

CURRICULUM VITAE

Alan Clark Calder

Mailing address:

Department of Astronomy and Astrophysics
University of Chicago
5640 South Ellis, RI 429
5640 South Ellis
Chicago, IL 60637
E-mail: calder@flash.uchicago.edu

Nationality: U.S. Citizen

Education

Doctor of Philosophy in Physics, Vanderbilt University, August, 1997.

Dissertation: *Multidimensional Simulations of Core Collapse Supernovae Using Multigroup Neutrino Transport.*

Master of Science in Physics, Vanderbilt University, December, 1993.

Master of Science in Physics, Clemson University, August, 1991.

Thesis: *Visual Characterization of the Nodal Surfaces of Many-Fermion Systems.*

Bachelor of Science in Physics, University of the South, May 1989.

Honors Research Report: *Dielectric Properties of Puddings.*

Academic Positions

Research Scientist, Department of Astronomy and Astrophysics, University of Chicago, November 2001 – present.

Instructor, Liberal Arts Department, School of the Art Institute of Chicago, 2004 – 2006.

Guest Faculty, Mathematics and Computer Science Division, Argonne National Laboratory, 2000 – 2004.

Research Associate, Department of Astronomy and Astrophysics, University of Chicago, August 1999 – October 2001.

Research Associate, National Center for Supercomputing Applications, University of Illinois, July 1997 – July 1999.

Research Assistant, Department of Physics and Astronomy, Vanderbilt University, 1994 – June 1997.

Consultant, Theoretical and Computational Physics Group, Oak Ridge National Lab., November 1995 – November 1996.

Teaching Assistant, Department of Physics and Astronomy, Vanderbilt University, Fall of 1991 – 1993.

Research Assistant, Department of Physics and Astronomy, Clemson University, Spring and Summer of 1991.

Teaching Assistant, Department of Physics and Astronomy, Clemson University, Fall of 1989 – Fall of 1990.

Research Interests

Main Field: Theoretical Astrophysics

Other Fields of Experience: Quantum Monte Carlo, Many-Body Physics, Experimental Biophysics

Research Interests: Relativistic Astrophysics, Supernovae, Radiation Transport, Multidimensional Hydrodynamics, High Performance Computing, Scientific Visualization, Computational Science Education

Teaching Experience

SCIENCE 3211 *The Search for Life in the Universe*. School of the Art Institute of Chicago, Spring 2006
SCIENCE 3211 *The Search for Life in the Universe*. School of the Art Institute of Chicago, Spring 2005
SCIENCE 3320 *Planetary Science*. School of the Art Institute of Chicago, Spring 2004

Affiliations and Honors

Judge, SC2005, SC2006 HPC Analytics Challenge
SC2000 Gordon Bell Prize, Special Category
Joseph Sheffield Memorial Society

Vanderbilt University:

Judge, Adventures in Supercomputing exposition, 1995
Vanderbilt Student Volunteers for Science, Group Leader 1994 – 1995
Vanderbilt Student Volunteers for Science, 1993 – 1994

Clemson University:

Sigma Pi Sigma
Society of Physics Students

University of the South:

Departmental Honors in Physics
Order of the Gownsmen
Sigma Pi Sigma
Society of Physics Students
Delta Kappa Epsilon National Fraternity – Tau Delta Chapter President, Fall 1988

Personal:

Eagle Scout, Awarded Fall 1985

Memberships in Professional Societies

American Astronomical Society
American Physical Society
Astronomical Society of the Pacific

Grants and Allocations

Co-Investigator, DOE Predictive Science Academic Alliance Program (PSAAP), *Center for Predictive Simulation of Radiation Hydrodynamic Experiments*. \$20.0M/5 yrs., Pre-proposal accepted, in prep.

Co-Investigator, NSF Integrative Graduate Education and Research Traineeship (IGERT), *Chicago IGERT on Emergent Multiscale Phenomena*. \$3.2M/5 yrs., under review.

