Curriculum Vitae

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Education

Ph.D. in Mechanical and Aerospace Engineering, Rutgers, the State University of New Jersey, October 1999.

M.S. in Mechanical and Aerospace Engineering, Rutgers, the State University of New Jersey, January 1997.

B. Tech. in Aerospace Engineering, Indian Institute of Technology, Kharagpur, West Bengal, India. June 1992.

Experience

2004 – present	Principal Member of Technical Staff, Sandia National Laboratories.
2000 – 2004	Senior Member of Technical Staff, Sandia National Laboratories.
1999 – 2000	Limited Term Member of Technical Staff, Sandia National Laboratories.
1996 – 1997	Intern, Los Alamos National Laboratory.
1993 – 1999	Graduate Research Assistant, Rutgers, the State University of New Jersey.
1992 – 1993	Hydraulics Design Engineer, Eicher Tractors, India.

Mentoring

- Johan Steensland, post-doctoral researcher at Sandia National Laboratories, Livermore, CA, (2003–present).
- Nicholas Trebon, M.S. student in the Department of Computer Science, University of Oregon, Eugene, OR, (2003–present).
- Summer students: Kylene Smith (undergraduate CS, University of Notre Dame, IN, 2001) and H. Liu (Ph.D. candidate in Electrical and Computer Engineering, Rutgers University, NJ, 2004).

Research Interests

- Computational and theoretical fluid mechanics, with emphasis on compressible and reactive flows.
- Higher-order numerical methods for PDE solutions on adaptively refined meshes.
- Component-based approaches to scientific simulation software and high performance computing.

- Computational systems biology.

Activities, Awards and Grants

- Reviewer, *Phys. Fluids*, *Combustion Theory and Modeling*, *IEEE - Computer Science* & *Proc. Combust. Inst.*
- Reviewer, *California Energy Commission* & *National Science Foundation*.
- "Computational Facility for Reacting Flow Science", Department of Energy (Office of Science, Basic Energy Sciences, Department of Chemical Sciences, Geosciences and Biosciences) project under the SciDAC (Scientific Discovery through Advanced Computing) program. October 2001.
- "The Center for Component Technology for Terascale Simulation Software", Department of Energy (Office of Science, Advanced Scientific Computing Research, Department of Mathematical, Information and Computational Sciences) project under the SciDAC program. October 2001.
- "Autonomic Component Framework for Grid Applications", National Science Foundation, under the New Generation Software program. October 2003.
- "Contagious bioterror agents in urban guerrilla warfare: threat estimation and epidemiology of distributed micro-releases", proposal under review, Joint Science and Technology Office, Dept. of Defence, 2005.
- Best paper award in the "Runtime Systems" category at the 15^{th} IASTED International Conference on Parallel and Distributed Computing and Systems 2003 (PDCS03).
- 2-year Excellence Fellowship awarded by the Dept. of Mech. & Aero. Engg., Rutgers University, NJ, in July 1993 for pursuing an M.S.
- Institute Silver Medal, awarded by the Indian Institute of Technology, Kharagpur.

Books and Journal Publications

- N. Trebon, A. Morris, **J. Ray**, S. Shende and A. D. Malony, "Performance modeling of component assemblies", *Concurrency and Computation: Practice and Experience*, 2007, 19(5):685-696.
- **J. Ray**, C. A. Kennedy, S. Lefantzi and H. N. Najm, "Using high-order methods on adaptively refined block-structured meshes - derivatives, interpolations, and filters", *SIAM Journal on Scientific Computing*, 2007, 29(1):139-181.
- J. C. Lee, H. N. Najm, S. Lefantzi, **J. Ray** and M. Frenklach, M. Valorani and D. Goussis, "A CSP and Tabulation Based Adaptive Chemistry Model", *Combustion Theory and Modeling*, 2007, 11(1):73-102.
- David E. Bernholdt, Benjamin A. Allan, Robert Armstrong and Felipe Bertrand, Kenneth Chiu, Tamara L. Dahlgren, Kostadin Damevski, Wael R. Elwasif, Thomas G. W. Epperly, Madhusudhan Govindaraju, Daniel S. Katz, James A. Kohl, Manoj Krishnan, Gary Kumfert,

J. Walter Larson, Sophia Lefantzi, Michael J. Lewis Allen D. Malony, Lois C. McInnes, Jarek Nieplocha, Boyana Norris, Steven G. Parker, **Jaideep Ray**, Sameer Shende, Theresa L. Windus, and Shujia Zhou, "A Component Architecture for High-Performance Scientific Computing", *International Journal of High-Performance Computing Application*, 2006, 20:162-202.

