

Damian Rouson, Ph.D., P.E.

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Experience

President **Sourcery Institute and Sourcery, Inc.** **2015-pres.**

- Leading a network of scientists, engineers and mathematicians engaged in computational science software development, research, education, and consulting.
- Leading open-source software projects: [OpenCoarrays](#) and [Morfeus](#).
- Teaching courses on parallel, object-oriented, and functional program design.

Managing Director & Lecturer **Stanford University** **2013-2014**

- Managed the Center for Computational Earth and Environmental Sciences.
- Developed a graduate course: Software Design in Modern Fortran for Scientists & Engineers.
- Led a high-performance computing facility for researchers in the School of Earth Sciences.

Technical Manager **Sandia National Laboratories** **2007-2013**

- Managed 22 staff conducting basic research at the intersection of fluid dynamics and chemistry and applied research in computer science and mathematics.
- Managed a department housing a 2,000 ft² computing lab with approximately 7500 cores.
- Architect and technical lead of the [ForTrinos](#) open-source software project.
- Researched multiphysics phenomena with an international array of collaborators.
- Previous assignments:
 - Acting Senior Manager, Combustion Research Facility, Oct.—Dec. 2011
 - Principal MTS, Scalable Computing R&D Dept., Oct. 2007-Mar. '08, Aug. '08-Mar. '09.
 - Acting Manager, Scalable Computing R&D Dept., March 2008—August 2008.

Section Head **U.S. Naval Research Laboratory** **2004-2007**

- Managed 5 staff and contract researchers in the Combustion Modeling & Scaling section
- Conceived, proposed and developed funded programs totaling approx. \$700,000 per year
- Conducted research on turbulence in classical, quantum, and magnetohydrodynamic media.

Assistant Professor **The City University of New York** **1999-2004**

- Supervised undergraduate and graduate research assistants.
- Taught undergraduate and graduate courses in fluid, thermal & computational sciences.

Engineer **Exponent Failure Analysis Associates** **1995-1999**

- Hired as the technical assistant to the Chief Executive Officer.
- Assisted in set-up of a full-scale building burn after the 2nd-worst domestic fire in U.S. history.
- Developed atmospheric dispersion models and data visualization techniques.

Visiting Positions

- Lecturer, Stanford University, Autumn 2013, '15, '16.
- Visiting Professor, University of Bergen, Norway, Summer 2012.
- Special Scientist, University of Cyprus, Fall 2006, Spring 2010, Spring 2012
- Summer Faculty Fellow, NASA Ames Research Center, Summer 2003, Summer 2004.
- Visiting Asst. Professor, University of Maryland, Summer 2000, Summer 2001.

Education

Ph.D.	Mechanical Engineering	Stanford University, 1997
M.S.	Mechanical Engineering	Stanford University, 1991
B.S. <i>cum laude</i>	Mechanical Engineering	Howard University, 1989

Professional Service, Honors & Affiliations

Advisory Board Member, Center for Research Software, University of Alabama , 2018-present.

Co-Editor, Software Engineering Track, *Computers in Science and Engineering*, 2015-present.

Editorial Board Member, *Scientific Programming*, 2014-2017.

Associate Editor, *Scientific Programming*, 2012-2104.

Alternate, J3 Fortran standards committee, 2012-present.

Technical Advisor, Numerical Algorithms Group Ltd.

Chair, Broader Engagement Workshop, Supercomputing 2013.

Member, Organizing Committee, 5th Intl. Workshop on Software Engineering for Computational Science & Engineering, 2013

Member, Scientific Committee, VECPAR 2012 (10th Intl. Mtg. on Vector & Parallel Computing).

Top 20 Most Downloaded Article, Feb.–Mar., *Physics of Fluids*, 2008.

Cover image, *Physics of Fluids*, Feb. 2008.

Alumni Volunteer Award, Howard University Alumni Association, 2004.

NASA Faculty Fellowship, 2003, 2004

NAFEO Faculty Fellowship, 2004

Alumni Board member-at-large, Howard University, 2003-'04

Alumni Excellence Award, Howard University CEACS Alumni Network, 2003

Registered Professional Engineer in the State of California, (Certificate No. M 31108), since 1999

Star Award, Exponent, Inc., 1997

National Science Foundation Minority Graduate Fellowship, 1991-'94

National Consortium for Educational Access Fellowship, 1990-'91

GEM Fellowship, 1989-'90

Tau Beta Pi Fellowship, National Engineering Honor Society, 1989-'90

U.S. Environmental Protection Agency Minority Student Fellowship, 1987-'88, 1988-'89

Best Editorial, Engineering College Magazines Associated, 1987

Best Non-Technical Article, Engineering College Magazines Associated, 1987

Member, American Physical Society, since 1990.