Co-Investigator, Department of Energy (NNSA/FAC) Solicitation # DE-SC52-06NA26436, *Experimental Astrophysics on the Omega Laser*. \$360,014

Co-Principal Investigator, NSF AST Award 0507456, *Type Ia Supernovae: Simulations and Nucleosynthesis*, July 1, 2005 - June 30, 2008. \$217,661

Principal Investigator, NASA Project Columbia allocation, *The Application of an Interoperability Based Environment for Adaptive Meshes to Radiation-Hydrodynamic Models of Gamma-Ray Bursts*, 100,000 CPU hrs.

Principal Investigator, NASA Advanced Supercomputing Division allocation under High Performance Computing and Communications program (IBEAM project), 500,000 CPU hrs./yr. FY02, FY03, FY04.

Co-Investigator, Department of Energy (NNSA/FAC) Solicitation # DE-PS03-02SF22493, *Experimental Astrophysics on the Omega Laser*. 40 shots/year for FY03 and FY04.

Principal Investigator, NASA CAN-00-OES-01 Subcontract, *Development of an Interoperability Based Environment for Adaptive Meshes (IBEAM) with Applications to Radiation-Hydrodynamic Models of Gamma-Ray Bursts*. October 1, 2001 - September 30, 2004. \$228,024

Co-Investigator, NASA Cooperative Agreement Notice CAN-00-OES-01, *Development of an Interoperability Based Environment for Adaptive Meshes (IBEAM) with Applications to Radiation-Hydrodynamic Models of Gamma-Ray Bursts*. Selected for negotiation June 4, 2001. \$1.8M/3 yrs.

Principal Investigator, Partners for Advanced Computational Services Startup Allocation (NCSA), 4000 SU hours on the SGI-CRAY Origin2000, Awarded December 23, 1998

Refereed Publications

Tera-scale Turbulence Computation on BG/L Using the FLASH3 Code. R. Fisher, S. Abarzhi, K. Antypas, S. M. Asida, A. C. Calder, F. Cattaneo, P. Constantin, A. Dubey, I. Foster, J. B. Gallagher, M. K. Ganapathy, C.C. Glendenin, L. Kadanoff, D.Q. Lamb, S. Needham, M. Papka, T. Plewa, L.B. Reid, P. Rich, K. Riley, and D. Sheeler. in prep. to be submitted to the IBM Journal of Research and Development.

Capturing the Fire 2: Hydrodynamic Character of a Multi-Stage Flame Front Model for Deflagrations of Carbon-Oxygen White Dwarfs. D. Townsley, A. C. Calder, S. M. Asida, T. Jena, A. Zhiglo, I. Seitzzahl, F. Peng, A. Khokhlov, J. Truran, and D. Q. Lamb. in prep. to be submitted to the ApJ.

Capturing the Fire: Flame Energetics and Neutronization for Type Ia Supernovae. A. C. Calder, D. Townsley, O. E. B. Messer, I. Seitzzahl, F. Peng, E. F. Brown, N. Vladoimirova, J. Truran, and D. Q. Lamb. ApJ., in press. astro-ph/0611009

The Late-Time Behavior of the Single-mode Rayleigh-Taylor Problem. P. Ramaprabhu, G. Dimonte, A. C. Calder, and B. Fryxell, Phys. Rev. E., in press.

Scientific Applications on the Massively Parallel BG/L Machine. K. Antypas, A.C. Calder, A. Dubey, R. Fisher, M.K. Ganapathy, J.B. Gallagher, L.B. Reid, K. Riley, D. Sheeler, and N. Taylor, proc. Parallel and Distributed Processing Techniques and Applications (PDPTA '06)

Laboratory Astrophysics Experiments for Simulation Code Validation: A Case Study. A. C. Calder, Ap&SS, **298**, 25, 2005

Type Ia Supernovae: Simulations and Nucleosynthesis. E. F. Brown, A. C. Calder, T. Plewa, P. M. Ricker, K. Robinson, J. B. Gallagher. Nuclear Physics A, **758**, 451, 2005

Type Ia Supernova Explosion: Gravitationally Confined Detonation. T. Plewa, A. C. Calder, and D. Q. Lamb. ApJ, **612**, L37, 2004

On the Nonlinear Evolution of Wind-driven Gravity Waves. A. Alexakis, A. C. Calder, L. J. Dursi, R. Rosner, F. X. Timmes, B. Fryxell, M. Zingale, P. M. Ricker, and K. Olson. Phys. Fluids, **16**, No. 9, 3256, 2004

