

2015 International Conference on Rayleigh-Bńeard Turbulence, Göttingen Germany, *Turbulent Rayleigh-Bénard convection in low-Prandtl-number fluids*; contributed talk.

2014 67th Annual Meeting of the DFD, APS, San Francisco, CA, *Local boundary layer scales in turbulent Rayleigh-Bénard convection*; contributed talk.

2014 Technische Universität Ilmenau, Germany, *Amplitude Equations*; invited talk.

2014 International Conference on Phase Transitions at Low Temperatures, Pattern Formation and Turbulence, Göttingen Germany, *Onset of Rayleigh-Bénard convection in cylindrical containers*; contributed talk.

Professional Activities Before Tenure

2013 66th Annual Meeting of the DFD, APS, Pittsburgh, PA, *Resolving the fine-scale structure in turbulent Rayleigh-Bénard Convection*; contributed talk.

2013 Technische Universität Ilmenau, Germany, *Numerical Simulations of Turbulent Rayleigh-Bénard Convection*; invited talk.

2012 International Conference on Rayleigh-Bénard Turbulence, Chinese University of Hong Kong, *Spatial Dependence of Boundary Layers in Simulations of Rayleigh-Bénard Convection*; contributed talk.

2012 65th Annual Meeting of the DFD, APS, San Diego, CA, *Spatial Dependence of Boundary Layers in Simulations of Rayleigh-Bénard Convection*; contributed talk.

2012 Cal Poly Pomona, CA, *Numerical Simulations of Turbulence in Heated Fluids*; invited talk

2011 Workshop on the Dynamics of Coherent Structures in Turbulent Flows, Bad Dürkheim, Germany, *Viscous and Thermal Boundary Layers in Simulated Turbulent Rayleigh-Bénard Convection*; invited talk.

2011 Kavli Institute for Theoretical Physics, University of California, Santa Barbara, *Viscous and Thermal Boundary Layers in Turbulent Rayleigh-Bénard Convection*; invited talk.

2010 Anacapa Society West Coast Meeting at Cal Poly Pomona, CA, *Viscous and Thermal Boundary Layers in Turbulent Rayleigh-Bénard Convection*; contributed talk and conference organizer.

2010 63rd Annual Meeting of the DFD, APS, Long Beach, CA, *Viscous and Thermal Boundary Layers in Simulated Turbulent Rayleigh-Bénard Convection*; contributed talk.

2009 62nd Annual Meeting of the DFD, APS, Minneapolis, MN, *Numerical Simulations of Turbulent Rayleigh-Bénard Convection*; contributed talk.

2009 Harvey Mudd, Claremont, CA, *Go With the Flow: Numerical Simulations of Turbulence in Fluids*; invited talk.

2009 Occidental College Summer Research Program Seminar Series, *Go With the Flow: Numerical Simulations of Turbulence in Fluids*; invited talk.

2009 SIAM Conference on Dynamical Systems, Snowbird, UT *Turbulent Thermal Convection*; contributed talk.

2007 60th Annual Meeting of the DFD, APS, Salt Lake City, UT, *Patterns in Rotating Rayleigh-Bénard Convection at High Rotation Rates*; contributed talk.

2007 SIAM Conference on Dynamical Systems, Snowbird, UT, *The Amplitude Equation for Rotating Rayleigh-Bénard Convection*; contributed talk.

2007 CLU, Thousand Oaks, CA, *Computational Intractability*; invited talk.

2006 CSU Channel Islands, Oxnard, CA, *Rayleigh-Bénard Convection*; invited talk.

Undergraduate Research Students Since Receiving Tenure

James Huh, *Lyapunov Exponents in Rayleigh-Bénard Convection at Extreme Aspect Ratio*, 2025.

BinYan Jia, *Large Aspect Ratio Rayleigh-Bénard Convection*, 2025.

Weishi Tian, *Machine Learning-Based Identification of Flow States in Turbulent Rayleigh-Bénard Convection Systems*, 2024-25.

Audrey Shim, *Turbulent Patterns for Rayleigh-Bénard Convection in Slender Cylinders*, 2024.

Ruby Berke, *Onset States for Rayleigh-Bénard Convection in Slender Cylinders*, 2023.

Noah Smith, *Partile Tracking inRayleigh-Bénard Convection*, 2023.

Jacob Gitin, *The Impact of Large Scale Flow Structures on Heat Transport in Narrow Rayleigh-Bénard Convection Systems*, 2022-23.

Jeffrey Yang, *The Dependence of Lyapunov Exponents on Rayleigh Number for Rayleigh-Bénard Convection"*, G. M. Schmiedeshoff Fellowship, 2021-2023.

Chen, Ling, *Particle Tracking in Steady-State and Turbulent Rayleigh-Bénard Systems*, REAP Sherman Fairchild Fellowship, 2021.

Faith, Ben, *"The Impact of Large Scale Flow Structures on Heat Transport in Narrow Rayleigh-Bénard Convection Systems"*, 2021.

Kwan, Michael, *Determining Lyapunov exponents for turbulent Rayleigh-Bénard convection*, 2017-2019. Science Scholar in 2019.

Corkrean, Ryan, *Characterizing turbulent behaviors using image analysis*, 2017.

Goldfaden, Adam, *Linear Stability Analysis of Onset Patterns Found in RBC Systems as a Function of Aspect Ratio*, 2015 (see publication 3).

Yu, Joshua, *The Effects of Varying Aspect Ratio and Rayleigh Number on Onset States in Rayleigh-Bénard Convection Systems*, 2014-2015 (see publication 3).

Ma, Siyuan, *The Cessation and Reversal of Low Prandtl Number Fluid Motion in Turbulent Rayleigh-Bénard Systems* 2014.

Undergraduate Research Students Before Tenure

Monroy, Raphael, *Observation of Geometrical Patterns in Rayleigh-Bénard Convection*, 2013.

Flagstad, Mary, *The effects of Aspect Ratio on Pattern Formation in Simulated Rayleigh-Bénard Convection*, 2012-2013 (see publication 3).

Muñoz, Jorge, *Spatial Dependence of Boundary Layers in Simulations of Rayleigh-Bénard Convection*, 2012.

Borrayo, Adriana, *The Fluid Velocity and its Reorientation in Simulated Turbulent Rayleigh-Bénard Systems*, 2011-2012.

Cardenas-Licea, Zamara, *An Analysis of the Effect of Rectangular Boxes on the Large-Scale Circulation in Turbulent Rayleigh-Bénard Convection*, 2011.

Kim, Elissa, *Viscous and Thermal Boundary Layers in Simulated Turbulent Rayleigh-Bénard Convection*, 2010, (see publication 2).

Fitts, Michelle, *Large-Scale Circulation in Turbulent Rayleigh-Bénard Convection*, 2010.

Ackermann, Erik, *Measuring the Onset of Turbulence in Rayeigh-Bénard Convection*, 2009-2010.

Ing, Nicole, *The Effects of Container Geometries on the Flow of Large-Scale Circulation in Simulated Rayleigh-Bénard Systems*, 2009.

White, Katelyn, *Turbulent Raylegih-Bénard Convection*, 2007-2008 (see publication 2).

Mutyaba, Lorraine, *Square Patterns in Rotating Rayleigh-Bénard Convection*, 2007-2008 (see publication 3).

Kimmel, Terri, *Square Patterns in Rotating Rayleigh-Bénard Convection*, 2007 (see publication 3).

Walton, Sam, *Dislocation Dynamics*, 2007.