Member, National Fire Protection Association, since 2004.

Books

Rouson, D.W.I., S. Filippone, and S. Shende (in contract) *Modern Fortran: Software Engineering for Scientists*, CRC Press.

Rouson, D.W.I., J. Xia, J. and X. Xu (2011) *Scientific Software Design: The Object-Oriented Way*, Cambridge University Press.

Book Chapters and Edited Volumes

Evans, K. J., D. Rouson, A. Salinger, M. Taylor, W. Weijer, and J. White (2009) “A scalable and adaptable solution framework within components of the Community Climate System Model,” *Lecture Notes in Computer Science* **5545**:3323-349.

Rouson, D.W.I., guest editor, (2008) *Scientific Programming*, special issue on complexity in high-performance computing, v. 16, n. 1.

Zannetti, P. Elliot, S. and Rouson, D.W.I., eds. (2007) *Environmental Sciences and Environmental Computing Vol. III*, Envirocomp Institute, Inc.

Rouson, D.W.I. and Handler, R. (2007) “Towards a variational multiscale large-eddy simulation of the atmospheric boundary layer,” *Environmental Sciences and Environmental Computing Vol. III*, Envirocomp Institute, Inc.

Patents

Morris, K., Xia, J., and Rouson, D. W. I. System and method for reference counting with user-defined structure constructors, U.S. patent application 13/197,118, Filed 3 August 2011, Issued: 23 February 2012.

Rouson, D. W. I. Dynamic memory management system and method, U.S. Patent 8010943, Filed July 2007, Issued 30 August 2011.

Refereed Journal Articles and Conference Papers

Rasmussen, S., Gutman, E.D. , Friesen, B. , Rouson, D., Filippone, S., Moulitsas, I. (2018). Development and performance comparison of MPI and Fortran Coarrays within an atmospheric research model. In *Proceedings of PAW-ATM 18: Parallel Applications Workshop, Alternatives to MPI.* , November 16.

Rouson, D., McCreight, J.L. and Fanfarillo, A. (2017). Incremental caffeination of a terrestrial hydrological modeling framework using Fortran 2018 teams. In *Proceedings of the Second Annual PGAS Applications Workshop*, November 13.

Rouson, D., Gutmann, E.D., Fanfarillo, A. and Friesen, B. (2017) Performance portability of an intermediate-complexity atmospheric research model in coarray Fortran. In *Proceedings of the Second Annual PGAS Applications Workshop* (p. 4) Denver, Colorado, USA, November 13.

Leatongkam, A., Nanthaamornphong, A., and Rouson, D. (2017) Generating Sequence Diagrams for Modern Fortran, *2017 International Workshop on Software Engineering for Science*, Buenos Aires, Argentina, May 22.

Haveraaen, H., K. Morris, D. Rouson, H. Radhakrishnan, and C. Carson (2015) “High-Performance Design Patterns for Modern Fortran,” *Scientific Programming*, Article ID 942059, 14 pages,. doi: 10.1155/2015/942059.

Radhakrishnan, H. D. W. I. Rouson, K. Morris, S. Shende, and S. C. Kassinos (2015) “Using Coarrays to Parallelize Legacy Fortran Applications: Strategy and Case Study,” *Scientific Programming*, Article ID 904983, 12 pages, 2015. doi:10.1155/2015/904983.

Cardellini, V., Fanfarillo, A., Filippone, S., and Rouson, D. (2015) Hybrid Coarrays: a PGAS Feature for Many-Core Architectures, *International Conference on Parallel Computing (ParCo) 2015*, Edinburgh, UK, September 1-4.

Nanthaamorphong, A., J. Carver, K. Morris, H. Michelsen, and D. W. I. Rouson. (2014) “Building CLiME via Test-Driven Development: A Case Study,” *Computing in Science and Engineering*, May/June, 16:3, 36-46.