Validating Astrophysical Simulation Codes. A. C. Calder, L. J. Dursi, B. Fryxell, T. Plewa, V. G. Weirs, T. Dupont, H. F. Robey, J. O. Kane, R. P. Drake, B. A. Remington, G. Dimonte, J. Hayes, J. M. Stone, P. M. Ricker, F. X. Timmes, M. Zingale, and K. Olson. CiSE **6** No. 5, 10, 2004

A comparison of high-resolution 3D numerical simulations of turbulent Rayleigh-Taylor (RT) instability: Alpha-Group collaboration. G. Dimonte, D. Youngs, A. Dimitis, S. Weber, M. Marinak, S. Wunsch, C. Garasi, A. Robinson, M. J. Andrews, P. Ramaprabhu, A. C. Calder, B. Fryxell, J. Biello, L. Dursi, P. MacNeice, K. Olson, P. Ricker, R. Rosner, F. Timmes, H. Tufo, Y.-N. Young, and M. Zingale. Phys. Fluids, **16**, No. 5, 1668, 2004

On Heavy Element Enrichment in Classical Novae. A. Alexakis, A. C. Calder, A. Heger, E. F. Brown, L. J. Dursi, J. W. Truran, R. Rosner, D. Q. Lamb, F. X. Timmes, B. Fryxell, M. Zingale, P. M. Ricker, and K. Olson. ApJ, **602** 931, 2004

Morphology of Rising Hydrodynamic and Magneto-hydrodynamic Bubbles from Numerical Simulations. K. Robinson, L. J. Dursi, P. M. Ricker, R. Rosner, T. Linde, M. Zingale, A. C. Calder, B. Fryxell, J. W. Truran, F. X. Timmes, A. Caceres, K. Olson, K. Riley, A. Siegel, and N. Vladimirova. ApJ, **601** 621, 2004

The Response of Model and Astrophysical Thermonuclear Flames to Curvature and Stretch. L. J. Dursi, M. Zingale, A. C. Calder, B. Fryxell, F. X. Timmes, N. Vladimirova, R. Rosner, A. Caceres, D. Q. Lamb, K. Olson, P. M. Ricker, K. Riley, A. Siegel, and J. W. Truran. ApJ, **595** 955, 2003

Mapping Hydrostatic Models in Godunov Codes. M. Zingale, L. J. Dursi, J. ZuHone, A. C. Calder, B. Fryxell, T. Plewa, J. W. Truran, A. Caceres, K. Olson, P. M. Ricker, K. Riley, R. Rosner, A. Siegel, F. X. Timmes, and N. Vladimirova. ApJS, **143** 539, 2002

On Validating an Astrophysical Simulation Code. A. C. Calder, B. Fryxell, T. Plewa, R. Rosner, L. J. Dursi, V. G. Weirs, T. Dupont, H. F. Robey, J. O. Kane, B. A. Remington, R. P. Drake, G. Dimonte, M. Zingale, F. X. Timmes, K. Olson, P. Ricker, P. MacNeice, and H. M. Tufo. ApJS, **143** 201, 2002

Numerical Models of Binary Neutron Star System Mergers II.: Coalescing Models with Post-Newtonian Radiation Reaction Forces. A. C. Calder and E. Y. M. Wang. ApJ, **570** 303, 2002

Interface Imprinting by a Rippled Shock Using an Intense Laser. J. O. Kane, H. F. Robey, B. A. Remington, R. P. Drake, J. Knauer, D. D. Ryutov, H. Louis, R. Teyssier, O. Hurricane, D. Arnett, R. Rosner, and A.

