

Curriculum Vitae for Cory D. Hauck

CURRENT EMPLOYMENT

Position: Research Associate / Householder Fellow
Institution: Oak Ridge National Laboratory
Group: Computational Mathematics
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EDUCATION

- Ph.D., Applied Mathematics, University of Maryland, 2006.
- M.S., Electrical Engineering, University of Maryland, 2004.
- B.S., Physics and Mathematics, University of South Carolina, 1997.

RESEARCH INTERESTS

- Computational Physics and Scientific Computing.
- Kinetic Equations and Hyperbolic PDE.
- Multi-Scale Modeling and Simulation.
- Optimization Methods for Moment Closures Problems.

EMPLOYMENT HISTORY

- 06/06-current: Postdoctoral Research Associate, Los Alamos National Laboratory.
- 09/99-06/06: Graduate Research/Teaching Assistant, University of Maryland.
- 10/97-08/99: Engineering Physicist, Doty Scientific, Columbia, SC.
- 05/96-09/97: Undergraduate Research Assistant, University of South Carolina & Brookhaven National Laboratory.

RECENT RESEARCH SUPPORT

- DOE Applied Math Program, Householder Fellowship, 2010-2011.
- DOE Applied Math Program, Project: *Advanced Optimization Techniques for Entropy-Based Moment Closures*, PI's: Cory Hauck (ORNL) and André Tits (U. Maryland), 2010-2012.
- DOE Applied Math Program, Project: *Mimetic Methods for Partial Differential Equations*, PI: Misha Shashkov, 2006-2009.

JOURNAL PUBLICATIONS

- "Positive P_N Closures", with R. G. McClarren, in revision for *SIAM J. Scientific Computing*.
- "High-Order Entropy-Based Closures for Linear Transport in Slab Geometries", with R. G. McClarren, accepted with minor revision by *Communications in Mathematical Sciences*.
- "Robust and Accurate Filtered Spherical Harmonics Expansions for Radiative Transfer", with R. G. McClarren, to appear in *Journal of Computational Physics*.

- “Simulating Radiative Transfer with Filtered Spherical Harmonics”, *Applied Physics Letters Physics Letters A*, 2010.
- “Methods for Diffusion Relaxation in the P_N Equations”, with R. B. Lowrie, and R. G. McClarren, to appear in *Numerical Methods for Relaxation Systems and Balance Equations*, Quaderni di Matematica International Series, edited by G. Puppo and G. Russo.
- “Oscillatory Behavior of Asymptotic-Preserving Splitting Methods for a Linear Model of Diffusive Relaxation”, *Kinetic and Related Models*, 1 (2008), pp. 573–590.
- “Temporal Regularization of the P_N Equations”, with R.B. Lowrie, *SIAM J. Multiscale Model. Simul.* 7 (2009), pp. 1497–1524.
- “Convex Duality and Entropy-Based Moment Closures: Characterizing Degenerate Densities”, with C.D. Levermore and A.L. Tits, *SIAM J. Control Optim.* 47 (2008), pp. 1977–2015.
- “Volume Determination for Bulk Materials in Bunkers”, with S.A. Ahmed, R. Buckingham, P.A. Gremaud, C.M. Kuster, M. Prodanovic, T.A. Royal and V. Silantyev, *Int. J. Numer. Meth. Eng.*, 61 (2004), pp. 2239–2249
- “Error-tolerant RF Litz Coils for NMR/MRI”, with F.D. Doty and G.E. Entzminger Jr., *J. Magn. Res.* 140 (1999), pp. 17–31.
- “Practical Aspects of Birdcage Coils”, with F.D. Doty and G.E. Entzminger Jr., and J. P. Staab, *J. Magn. Res.* 138 (1999), pp. 144–154.