- Cardellini, V., Filippone, S. and Rouson, D. W. I. (2014) "Design patterns for sparse-matrix computations on hybrid CPU/GPU platforms," *Scientific Programming*, 22:1, 1-19.
- Fanfarillo, A., Burnus, T., Filippone, S., Cardellini, V., Nagle, D., and Rouson, D. W. I. (2014) OpenCoarrays: open-source transport layers supporting coarray Fortran compilers, *8th Intl. Conf. on Partitioned Global Address Space Programming Models*, Eugene, Oregon, USA, October 6-10.
- Clune, T., M. Rilee and D. Rouson (2014): Testing as an Essential Process for Developing and Maintaining Scientific Software, 2nd Workshop on Sustainable Software for Science: Practices and Experiences (WSSSPE2), 2014 November 16, New Orleans, Louisiana, USA. (<http://dx.doi.org/10.6084/m9.figshare.1112520>).
- Haveraaen, M., K. Morris, and D. W. I. Rouson (2013) "High-performance design patterns for modern Fortran," *First International Workshop on Software Engineering for High Performance Computing in Computational Science and Engineering*, Denver, Colorado, USA. November 22.
- Radhakrishnan, H., D. W. I. Rouson, K. Morris, S. Shende, and S. C. Kassinos (2013) "Test-driven coarray parallelization of a legacy Fortran application," *First International Workshop on Software Engineering High Performance Computing in Computational Science and Engineering*, Denver, Colorado, USA. November 22.
- Nanthaamornphong, A., K. Morris, D. W. I. Rouson, and H. A. Michelsen, (2013) "A Case Study: Agile Development in the Community Laser-Induced Incandescence Modeling Environment (CliiME)," *2013 International Workshop on Software Engineering for Computational Science and Engineering*, San Francisco, California USA. May 18.
- Davide Barbieri, Valeria Cardellini, Salvatore Filippone, and Damian Rouson (2012) "Design Patterns for Scientific Computations on Sparse Matrices," in M. Alexander et al. (Eds.): *Euro-Par 2011 Workshops, Part I*, LNCS 7155, pp. 367--376. Springer, Heidelberg.
- Morris, K., Rouson, D. W. I., Lemaster, and Filippone, S. (2012) "Exploring capabilities within Fortran by solving the 3D Burgers equation," *Scientific Programming* **20**:3, 275-292.
- Rouson, D. W. I., K. Morris. and J. Xia (2012) "Managing C++ objects with Fortran in the driver's seat: This is not your parents' Fortran," *Computing in Science and Engineering* **14**:2, 46-54.
- Xu, X., Rouson, D. W. I., Kassinos, S. C. and Radhakrishnan, H. (2012) "Dispersed-phase structure in sheared MHD turbulence," *Journal of Turbulence* **13**:2, 1-24.
- Morris, K., Handler, R. and Rouson, D. W. I. (2011) "Intermittency in the turbulent Ekman layer," *Journal of Turbulence*, **12**:12, 1-25.
- Morris, K., D. W. I. Rouson, and J. Xia (2011) "On the object-oriented design of reference-counted shadow objects in Fortran 2003," *Fourth International Workshop on Software Engineering for Computational Science and Engineering*, Honolulu, Hawaii USA. May 28.
- Rouson, D. W. I., Xia, J. and Adalsteinsson, H. (2010) "Design patterns for multiphysics modeling in Fortran 2003 and C++," *ACM Transactions on Mathematical Software* v. 37, n. 1.
- Rouson, D. W. I., J. Xia and X. Xu, (2010) "Object construction and destruction design patterns in Fortran 2003," *International Conference on Computational Science 2010*, Amsterdam, Netherlands, May 31-June 2.
- Akylas, E.E., S. C. Kassinos, D. W. I. Rouson, and X. Xu, (2009) "Accelerating stationarity in

linearly forced isotropic turbulence," *The Sixth International Symposium on Turbulence and Shear Flow Phenomena*, Seoul, Korea, June 22-24.

Rouson, D.W.I. (2008) "Towards analysis-driven scientific software architecture: The case for abstract data type calculus", *Scientific Programming*, v. 16, n. 4.

Morris, K., Koplik, J., and Rouson, D. W. I. (2008) "Vortex locking in direct numerical simulations of quantum turbulence," *Physical Review Letters* **101**, 015301.

Rouson, D.W.I., Kassinos, S. C., Moulitsas, I., Sarris, I. and Xu, X. "Dispersed-phase structural anisotropy in homogeneous magnetohydrodynamic turbulence at low magnetic Reynolds number," *Physics of Fluids* **20**, 025101 (2008).

Rouson, D.W.I., Rosenberg, R., Xu, X., Moulitsa, I. and Kassinos, S.C. (2008) "A grid-free abstraction of the Navier-Stokes equations in Fortran 95/2003," *ACM Transactions on Mathematical Software*, **34**:1.

Rouson, D.W.I., Xu, X. and Morris, K. (2006) "Formal constraints on memory management for composite overloaded operations," *Scientific Programming*, **14**:1, 27-40.

Rouson, D.W.I, Morris, K. and Xu, X. (2005) "Dynamic memory de-allocation in Fortran 95/2003 derived type calculus", *Scientific Programming* , **13**:3, 189-203.