Calder. Phys. Rev. E, **63**, 055401(R) 2001

Numerical Simulations of Thermonuclear Flashes on Neutron Stars. B. Fryxell, M. Zingale, F. X. Timmes, D. Q. Lamb, K. Olson, A. C. Calder, L. J. Dursi, P. Ricker, R. Rosner, J. W. Truran, P. MacNeice, and H. Tufo. Nuclear Physics A, **688** 172 2001

Helium Detonations on Neutron Stars. M. Zingale, J. W. Truran, F. X. Timmes, B. Fryxell, D. Q. Lamb, K. Olson, A. C. Calder, L. J. Dursi, P. Ricker, R. Rosner, P. MacNeice, and H. Tufo. ApJS, **133** 195, 2001

High-Performance Reactive Fluid Flow Simulations Using Adaptive Mesh Refinement on Thousands of Processors. A. C. Calder, B. C. Curtis, L. J. Dursi, B. Fryxell, G. Henry, P. MacNeice, K. Olson, P. Ricker, R. Rosner, F. X. Timmes, J. W. Truran, H. M. Tufo, and M. Zingale. in Proc. Supercomputing 2000, IEEE Computer Soc. 2000, <http://sc2000.org> (Gordon Bell Prize)

On The Cellular Structure of Carbon Detonations. F. X. Timmes, M. Zingale, K. Olson, B. Fryxell, P. Ricker, A. C. Calder, L. J. Dursi, J. W. Truran, H. Tufo, P. MacNeice, and R. Rosner. ApJ, **543** 938, 2000

Numerical Models of Binary Neutron Star System Mergers. I.: Numerical Methods and Equilibrium Data for Newtonian Models. F. D. Swesty, E. Y. M. Wang, and A. C. Calder. ApJ, **541** 937, 2000

Flash Code: Studying Astrophysical Thermonuclear Flashes. R. Rosner, A. Calder, J. Dursi, B. Fryxell, D. Q. Lamb, J. C. Niemeyer, K. Olson, P. Ricker, F. X. Timmes, J. W. Truran, H. Tufo, Y-N Young, M. Zingale, Ewing Lusk, and Rick Stevens. CiSE, **2** No. 2, 33, 2000

An Investigation of Neutrino-Driven Convection and the Core Collapse Supernovae Mechanism Using Multi-group Neutrino Transport. A. Mezzacappa, A. C. Calder, S. W. Bruenn, J. M. Blondin, M. W. Guidry, M. R. Strayer, and A. S. Umar. ApJ, **495** 911, 1998

The Interplay Between Protoneutron Star Convection and Neutrino Transport in Core Collapse Supernovae. A. Mezzacappa, A. C. Calder, S. W. Bruenn, J. M. Blondin, M. W. Guidry, M. R. Strayer, and A. S. Umar. ApJ, **493** 848, 1998

Visualization of the Local Contribution to the Nodal Surface of a Many-Fermion Wave Function. A. C. Calder, M. R. Curry, R. M. Panoff, and Y. J. Wong. Phys. Rev. E, **53**, 5450, 1996

Contributed Papers

A Case Study of Verifying and Validating an Astrophysical Simulation Code. A. C. Calder, N. T. Taylor, K. Antypas, and D. Sheeler, in press, to appear in proc. Numerical Modeling of Space Plasma Flow held May 27-30 2006, Palm Springs, California.

FLASH: Applications and Future. K.B. Antypas, A. C. Calder, A. Dubey, J. B. Gallagher, J. Joshi, D. Q. Lamb, T. Linde, E. Lusk, O. E. B. Messer, A. Mignone, H. Pan, M. Papka, F. Peng, T. Plewa, P. M. Ricker, K. Riley, D. Sheeler, A. Siegel, N. Taylor, J. W. Truran, N. Vladimirova, G. Weirs, D. Yu, Z. Zhang. in Parallel Computational Fluid Dynamics 2005: Theory and Applications, eds. A. Deane, G. Brenner, A. Ecer, D. R. Emerson, J. McDonough, J. Periaux, N. Satofuka, D. Tromeur-Dervout. in press.