- J. Steensland and **J. Ray**, "A Partitioner-Centric Model for SAMR Partitioning Trade-Off Optimization : Part I", *International Journal of High Performance Computing Applications*, 2005, 19(4):409-422.
- L. C. McInnes, B. A. Allan, R. Armstrong, S. J. Benson, D. E. Bernholdt, T. L. Dahlgren, L. F. Diachin, M. Krishnan, J. A. Kohl, J. W. Larson, S. Lefantzi, J. Nieplocha, B. Norris, S. G. Parker, **J. Ray** and S. Zhou, "Parallel PDE-Based Simulations Using the Common Component Architecture". Chapter in *Numerical Solution of Partial Differential Equations on Parallel Computers*, 2005. Editors: A. M. Bruaset, P. Bjorstad, and A. Tveito, Lecture Notes in Computational Science and Engg., (51), Springer.
- S. Lefantzi, **J. Ray**, C.A. Kennedy and H.N. Najm, "A Component-based Toolkit for Simulating Reacting Flows with High Order Spatial Discretizations on Structured Adaptively Refined Meshes". *Progress in Computational Fluid Dynamics: An International Journal*, 2005, 5(6):298-315.
- **J. Ray** and L. Jameson, "Estimation of Shock Induced Vorticity on Irregular Gaseous Interfaces : A Wavelet-based Approach". *Shock Waves : An International Journal*, 2005, 14(3):147-160.
- A. Malony, S. Shende, N. Trebon, **J. Ray**, R. Armstrong, C. Rasmussen and M. Sottile, "Performance Technology for Parallel and Distributed Component Software". *Concurrency and Computation: Practice and Experience*, 2005, 17(2–4):117-141.
- C. C. Douglas, J. Hu, **J. Ray**, D. T. Thorn, and R. Tuminaro, "Cache aware multigrid for variable coefficient elliptic problems on adaptive mesh refinement hierarchies", *Numerical Linear Algebra and Applications*, 2004, 11:173-187.
- B.A. Allan, R.C. Armstrong, A.P. Wolfe, **J. Ray**, D.E. Bernholdt and J.A. Kohl, "The CCA core specification in a distributed memory SPMD framework", *Concurrency: Practice and Experience*, 2002, 14(5):323-345.
- **J. Ray**, H.N. Najm, R.B. Milne, K.D. Devine and S. Kempka, "Triple flame structure and dynamics at the stabilization point of an unsteady lifted jet diffusion flame", *Proc. Combust. Inst*, 2000, 28(1):219-226.
- A. D. Kotelnikov, **J. Ray** and N. J. Zabusky, "Vortex morphologies on re-accelerated interfaces: visualization, quantification and modeling of one- and two-mode compressible and incompressible environments", *Phys. Flds*, 2000, 12(12):3245-3264.
- **J. Ray**, R. Samtaney and N. J. Zabusky, "Shock interaction with heavy gaseous elliptic cylinders: Two leeward side shock competition modes and a heuristic model for interfacial circulation deposition at early times", *Phys. Flds.*, 2000, 12(3):707-716.
- R. Samtaney, **J. Ray** and N. J. Zabusky, "Baroclinic circulation generation on shock accelerated slow/fast gas interfaces", *Phys. Flds.*, 1998, 10(5):1217-1230.

Refereed Conference Publications

- **J. Ray** and Y. M. Marzouk, “Bayesian inference of epidemiological characteristics in a partially observed epidemic”, Proceedings of the DTRA Chemical and Biological Technologies Conference, New Orleans, November 17-21, 2008.
- J. Rodriguez, K. E. Cheng, G. McClellan, D. J. Crary, D. Oldson, B. Adams and **J. Ray**, “ Contagious disease module for the Joint Effects Model”, Proceedings of the DTRA Chemical and Biological Technologies Conference, New Orleans, November 17-21, 2008.
- **J. Ray**, Y. M. Marzouk M. Kraus and P. Fast, “Characterizing bioterrorist attacks from a short time series of diagnosed patient data - A Bayesian approach”, Proceedings of the Second Conference on Quantitative Methods in Defense and National Security, George Mason University, Fairfax, VA, February 7-8, 2007.
- S. Chandra, M. Parashar and **Jaideep Ray**, “Analyzing the Impact of Computational Heterogeneity on Runtime Performance of Parallel Scientific Components”, Proceedings of the 15th High Performance Computing Symposium (HPC-07), SCS Spring Simulation Multiconference, Norfolk, VA, USA, March 2007.
- Sumir Chandra, Manish Parashar and **Jaideep Ray**, “Dynamic Structured Partitioning of Parallel Scientific Applications with Pointwise Varying Workloads”, Proceedings of the International Parallel and Distributed Processing Symposium, April 24-28, 2006. Rhodes, Greece.
- **J. Ray**, C. Kennedy, J. Steensland and H. Najm, “Advanced Algorithms for Computations on Block-Structured Adaptively Refined Meshes,” *Journal of Physics: Conference Series*, 2005, 16:113-118.
- Benjamin A. Allan and **J. Ray**, “The scalability impact of a component-based software engineering framework on a growing SAMR toolkit: a case study,” Parallel Computational Fluid Dynamics May 25-27, 2005, College Park, MD.
- N. Trebon, A. Morris, **J. Ray**, S. Shende and A. Malony, “Performance Modeling of Component Assemblies with TAU,” Compframe 2005 June 22-24, 2005, Atlanta, GA.
- J. C. Lee, H. N. Najm, S. Lefantzi, **J. Ray**, M. Frenklach, M. Valorani and D. A. Goussis, “An Adaptive Reduced–Order Chemical Model”, 20th International Colloquium on the Dynamics of Explosions and Reactive Systems , July 31st to August 5th, 2005, Montreal, Canada.
- J. C. Lee, H. N. Najm, S. Lefantzi, **J. Ray**, M. Frenklach, M. Valorani and D. A. Goussis, “The Role of Explosive Modes in Homogeneous Ignition and Premixed Flames”, 20th International Colloquium on the Dynamics of Explosions and Reactive Systems , July 31st to August 5th, 2005, Montreal, Canada.
- Johan Steensland and **J. Ray**, “A Partitioner-Centric Model for SAMR Partitioning Trade-Off Optimization: Part II”, In the proceedings of The 6th International Workshop on High Performance Scientific and Engineering Computing (HPSEC-04), held in conjunction with The 2004 International Conference On Parallel Processing (ICPP-04), in Montreal, Canada, Aug. 15-18, 2004.