Rouson, D.W.I and Xiong, Y. (2004). "Design metrics in quantum turbulence simulations: how physics influences software architecture", *Scientific Programming* , **12**:3, pp. 185-198.

[J1] Rouson, D. W. I. & Eaton, J. K. (2001) "On the preferential concentration of solid particles in turbulent channel flow," *Journal of Fluid Mechanics*, **428**, 149-169.

Invited Keynote & Plenary Lectures

"Design patterns for multiphysics modeling in Fortran 2003 and C++," CBC Workshop on High-Performance Computing and Biomedical Flows, Simula Research Laboratory, Oslo, Norway, May 19-21, 2008.

"Can Scalable Development Lead to Scalable Execution?" Workshop on Petascale Computing: Its Impact on Geophysical Modeling and Simulation, NCAR Mesa Laboratory, Boulder, Colorado, May 5-7, 2008.

"Forensic tools for fire investigation," Natural Gas Claims & Litigation Association Conference, San Diego, CA, April 2006.

Posters & Other Publications

Abel, D. T., Moeller, P., Nagler, R., Nash, B., Pogorelov, I.V., Méot, F., Beekman, I. B., and Rouson, D. W. I. (2019). Zgoubi Status: Improved Performance, Features, and Graphical Interface. *10th International Particle Accelerator Conference*, May.

Fanfarillo, A. and D. Rouson (2015) "Leveraging OpenCoarrays to Support Coarray Fortran on IBM Power8E." *ACM SIGPLAN Fortran Forum*. Vol. 34. No. 2. ACM, 2015.

Rouson, D. W. I., K. Morris, M. Haverlaen, S. Shende, and J. Xia (2013) "High-performance design patterns in modern Fortran," *International Conference for High Performance Computing, Networking, Storage, and Analysis*, Denver, Colorado, USA, November 14-17.

Rouson, D. W. I., H. Radhadrishnan, K. Morris, S. Shende, and S. C. Kassinos (2013) "Test-driven parallelization of a legacy Fortran program," *International Conference for High Performance Computing, Networking, Storage, and Analysis*, Denver, Colorado, USA, November 14-17.

Rouson, D. W. I. "Puppeteer," ParaPLOP 2009 Workshop on Parallel Programming Patterns, Santa Cruz, CA Jun. 4-5, 2009.

Rouson, D.W.I., Xu, X. and K. Morris, "Morfeus: A Pattern-Based Multiphysics Framework in Fortran 2003," SIAM Computational Science & Engineering Conf., Miami, FL, Mar. 1-6, 2009.

Evans, K. J., Rouson, D., Salinger, A., Taylor, M., White, J. B., and Drake, J. B., "A fully implicit solution method capability in CAM-HOMME," DOE Applied Mathematics Principal Investigators Meeting, Argonne, IL, October 15-17, 2008.

Evans, K. J., Rouson, D., Salinger, A., Taylor, M., White, J. B., and Drake, J. B., "Fully implicit solver in HOMME," Community Climate System Model Workshop, Breckenridge, Colorado, Jun. 17, 2008.

Xu, X., Rouson, D.W.I., and Knaepen, B. "A variational multiscale large-eddy simulation of isotropic turbulence at low magnetic Reynolds number," *Proc. of the 2007 MHD Summer Program*, University of Belgium, Brussels, Belgium, 2007.

Rouson, D.W.I., Kassinos, S., Sarris, I. and Toschi, F. "Particle dispersion in magnetohydrodynamic turbulence at low magnetic Reynolds number", to appear in *Proc. of the 2006 Summer Program, Center for Turbulence Research*, Stanford University, Stanford, CA 94305, 2006.

Ananth, R., Ndubizu, C.C., Rouson, D., and Williams, F.W. "Ultra fine mist suppression of a burning cylinder in cross-flow", *Advances in Fire Suppression Technologies Conference*, San Diego, CA, October 2005.

Liang, K. M., Ma, T., Quintiere, J. G., Rouson, D. "Application of CFD Modeling to Room Fire Growth on Walls." National Institute of Standards & Technology, NIST GCR 03-849, April 2003.

Rouson, D.W.I., Tieszen, S., Evans, G. "Modeling convection heat transfer and turbulence with fire applications: a high temperature vertical plate and a methane fire", in *Proc. of the Summer Program 2002, Center for Turbulence Research*, Stanford University, Stanford, CA 94305, January 2003.

Rouson, D. W. I, Baum, H. R. & Quintere, J. G. "A boundary layer combustion model for coupling with large eddy simulations", *2nd Joint Mtg. of U.S. Sections of the Combustion Institute*, Oakland, CA, March 2001.