Deflagrations Evolved from an Off-Center Ignition. J. W. Truran, A. C. Calder, T. Plewa, N. Vladimirova, and D. Q. Lamb, in Proc. of the 12th Workshop on Nuclear Astrophysics (Ringberg Castle, March 22-27, 2004), MPA/P14, eds. E. Müller and Hans-Thomas Janka, Garching, 2004, p. 96

Breaking Gravity Waves: A Mechanism for Nova Enrichment. A. C. Calder, A. Alexakis, A. Heger, E. F. Brown, L. J. Dursi, J. W. Truran, R. Rosner, and J. Jose, in Proc. of the 12th Workshop on Nuclear Astrophysics (Ringberg Castle, March 22-27, 2004), MPA/P14, eds. E. Müller and Hans-Thomas Janka, Garching, 2004, p. 69

Simulations of Rising Hydrodynamic and Magnetohydrodynamic Bubbles. P. M. Ricker, K. Robinson, L. J. Dursi, R. Rosner, T. Linde, M. Zingale, A. C. Calder, B. Fryxell, T. Plewa, J. W. Truran, A. Caceres, K. Olson, K. Riley, A. Siegel, N. Vladimirova. In Proceedings of The Riddle of Cooling Flows in Galaxies and Clusters of Galaxies (held in Charlottesville, VA, May 31 - June 4, 2003), eds. T. Reiprich, J. Kempner, and N. Soker. Published electronically at <http://www.astro.virginia.edu/coolflow/>

A Case Study of Verifying and Validating an Astrophysical Simulation Code. A. C. Calder, B. Fryxell, T. Plewa, R. Rosner, L. J. Dursi, V. G. Weirs, T. Dupont, H. F. Robey, J. O. Kane, B. A. Remington, R. P. Drake, G. Dimonte, M. Zingale, A. Siegel, A. Caceres, K. Riley, N. Vladimirova, P. Ricker, F. X. Timmes, K. Olson, and H. M. Tufo. Prepared for Foundations 2002, October 22-23, 2002 <http://www.trainingsystems.org/events/31V0>

Investigations of Pointwise Ignition of Helium Deflagrations on Neutron Stars. M. Zingale, S. E. Woosley, A. Cumming, A. Calder, L. J. Dursi, B. Fryxell, K. Olson, P. Ricker, R. Rosner, and F. X. Timmes in 3-d Stellar Evolution, eds. S. Turcotte, S. Keller, and R. Cavallo, ASP conference proceedings vol. 293, ASP, San Francisco, 2003, p. 329

Onset of Convection on a Pre-Runaway White Dwarf. L. J. Dursi, A. C. Calder, A. Alexakis, J. W. Truran, M. Zingale, B. Fryxell, P. Ricker, F. X. Timmes, and K. Olson. in Classical Nova Explosions, eds. M. Hernanz and J. Jose, AIP, Melville, 2002, p. 139

Mixing by Non-linear Wave Breaking at the Surface of a White Dwarf. A. C. Calder, A. Alexakis, L. J. Dursi, R. Rosner, J. W. Truran, B. Fryxell, P. Ricker, M. Zingale, K. Olson, F. X. Timmes, and P. MacNeice. in Classical Nova Explosions, eds. M. Hernanz and J. Jose, AIP, Melville, 2002, p. 134

Mixing by Wave Breaking at the Surface of a White Dwarf. J. W. Truran, A. Alexakis, L. J. Dursi, A. C. Calder, M. Zingale, B. Fryxell, P. Ricker, F. X. Timmes, R. Rosner, and K. Olson, in Proc. of the 11th Workshop on Nuclear Astrophysics (Ringberg Castle, February 11-16, 2002), MPA/P13, eds. W. Hillebrandt and E. Müller, Garching, 2002, p. 186

A Semi-analytic Model for the Radiation Reaction Luminosity for post-Newtonian Binary Neutron Star Mergers. F. D. Swesty and A. C. Calder. in Relativistic Astrophysics, eds. J. C. Wheeler and H. Martel, AIP, Melville, 2001, p. 808

Coalescing Binary Neutron Star Systems. A. C. Calder, F. D. Swesty, and E. Y. M. Wang. in Relativistic Astrophysics, eds. J. C. Wheeler and H. Martel, AIP, Melville, 2001, p. 796

Quenching Processes in Flame-Vortex Interactions. M. Zingale, J. C. Niemeyer, F. X. Timmes, L. J. Dursi, A. C. Calder, B. Fryxell, D. Q. Lamb, K. Olson, P. M. Ricker, R. Rosner, and P. MacNeice. in Relativistic

