

John W. Peterson

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Austin, TX 78727

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Education

Doctor of Philosophy, May 2008

Aerospace Engineering, The University of Texas at Austin

Overall GPA: 3.8125

Advisor: G. F. Carey

Parallel Adaptive Finite Element Methods for Problems in Natural Convection. Developed adaptive finite element solution methods for solving the system of nonlinear PDEs governing combined buoyant and surface-tension-driven Rayleigh-Bénard-Marangoni flow. Mapped large region of parameter space with combined unsteady and pseudo-arclength continuation procedures, and made qualitative comparisons with experimental results.

Master of Science in Engineering, May 2003

Aerospace Engineering, The University of Texas at Austin

Overall GPA: 3.70/4.0

Advisor: G. F. Carey

A Numerical Investigation of Bénard Convection in Small Aspect Ratio Containers. Numerical simulations of Rayleigh-Bénard-Marangoni flow are conducted for heated fluid layers of small aspect ratio in polygonal containers. Distinct steady-state patterns with 1-8 convection cells are found for a range of aspect ratios between 3 and 11.

Bachelor of Science (with Honors), August 2001

Aerospace Engineering, The University of Texas at Austin

Overall GPA: 3.79/4.0

Experience

May 2008 – Present **Research Associate, Texas Advanced Computing Center**

Member of the High Performance Computing (HPC) group. Responsible for consulting with center users and improving parallel efficiency of their applications.

Fall 2007 **Teaching Assistant**

CAM 394F — Introduction to Finite Element Methods, Dr. Mary F. Wheeler

Fall 2006 **Lecturer**

ME 330 — Fluid Mechanics

(Organized, taught, and evaluated a full section of 35 students.)

Spring 2006 **Teaching Assistant**

ASE 362K — Compressible Fluid Mechanics, Dr. D. S. Dolling

May 2004 – May 2008 **CFDLab Manager, Dr. Graham F. Carey**

The CFDLab, University of Texas at Austin

Responsible for day-to-day system administration tasks as well as purchasing new equipment and performing system upgrades for approximately 25 Linux workstations and a 16-node Beowulf cluster.

Sep 2001 – May 2004 **Graduate Research Assistant, Dr. Graham F. Carey**

The CFDLab, University of Texas at Austin

Numerous object-oriented software development projects including finite element, meshing, and graphics applications.

Jun 2002 – Aug 2002 **Participant, NASA Visiting Student Enrichment Program**

NASA Goddard Space Flight Center, Greenbelt, MD

Code coupling project involving NASA's `paramesh` and the microgravity fluid physics code `mgflo`.

Jan 2000 – Aug 2001 **Undergraduate Research Assistant, Dr. Graham F. Carey**

The CFDLab, University of Texas at Austin

Responsible for research assignments related to finite element shape quality in adaptively-refined moving-mesh applications, and daily maintenance of the Lab's website.

Sep 1999 – Dec 1999 **Co-Op Engineer**

LinCom Corporation, Johnson Space Center, Houston, TX

Worked on a project to devise a navigational aid for modules docking with the International Space Station. Developed the C source code for an iterative method of solving the Clohessy-Wiltshire equations of motion.

Jun 1999 – Aug 1999 **Summer Intern**

Institute for Advanced Technology, Pickle Research Campus, UT-Austin.

Analyzed the dynamics of the Lunar Prospector spacecraft's moon impact.

Misc. Academic Experience

Guest Lecturer

11/07 CAM 397 Intro. to Mathematical Modeling
6/07 EM F397 Num. Simul. Transport in Semiconductors
4/05 EM 393N Num. Meth. for Flow & Transport
11/05 EM 397.4 Grid Generation and Adaptive Grids
10/05 ASE 211 Engineering Computation

Peer Reviewer

Communications in Numerical Methods in Engineering
Transactions on Mathematical Software

Computer Skills Languages: C/C++
Scientific Programming Software: matlab/octave, tecplot, L^AT_EX, cubit,
GMV, LibMesh, cvs/svn
APIs: MPI, OpenGL, fltk, PETSc
Linux System Administration: RAID, NFS, emacs, vi, make, bash, autoconf,
LVM

Awards NASA Graduate Student Researcher Program Fellow, 2002-2004
University of Texas Thrust 2000 Graduate Fellow, 2001-2004
College of Engineering Boeing Scholarship, 2001
Aerospace Engineering Ching Yew Scholarship, 1999
AIAA Spirit of Apollo Scholarship, 1998
Aerospace Engineering Daniel M. Luna Scholarship, 1998