PEER-REVIEWED PROCEEDINGS

- “Positive P_N Closures”, with R. G. McClarren, *Transactions of the American Nuclear Society*, Winter 2009.
- “Filtered Spherical Harmonic Methods for Transport Equations”, with R. G. McClarren and R. B. Lowrie, *Proceedings of the International Conference on Mathematics, Computational Methods, and Reactor Physics*, Saratoga Springs, NY, 2009.
- “Convex Duality and Entropy-Based Moment Closures: Characterizing Degenerate Densities”, with C.D. Levermore and A.L. Tits, *Proceedings of the 47th IEEE Conference on Decision and Control*, Cancun, Mexico, 2009.

REPORTS AND UNPUBLISHED MANUSCRIPTS

- *Numerical Splitting for Hydrodynamic Semiconductor Models*, Los Alamos Report LA-UR 06-8584, 2006.
- *Entropy-based Closures in Semiconductor Models*, Ph.D. Thesis, University of Maryland, 2006.

TALKS AND PRESENTATIONS

- 05/10: *Advanced Optimization Techniques for Entropy-Based Moment Closures*, 2010 DOE Applied Mathematics Program Meeting, Berkeley, CA.
- 03/10: *Optimization-Based Closures for Radiation Transport*, **Invited Talk**, Numerical Analysis Seminar, North Carolina State University.
- 03/10: *Discontinuous Galerkin Methods with Entropy Variables and Explicit Time Integrators: A Numerical Study with the Shallow Water Equations*, SIAM SEAS 2010 Annual Meeting, Raleigh, NC.
- 03/10: *Optimization-Based Moment Closures in Kinetic Theory and Transport*, **Invited Talk**, Mathematics and Statistics Colloquium, Old Dominion University.

- 02/10: *A numerical regularization technique for multi-scale, linear transport models*, **Invited Talk**, Computational and Applied Math Seminar, University of Tennessee.
- 11/09: *Optimization-Based Closures for Radiation Transport*, **Invited Talk**, Applied Mathematics / PDE Seminar, University of Wisconsin.
- 11/09: *Optimization-Based Closures for Radiation Transport*, **Invited Talk**, Applied Mathematics Seminar, Michigan State University.
- 07/09: *Discontinuous Galerkin Methods with Entropy Variables and Explicit Time Integrators: A Numerical Study with the Shallow Water Equations*, Contributed Talk, *Mini-Symposium on Moment Closures for Kinetic and Hyperbolic Equations*, SIAM 2009 Annual Meeting, Denver, CO
- 04/09: *Realizability in Entropy-Based Moment Closures for Gas Dynamics*, **Invited Talk**, Workshop on “The Boltzmann Equation: DiPerna-Lions Plus 20 Years”, Institute for Pure and Applied Mathematics, UCLA.
- 03/09: *Positive P_N Closures*, Contributed Talk, Working Seminar for Program on Kinetic Theory and Transport, Institute for Pure and Applied Mathematics, UCLA.
- 02/09: *Model Reduction and Asymptotic Preserving Numerical Methods for Kinetic Transport Equations*, **Invited Talk**, Computer Science and Mathematics Division Seminar, Oak Ridge National Laboratory.
- 02/09: *Some Computational Aspects of Kinetic Transport Equations*, **Invited Talk**, Mathematics Colloquium, University of South Carolina.
- 11/08: *A Numerical Regularization Technique for Multi-Scale, Linear Transport Models*, **Invited Talk**, Applied Mathematics Seminar, Texas A&M University.
- 09/08: *A Numerical Regularization Technique for Multi-Scale, Linear Transport Models*, **Invited Talk**, Applied Mathematics Seminar, North Carolina State University.
- 02/08: *Temporal Regularization of the P_N Equations*, **Invited Talk**, Applied Mathematics Seminar, University of Wisconsin.
- 05/07: *Convex Duality and Entropy-Based Moment Closures: Characterizing Degenerate Densities*, Poster Presentation, Applied Mathematics PI Meeting, Office of Advanced Scientific Computing Research, Lawrence Livermore National Laboratory.
- 05/07: *Mimetic Schemes for Hyperbolic Balance Laws of Kinetic Transport with Diffusive Relaxation*, Contributed Talk, SIAM Southeastern/Atlantic Sectional Meeting, University of Memphis.
- 02/07: *Convex Duality in Entropy-Based Moment Closures*, Contributed Talk, “Los Alamos/Arizona Days” Applied Mathematics Conference, University of Arizona.
- 11/06: *Multi-scale Modeling and Simulation of Kinetic Systems*, Postdoc Seminar, Center for Non-linear Studies, Los Alamos National Laboratory.
- 08/05: *Perturbations to Entropy Minimization Hydrodynamic Closures*, **Invited Talk**, Mathematics Department, University of Texas at Austin.
- 08/05: *A Numerical Splitting Method for a Hydrodynamic Model of Electron Transport*, **Invited Talk**, Los Alamos National Laboratory.
- 09/04: *How to Build Mathematical Models of Complicated Systems*, Graduate Series Minicourse Lecture, University of Maryland.
- 03/04: *Semiconductor Device Modeling*, Award Winning Talk, Spotlight on Graduate Research Competition, University of Maryland.
- 07/02: *Volume Determination for Bulk Materials in Bunkers*, Industrial Mathematics Modeling Workshop, North Carolina State University.