Astrophysics, eds. J. C. Wheeler and H. Martel, AIP, Melville, 2001, p. 490

Simulations of Astrophysical Fluid Instabilities. A. C. Calder, B. Fryxell, R. Rosner, L. J. Dursi, K. Olson, P. M. Ricker, F. X. Timmes, M. Zingale, P. MacNeice, and H. M. Tufo. in Relativistic Astrophysics, eds. J. C. Wheeler and H. Martel, AIP, Melville, 2001, p. 484

Adaptive Mesh Simulations of Astrophysical Detonations Using the ASCI Flash Code. B. Fryxell, A. C. Calder, L. J. Dursi, D. Q. Lamb, P. MacNeice, K. Olson, P. M. Ricker, R. Rosner, F. X. Timmes, J. W. Truran, H. M. Tufo, M. Zingale. in Proceedings of the VII International Workshop on Advanced Computing and Analysis Techniques in Physics Research (ACAT 2000), P. C. Bhat and M. Kasemann, eds. AIP Press, Melville, 2001, p. 223

Large-Scale Simulations of Clusters of Galaxies. P. M. Ricker, A. C. Calder, L. J. Dursi, B. Fryxell, D. Q. Lamb, P. MacNeice, K. Olson, R. Rosner, F. X. Timmes, J. W. Truran, H. M. Tufo, M. Zingale. in Proceedings of the VII International Workshop on Advanced Computing and Analysis Techniques in Physics Research (ACAT 2000), P. C. Bhat and M. Kasemann, eds. AIP Press, Melville, 2001, p. 316

Numerical Simulations of Thermonuclear Flashes on Neutron Stars. B. Fryxell, M. Zingale, F. X. Timmes, D. Q. Lamb, K. Olson, A. C. Calder, L. J. Dursi, P. Ricker, R. Rosner, J. W. Truran, P. MacNeice, and H. Tufo. in Proc. of the Sixth International Conference on Nuclei in the Cosmos, Aarhus, Denmark, 27 June - 1 July, 2000. ed. J. Christensen-Dalsgaard and K. Langanke, Elsevier, Amsterdam 2001, p. 172c

What is 29 Doradus? J. R. Dickel, J. B. Kaler, A. C. Calder, R. F. Webbink, E. Olszewski, D. Welch, E. C. Olson, N. L. Romero, and D. F. Bright. Mercury, **29** No. 5, 38, 2000

Helium Detonations on Neutron Stars. B. Fryxell, M. Zingale, F. X. Timmes, D. Q. Lamb, K. Olson, A. C. Calder, L. J. Dursi, P. Ricker, R. Rosner, J. W. Truran, P. MacNeice, and H. Tufo. in Proc. of the 10th Workshop on Nuclear Astrophysics (Ringberg Castle, March 20-25, 2000), MPA/P12, eds. W. Hillebrandt and E. Müller, Garching, 2000, p. 38

Numerical Models of Newtonian and Post-Newtonian Binary Neutron Star Mergers. E. Y. M. Wang, F. D. Swesty, and A. C. Calder, in Stellar Evolution, Stellar Explosions, and Galactic Chemical Evolution, ed. A. Mezzacappa, IOP Publishing Ltd, Bristol, 1998, p. 723

Numerical Methods for Modeling Binary Neutron Star Systems. A. C. Calder, F. D. Swesty, and E. Y. M. Wang, in Stellar Evolution, Stellar Explosions, and Galactic Chemical Evolution, ed. A. Mezzacappa, IOP Publishing Ltd, Bristol, 1998, p. 715

References for Alan C. Calder

Dr. Robert Rosner
Director, Argonne National Laboratory
9700 S. Cass Avenue
Argonne, IL 60439
(630) 252-2481
E-mail: RRosner@anl.gov

Dr. Leo Kadanoff
University of Chicago
Room E219 CIS Building
929 East 57th Street
Chicago, IL 60637
(773) 702-7189
E-mail: l-kadanoff@uchicago.edu

Dr. James Truran
Department of Astronomy and Astrophysics
University of Chicago
5640 South Ellis Ave.
Chicago, IL 60637
(773) 702-9584
E-mail: truran@nova.uchicago.edu

Dr. Elizabeth Wright
Coordinator, Science and Math
School of the Art Institute of Chicago
37 S. Wabash
Chicago, IL 60603
(312) 345-3764
E-mail: ewright@saic.edu