Publications

- [1] J. W. Peterson, G. F. Carey, and B. T. Murray, “Multi-Resolution Simulation of Double-Diffusive Convection in Porous Media,” *Int. J. Numer. Meth. for Heat & Fluid Flow*, to appear.
- [2] J. W. Peterson, *Parallel Adaptive Finite Element Methods for Problems in Natural Convection*. PhD thesis, ASE-EM dept., The University of Texas at Austin, May 2008. <http://www.cfdlab.ae.utexas.edu/~peterson/diss.pdf>.
- [3] J. Steensland and J. W. Peterson, “A Study of Dynamically Adaptive Partitioning for AMR,” in *Proceedings of the 2007 International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA '07) Volume 2*, (Las Vegas, NV), pp. 503–509, CSREA Press, June 25–28 2007. ISBN: 1-60132-021-3.
- [4] J. W. Peterson, G. F. Carey, D. J. Knezevic, and B. T. Murray, “Adaptive finite element methodology for tumor angiogenesis modeling,” *Int. J. Numer. Meth. Eng.*, vol. 69, no. 6, pp. 1212–1238, 2007. <http://dx.doi.org/10.1002/nme.1802>.
- [5] B. Kirk, J. W. Peterson, R. H. Stogner, and G. F. Carey, “libMesh: A C++ Library for Parallel Adaptive Mesh Refinement/Coarsening Simulations,” *Engineering with Computers*, vol. 22, no. 3–4, pp. 237–254, 2006. <http://dx.doi.org/10.1007/s00366-006-0049-3>.
- [6] G. F. Carey, W. Barth, B. Kirk, and J. W. Peterson, “Parallel CFD for Flow and Transport Applications Including Unstructured and Adaptive Grids,” in *Proceedings of Parallel CFD 2004: Multidisciplinary Applications*, G. Winter, A. Ecer, J. Periaux, N. Satofuka and P. Fox (Eds), (Amsterdam, The Netherlands), Elsevier Science B.V., Oct 2005. ISBN: 0444520244.
- [7] J. W. Peterson, “A Numerical Investigation of Bénard Convection in Small Aspect Ratio Containers,” Master’s Report, ASE-EM dept., The University of Texas at Austin, May 2003. <http://www.cfdlab.ae.utexas.edu/~peterson/masters.pdf>.

Presentations

- [8] J. W. Peterson, “LibMesh: Experience and Usage.” Presentation, March 2008. Invited Speaker, DOD/PET Shortcourse on Parallel Adaptive Finite Element Simulation, Army Research Lab, Aberdeen, MD.

- [9] J. W. Peterson, “Adaptive FEM for Applications.” Presentation, April 2007. Invited Seminar, Army Engineer Research and Development Center, Vicksburg, MS.
- [10] J. W. Peterson, B. T. Murray, and G. F. Carey, “Double-Diffusive Convection in Porous Media.” Presentation, March 26–28 2007. 14th International Conference on Finite Elements in Flow Problems, Santa Fe, NM.
- [11] J. W. Peterson and G. F. Carey, “Double-Diffusive Convection in Porous Media and Superconvergent Boundary Flux Integrals.” Presentation, March 2007. Finite Element Rodeo, Houston, TX.
- [12] J. W. Peterson, B. T. Murray, and G. F. Carey, “Adaptive Grid Strategies for FEM Simulations of Double-Diffusive Convection in Porous Media.” Presentation, February 2007. Graduate And Industry Networking (GAIN) Conference, Austin, TX.
- [13] J. W. Peterson, “LibMesh: Experience and Usage.” Presentation, January 2007. Invited Speaker, DOD/PET Workshop on Parallel Adaptive Finite Element Simulation, Army Engineer Research and Development Center, Vicksburg, MS.
- [14] J. W. Peterson, B. T. Murray, D. J. Knezevic, and G. F. Carey, “A Stabilized h -Adaptive Continuation Method for Double-Diffusive Convection in Porous Media.” Presentation, March 2006. Finite Element Rodeo, College Station, TX.
- [15] J. W. Peterson, B. T. Murray, D. J. Knezevic, and G. F. Carey, “Three-Dimensional, Adaptive Finite Element Simulations of Thermosolutal Convection in Porous Media.” Presentation, July 2005. United States National Congress for Computational Mechanics VIII, Austin, TX.
- [16] J. W. Peterson, B. S. Kirk, and G. F. Carey, “Stabilized Adaptive Finite Element Methods.” Presentation, June 2005. LibMesh Workshop, Austin, TX.
- [17] J. W. Peterson, G. F. Carey, W. L. Barth, B. S. Kirk, and S. Iqbal, “Parallel Computing on Beowulf Clusters: Performance and Applications.” Presentation, July 2004. SIAM Annual Meeting, Portland, OR.
- [18] G. F. Carey, L. Branets, S. Iqbal, B. S. Kirk, J. W. Peterson, and R. Stogner, “Unstructured Mesh Technology, Mesh Smoothing, and Adaptivity.” Poster Presentation, March 2004. Finite Element Rodeo, University of Texas, Austin, TX.

- [19] G. F. Carey, W. L. Barth, B. S. Kirk, J. W. Peterson, J. Woods, and M. Anderson, "Finite Elements for Flow and Transport." Poster Presentation, October 2003. Center for Subsurface Modeling Industrial Affiliates Meeting, University of Texas, Austin, TX.
- [20] G. F. Carey and J. W. Peterson, "High Performance Computing in Finite Element Analysis." Presentation, August 2003. University of Manchester, UK.
- [21] J. W. Peterson and B. S. Kirk, "A Numerical Investigation of Bénard Convection in Small Aspect Ratio Containers." Presentation, July 2003. United States National Congress for Computational Mechanics VII, Albuquerque, NM.
- [22] J. W. Peterson, "Code Coupling: Microgravity Fluid Flow Meets Adaptive Mesh Refinement." Presentation, August 2002. NASA, Visiting Students Enrichment Program, Goddard Space Flight Center, Greenbelt, MD.