AWARDS, HONORS, INVITATIONS

- Visiting Fellow: Newton Institute for Mathematical Sciences, University of Cambridge, 2010 Program on *Partial Differential Equations in Kinetic Theory*.
- Invited Fellow: Institute for Pure and Applied Mathematics (IPAM), Spring 2009 Program on *Quantum and Kinetic Transport: Analysis, Computations, and New Applications*.
- Invited Participant: Young Investigators Symposium, Oak Ridge National Laboratory, October 2008
- VIGRE research grant, Spring 2005.
- Award Winner, Spotlight on Graduate Research, Department of Mathematics, University of Maryland, 2004.
- Distinguished Teaching Assistant, University of Maryland, 2002-2003.
- Nominee, Excellence in Teaching Award for Graduate Teaching Assistants, Department of Mathematics, University of Maryland, 2001 and 2004.
- “TOAST” Award for Outstanding Graduating Senior, College of Science and Mathematics, University of South Carolina, 1997.
- National Merit Scholarship, 1993-1997.

PROFESSIONAL MEMBERSHIPS

- American Mathematical Society (AMS).
- Society for Industrial and Applied Mathematics (SIAM).
- American Physical Society (APS).
- Institute of Electrical and Electronics Engineer (IEEE).

OUTREACH AND PROFESSIONAL SERVICE

- Referee: *SIAM Journal on Applied Mathematics*, *SIAM Review*, *SIAM Journal on Numerical Analysis*, *SIAM Journal on Scientific Computing*, *Communications in Mathematical Sciences*, *Mathematical Modeling and Numerical Analysis*.
- Organizer, SIAM 2013 Southeastern-Atlantic Sectional Meeting.
- Co-Organizer, Mini-symposium on *Numerical Methods for Kinetic Equations and Related Models*, SIAM 2010 Annual Meeting.
- Organizer, Mini-symposium on *Method Closures for Kinetic and Hyperbolic Equations*, SIAM 2009 Annual Meeting.
- Research Mentor: Summer Student Program, Center for Nonlinear Studies, 2008 and 2009.
- Judge: Los Alamos Summer Student Symposium, 2008.
- Organizer: Postdoc Seminar, Center for Nonlinear Studies, LANL, 09/07-09/08.
- Guest Lecturer: Los Alamos Summer School in Physics, 2007 and 2008.
- Science Fair Judge: McCurdy Schools, Espanola, NM, January 2007.
- Judge: Spotlight on Graduate Research, Department of Mathematics, University of Maryland, 2003.

COMPUTER EXPERIENCE

- Operating Systems: Windows, MacOS, Linux
- Math Packages: MATLAB, Mathematica, Maple. \LaTeX
- Programming Languages: C, FORTRAN; currently learning C++ and Python