Rouson, D. W. I. and Eaton, J. K. "Particle Interaction Models for Higher-Order Simulations of Particle-Laden Turbulence," *Third International Conference on Multiphase Flow*, Lyon, France, 1998.

Hosokawa, S., Eaton, J. K., Abrahamson, S. C., & Rouson, D. W. I. " High-order modeling of vortex decay in the presence of solid particles," *3rd Intl. Conf. on Multiphase Flow*, Lyon, France, 1998.

Rouson, D. W. I. *A Direct Numerical Simulation of a Particle-Laden Turbulent Channel Flow*, Ph.D. Dissertation, Stanford University, Stanford, CA, 1997.

Rouson, D. W. I. & Eaton, J. K. "Direct Numerical Simulation of turbulent channel flow with immersed particles," *3rd International Symposium on Numerical Methods in Multiphase Flow*, ASME FED-Vol. 185, p. 47, 1994.

Selected Presentations

Teaching (short courses on software engineering for science)

- Sourcery Institute, November 5-8, Oakland, CA, 2018.
- University of Cyprus, May 22 - June 1, Nicosia, Cyprus, 2017.
- SC16 (Int. Conf. on HPC, Networks, and Data Storage), Salt Lake City, UT, Nov. 16, 2016.
- International Conference on Supercomputing, Frankfurt, Germany, June 2016.
- National Center for Atmospheric Research, Boulder, CO, September 2016.
- Pacific Northwest National Laboratory, Richland, WA, December, 2015.
- SC15 (Int. Conf. on HPC, Networks, and Data Storage), Austin, TX, Nov. 16, 2015.
- National Center for Atmospheric Research S, Boulder, CO, August, 2015.
- Oak Ridge National Laboratory, Oak Ridge, TN, September 9-11, 2015.
- Wright Patterson Air Force Base, Ohio, January, 2015.
- SC14 (Int. Conf. on HPC, Networks, and Data Storage), New Orleans, LA, Nov. 16, 2014.
- Bettis Atomic Power Laboratory, West Mifflin, PA, September 9-11, 2014
- BP (formerly British Petroleum), Houston, TX, July 18, 2014.
- NASA Langley Research Center, Hampton, VA, April 28 – 30, 2014
- Army Research Laboratory, Aberdeen, MD, February 18-20, 2014.
- U.S. Naval Research Laboratory, Monterey, CA, January 14-16, 2014.
- NASA Langley Research Center, October 23-25, 2013.
- Knolls Atomic Power Laboratory, September 9-11, 2013.
- U.S. Naval Research Laboratory, Washington, DC, June 11-13, 2013.
- NASA Goddard Space Flight Center, March 19-21, 2013.
- Oak Ridge National Laboratory, Oak Ridge, TN, February 5-7, 2013.
- BP (formerly British Petroleum), Houston, TX, January 14-16, 2013.
- Supercomputing 2012 Conference, Salt Lake City, UT, November 11, 2012.
- National Center for Atmospheric Research S, Boulder, CO, August 7-9, 2012.
- National Energy Research Supercomputing Center, Oakland, CA, April 10-12, 2012.
- University of California, Berkeley, March 26-28, 2012.
- HECToR academic supercomputing service, Manchester, UK, October 11-13, 2011.

Teaching (graduate)

- Software Design in Modern Fortran for Scientists and Engineers, Fall 2013, '14, '16.
- Scientific Software Design, University of Cyprus, Fall 2006, Spring 2017.
- Introduction to Numerical Methods, CUNY, Fall, 2000, '01, '02, '03, '04
- Turbulent Flow, CUNY, Spring 2003, '04, '05

Teaching (undergraduate)

- Aircraft & Rocket Propulsion, CUNY, Spring 2004
- Thermodynamics, CUNY, Spring 2000, '02, Fall '03
- Turbomachinery Design, CUNY, Spring 2001
- Aero-thermo-fluids Laboratory, CUNY, Fall 1999

Teaching (other)

- “Forensic software for fire investigation” (1-hr, accredited by N.Y. State Bar), Wilson Elser Moskowitz Edelman & Dicker LLP, New York, New York, Jun. 2002.

Expert testimony

- *Coach v. Sealy, Inc.*, New York, NY (deposition testimony on fire cause and origin), December 2006.

- *Clifford v. Air Tractor*, Greenville, MS (trial testimony on aircraft fuel system design and flight dynamics), August 2004.
- *Rancifer v. McGarrh*, Stanford, CA (deposition testimony on fire safety practices and equipment), July 2004.
- *Turner v. Fulton*, New York, NY (deposition testimony on automobile towing coupler design), June 2001.