JOHN HENRY J. NIEDERHAUS

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OBJECTIVE

Research position in computational fluid dynamics/multiphysics modeling in an industrial, academic, or national laboratory. Interested in the environments of high energy density physics, laser fusion, nuclear power, combustion, and geophysics, and in the modeling of shock propagation, turbulence, and mixing.

EDUCATION

UNIVERSITY OF WISCONSIN-MADISON
Ph.D., Engineering Physics, expected May, 2007
Thesis title: "A computational parameter study in 3D for the shock-bubble interaction."
Non-technical minor: History of Science
Advisor: Riccardo Bonazza; informal co-advisor: Jeff Greenough (LLNL)

PENNSYLVANIA STATE UNIVERSITY University Park, PA
M.S., Nuclear Engineering, August 2003
Thesis title: "A single-disk chopper time-of-flight spectrometer for thermal neutron beams."
Advisors: Jack Brenizer and Kenan Ünlü *GPA: 4.0/4.0*

VIRGINIA MILITARY INSTITUTE Lexington, VA
B.S., Physics, May 2001
Double major in History; minor in Astronomy
Top-ranked student in Class of 2001 *GPA: 3.9/4.0*

EMPLOYMENT

Research assistant, *Engineering Physics, University of Wisconsin-Madison (Wisconsin Shock Tube Laboratory)* **August, 2003-present**
Used a high-resolution 2D/3D multifluid hydrodynamics code implemented on LLNL supercomputer platforms to analyze shock dynamics, vortex formation, mixing, and turbulence features in laser-fusion-related Richtmyer-Meshkov instabilities and shock-bubble interactions; performed simulations also for code validation and experiment design.

Summer intern, *Lawrence Livermore National Laboratory, Livermore, CA (AX Division)* **June-August 2004, June-August 2005**
Developed scripts for post-processing large simulation datasets and generating computational flow visualizations; used simulations to identify a mechanism for the development of secondary vortex rings observed in shock tube experiments for the shock-bubble interaction. Mentor: Jeff Greenough (AX Division)

Research assistant, *Pennsylvania State University, University Park, PA (Neutron Beam Laboratory)* **January, 2002-July, 2003**
Performed experiments in neutron radiography and neutron time-of-flight spectroscopy at the Breazeale Nuclear Reactor; developed a post-processing algorithm to transform time-of-flight data to energy spectra, correcting for secondary effects.

Student tutor, *Pennsylvania State University, University Park, PA* **September, 2001-December, 2002**
Tutored student-athletes in freshman- and sophomore-level physics and math classes.

Cadet tutor, *Virginia Military Institute, Lexington, VA* **September, 1999-May, 2001**
Tutored cadets in introductory German and sophomore-level physics classes.

EMPLOYMENT (CONTINUED)

Summer intern, *Lawrence Livermore National Laboratory, Livermore, CA* **June-August, 2000**

Performed Monte Carlo calculations to reconstruct the neutron signal recorded by a time-of-flight spectrometer on the OMEGA laser fusion device; developed a post-processing technique to correct for Doppler broadening of the spectrum.

SKILLS

Numerical simulation: used the Godunov AMR code *Raptor* (LBL/LLNL) in numerous 2D/3D hydrodynamic simulations; managed input/output, errors, archival storage.
Dataset visualization: advanced user of the LLNL visualization tool *VisIt* for state-of-the-art rendering, graphics, and quantitative analysis for large 2D and 3D datasets.
Computing: skilled user of *Unix* and *Linux* operating systems; extensive experience with LLNL-specific filesystems, protocols, and massively parallel supercomputer resources.
Scripting: skilled in *MATLAB* and *Python*. **Programming:** skilled in *FORTRAN* and *C*.
Numerical methods: trained in computational fluid/gas dynamics and neutron transport.
Scientific tools: proficient in *Fluent*/*GAMBIT*, *Maple*, *Mathematica*, *Mathcad*, and *EES*.
Laboratory: experience with radiation detection instrumentation and electronics.