- J.C. Lee, H.N. Najm, S. Lefantzi, **J. Ray**, M. Frenklach, M. Valorani, and D.A. Goussis, "On chain branching and its role in homogeneous ignition and premixed flame propagation", Third MIT Conference on Computational Fluid and Solid Mechanics, June 14-17, 2005, Cambridge, MA.

- B. Norris, **J. Ray**, R.C. Armstrong, L.C. McInnes, D.E. Bernholdt, W.R. Elwasif, A.D. Malony, S. Shende, " Computational Quality of Service for Scientific Components", Component-Based Software Engineering, 7^{th} International Symposium, CBSE 2004, Edinburgh, UK, May 24-25, 2004. Also in Lecture Notes in Computer Science, 3054, Pg 264-271. Springer.

- **J. Ray** and N. Trebon and S. Shende and R. C. Armstrong and A. Malony, "Performance Measurement and Modeling of Component Applications in a High Performance Computing Environment: A Case Study", Proceedings of the 18^{th} International Parallel and Distributed Computing Symposium , April 26–30, 2004, Santa Fe, NM.

- J. Steensland and **J. Ray**, "A Partitioner-Centric Model for SAMR Partitioning Trade-Off Optimization: Part I", Proceedings of the 4^{th} Annual Symposium of the Los Alamos Computer Science Institute (LACSI04).

- J. Steensland and **J. Ray**, "A Heuristic Re-Mapping Algorithm Reducing Inter-Level Communication in SAMR Applications", Proceedings of the 15^{th} IASTED International Conference on Parallel and Distributed Computing and Systems 2003 (PDCS03). *Best paper award in the "Runtime Systems" category*.

- S. Lefantzi and **J. Ray**, "A Component-based Scientific Toolkit for Reacting Flows", Proceedings of the Second MIT Conference on Computational Fluid and Solid Mechanics, Boston, Mass. 2003.

- S. Lefantzi, **J. Ray** and H. N. Najm, "Using the Common Component Architecture to Design High Performance Scientific Simulation Codes", Proceedings of the 17^{th} International Parallel and Distributed Processing Symposium, April 2003, Nice, France.

- C.C. Douglas, J. Hu, **J. Ray**, D. Thorne and R. Tuminaro, "Fast, Adaptively Refined Computational Elements in 3D", presented at 2002 International Conference on Computational Science, Part III, April 21th to 24th, Amsterdam, Netherlands. Also in Lecture Notes in Comput. Sc., 2331, pp 774-783, Springer, Berlin, 2002.

Presentations

- **Jaideep Ray**, C. Kennedy, S Lefantzi, and Habib Najm, "High-order Methods on Block-structured Adaptive Meshes - Discretizations, Interpolations and Filters", Minisymposium on Flow Simulations and Algorithms on Block-Structured Adaptively Refined Meshes, SIAM Conference on Numerical Combustion, April 23-26, 2006, Granada, Spain.

- **Jaideep Ray**, C. Kennedy, J. Steensland and H. Najm, "Advanced Algorithms for Computations on Block-Structured Adaptively Refined Meshes." *Journal of Physics: Conference Series*, 2005, 16:113-118.

- S. Lefantzi, **J. Ray**, B. A. Allan and H. N. Najm, "Computational Facility for Reacting Flow Science: Functionality, Reusability and Interoperability", Minisymposium on Numerical Software for Solving Problems in Computational Science and Engineering, SIAM Conference on Computational Science and Engineering, Feb 12-15, 2005, Orlando, FL.
- S. Lefantzi, C. A. Kennedy, **J. Ray** and H.N. Najm, "A study of the effect of higher order spatial discretizations in SAMR (Structured Adaptive Mesh Refinement) simulations", Proceedings of the Fall Meeting of the Western States Section of the The Combustion Institute, October 20–21, 2003, Los Angeles, CA.
- R.B. McCoy, H.N. Najm and **J. Ray**, "Shear layer effect on edge flame structure in a non-premixed methane-air flame", Proceedings of Third Joint Meeting of the U.S. Sections of the Combustion Institute Chicago, USA, March 2003.
- **J. Ray**, C.A. Kennedy, S. Lefantzi and H.N. Najm, "High-order spatial discretizations and extended stability methods for reacting flows on structured adaptively refined meshes", Proceedings of Third Joint Meeting of the U.S. Sections of the Combustion Institute Chicago, USA, March 2003.
- **J. Ray**, S. Lefantzi and H. Najm, "Using the Common Component Architecture to Design Simulation Codes", presented at SIAM, Computational Science and Engineering Conference, San Diego, CA, January 2003.
- R.B. McCoy, H.N. Najm, **J. Ray**, J.E. Rehms and P.H. Paul, "Edge flame structure in non-premixed methane-air jet", at the Western States Symposium of the Combustion Institute, University of California, La Jolla, CA, March 25th and 26th, 2002.
- **J. Ray**, H.N. Najm and R.B. McCoy, "Ignition front structure in a methane-air jet", presented at the Second Joint Meeting of the U.S. Section of the Combustion Institute, Oakland, CA. March 25th to 28th, 2001.
- **J. Ray**, H.N. Najm and R.B. Milne, "Adaptive Lagrangian-Eulerian Reacting Flow Modeling", presented at the Second SIAM Numerical Combustion Meeting Amelia Island, FL. February 2000.
- **J. Ray** and N.J. Zabusky, "The Richtmyer-Meshkov Instability with Reshock", presented at the 51^{st} Annual Meeting of the Division of Fluid Dynamics, American Physical Society, Philadelphia, PA, 22-24th November, 1998. (abstract in Bull. Amer. Phys. Soc., vol. 43, Nov. 1998).
- **J. Ray**, R. Samtaney and N.J. Zabusky, "Shock competition and circulation deposition in shock interactions with heavy prolate cylinders", presented at the 51^{st} Annual Meeting of the Division of Fluid Dynamics, American Physical Society, Philadelphia, PA, 22-24th November, 1998. (abstract in Bull. Amer. Phys. Soc., vol. 43, Nov. 1998).
- **J. Ray** and N.J. Zabusky, "Escaped vortex projectiles from shock wave interactions with elliptical and ellipsoidal clouds", presented at the Joint Meeting of the American Physical Society and the American Association of Physics Teachers with The Canadian Association of Physicists and the Sociedad Mexicana de Fisica., Washington, D.C., 18-21st April, 1997. (abstract in Bull. Amer. Phys. Soc., vol. 42, no. 2, April. 1997).

- N. J. Zabusky, S. Zeng, **J. Ray**, and R. Samtaney, “Vortical Projectiles from Shock-Bubble Interactions”, Proceedings of the Sixth International Workshop on the Physics of Compressible Turbulent Mixing. Ed. G. Jourdan and L. Houas. June 1997, Universite de Provence, Marseilles. Imprimerie Caractere.
- **J. Ray** and N.J. Zabusky, “Analytical and numerical models for a harmonic perturbation of the Richtmyer-Meshkov instability in the linear and non-linear epochs”, presented at The 49th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, Syracuse, NY, 24-26th November, 1996. (abstract in Bull. Amer. Phys. Soc., vol. 41, no. 9, Nov. 1996).
- R. Samtaney, **J. Ray** and N. J. Zabusky, “Baroclinic circulation generation on shock accelerated slow/fast gas interfaces”, Proceedings of the Sixth International Workshop on the Physics of Compressible Turbulent Mixing. Ed. G. Jourdan and L. Houas. June 1997, Universite de Provence, Marseilles. Imprimerie Caractere.
- **J. Ray**, N. J. Zabusky and R. Samtaney, “Vortex methods for early and intermediate time Richtmyer-Meshkov environments”, Proceedings of the 20th International Symposium on Shock Waves, Vol I. Ed. B. Sturtevant, H. G. Hornung and J. E. Shepherd. 1996, World Scientific Publishing Co. Pte. Ltd. Singapore.