PROFESSIONAL SOCIETIES

American Nuclear Society: national level and UW-Madison student chapter
American Physical Society

AWARDS AND HONORS

Morgridge Wisconsin Distinguished Graduate Fellow, 2006
Award for Best Student Poster (co-authored by Devesh Ranjan), 16th American Nuclear Society Topical Meeting on the Technology of Fusion Energy, September, 2004
Pennsylvania State University Graduate Fellow, 2001-2003
NCAA Academic All-American, 2001
Valedictorian, Virginia Military Institute Class of 2001
Virginia Military Institute Scholar, 1997-2001

ACTIVITIES

Intervarsity Graduate Christian Fellowship, Madison, WI, 2003-present
Lake Trails Presbyterian Church (youth, music ministries), Madison, WI, 2003-present
Movin' Shoes Track Club, Madison, WI, 2003-present
Penn State Triathlon Club, State College, PA, 2001-2003
Virginia Military Institute Cross Country/Track and Field (NCAA Division I), 1997-2001
Virginia Military Institute Regimental Band and Brass Quintet, 1997-2001
Study abroad in Berlin, Germany via Lexia International, June-August, 1999
Cross-cultural religious volunteer/missions work in Estonia, Canada, and U.S. urban areas, 1996-2006

PUBLICATIONS

Ranjan, D., Niederhaus, J., Motl, B., Anderson, M., Oakley, J., and Bonazza, R., "Experimental Investigation of Primary and Secondary Features in High Mach Number Shock-Bubble Interaction," *Physical Review Letters*, in review, September, 2006.

Niederhaus, J., Ranjan, D., Oakley, J., Anderson, M., and Bonazza, R., "Inertial-Fusion-Related Hydrodynamic Instabilities in a Spherical Gas Bubble Accelerated by a Planar Shock Wave," *Fusion Science and Technology* **47**, 4 (2005), pp. 1160-1164.

CONFERENCE PRESENTATIONS

Niederhaus, J., Greenough, J., Oakley, J., Ranjan, D., Anderson, M., and Bonazza, R.,"A Computational Parameter Study for the 3D Shock-Bubble Interaction, with and without Modeled Soap Film," Tenth International Workshop on the Physics of Compressible Turbulent Mixing, Paris, France, July 17-21, 2006.

Niederhaus, J., Ranjan, D., Oakley, J., Anderson, M., Bonazza, R., and Greenough, J., "Interaction of a Planar Shock with a Spherical Gas Inhomogeneity – Part II: Calculations," American Physical Society Division of Fluid Dynamics 58th Annual Meeting, Chicago, IL, November 20-22, 2005.

CONFERENCE PRESENTATIONS (CONTINUED)

Motl, B., Niederhaus, J., Anderson, M., Oakley, J., and Bonazza, R., "Richtmyer-Meshkov Instability of a Membraneless, Sinusoidal Gas Interface," 25th International Symposium on Shock Waves, Paper 1197-3, Bangalore, India, July 17-22, 2005.

Ranjan, D., Niederhaus, J., Anderson, M., Oakley, J., Bonazza, R., and Greenough, J., "IFE-Related Instabilities in a Spherical Gas Bubble Accelerated by a Planar Shock Wave," 16th American Nuclear Society Topical Meeting on the Technology of Fusion Energy, Madison, WI, September 14-16, 2004.

Ranjan, D., Niederhaus, J., Bauer, T., Oakley, J., Anderson, M., Smith, L., Greenough, J., and Bonazza, R., "Experimental and Computational Investigations of Shock-Accelerated Gas Bubbles," Ninth International Workshop on the Physics of Compressible Turbulent Mixing, Cambridge, UK, July 19-23, 2004.

Niederhaus, J., Brenizer, J., and Ünlü, K., "Thermal Neutron Time-of-Flight Spectroscopy at Penn State Using a Single-Disk Chopper," PHYSOR 2004 – The Physics of Fuel Cycles and Advanced Nuclear Systems: Global Developments, Chicago, IL, April 25-29, 2004.

Niederhaus, J., Brenizer, J., and Ünlü, K., "Development of a Single-Disk Neutron Chopper for Time-of-Flight Spectroscopy at Penn State," American Nuclear Society Winter Meeting, New Orleans, LA, November 1-5, 2003.

REFERENCES

Professor Riccardo Bonazza
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Professor Michael Corradini
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