The Pipeline Workshop: Diversifying the HPC Workforce
at the University of New Mexico, Albuquerque, New Mexico
January 26-27, 2017
Sponsored by:
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Acknowledgments

The Pipeline Workshop is generously supported by the Computing Research Association -- Women (CRA-W) and the Coalition to Diversify Computing (CDC). The workshop is hosted by the University of New Mexico.

We thank our committees for their time and dedication to all aspects of this workshop including planning, participant review and selection, scheduling and implementation. We also thank the wonderful array of speakers who form the center of this valuable experience.

Workshop Chairs

Dorian Arnold - University of New Mexico  (darnold@cs.unm.edu)
Damian Rouson - Sourcery Institute (damian@rouson.net)

Organizing Committee

Kurt Ferreira - Sandia National Labs (kbferre@sandia.gov)
Christian Grant - Oklahoma University (cgrant@ou.edu)
Patty Lopez -- Intel Corp (patty.lopez@intel.com)
Lois Curfman McInnes - Argonne National Lab (curfman@mcs.anl.gov)
Raul Viera Mercado - Lawrence Livermore National Lab (vieramercado1@llnl.gov)
Karla Morris - Sandia National Labs (knmorri@sandia.gov)
Hai Ah Nam - Los Alamos National Lab (hnam@lanl.gov)
Erika Parsons - University of Washington-Bothel (efuente@uw.edu)
Rolf Riesen - Intel Corp. (rolf.riesen@intel.gov)
Philip Roth - Oak Ridge National Lab (rothpc@ornl.gov)

Advisory Committee

Tony Baylis - Lawrence Livermore National Lab (baylis3@llnl.gov)
Luiz DeRose - Cray Inc. (ldr@cray.com)
Gary Grider - Los Alamos National Lab (ggrider@lanl.gov)
Bruce Hendrickson - Sandia National Labs (bahendr@snl.gov)
Glenn Kubiak - Lawrence Berkeley National Lab (gdkubiak@lbl.gov)
Barney Maccabe - Oak Ridge National Lab (maccabeab@ornl.gov)
Bob Robey - Los Alamos National Lab (brobey@lanl.gov)
Valentina Salapura - IBM (salapura@us.ibm.com)
Foreword

Welcome to the Pipeline Workshop: Diversifying the HPC Workforce. High-performance computing (HPC aka scientific computing or computational sciences) is a multidisciplinary field that includes areas like Applications & Algorithms; Computer Hardware and Software Technologies; Data Analytics; and Program Analysis & Tools. In HPC, engineers also tackle some of the most challenging problems in hardware and software system development and system management and administrations. The Pipeline Workshop aims to expand the HPC workforce with researchers and engineers from traditionally underrepresented groups (women, racial minorities and persons with disabilities). The workshop targets senior undergraduate and junior graduate students with three primary elements:

1. Research Explorations: Sessions by leading experts to expose participants to current and emerging research challenges in computational science and engineering domains.

2. Curriculum Advisement: Sessions to help participants tailor their educational curriculum for careers in computational science and engineering fields.

3. Real Opportunities: Pre- and peri-workshop activities to match participants with lab and university mentors and specific internship and educational opportunities.

We hope you all have a wonderful experience and we look forward to having each and everyone of you in the HPC workforce in the near future.

Sincerely,

Dorian Arnold and Damian Rouson

Pipeline Workshop (co-chairs)
Workshop Program

Wednesday, January 25, 2017
Arrival Day
Hyatt Regency Albuquerque
330 Tijeras NW, Albuquerque, NM 87102

5:30pm -- Networking and Light Dinner Reception
7:30pm  Hyatt Regency, Sierra Vista (19th floor)

Thursday, January 26

6:00am -- Breakfast Buffet
7:45am  Hyatt Regency, Forque Kitchen & Bar

8:00am -- Transportation to UNM Centennial Engineering Center (CENT)
8:15am  Meet at Hyatt Regency Main Entrance

Bus departs at 8am sharp. Please be punctual!

8:15am -- Arrival and Sign-in
8:30am  CENT, Robert Stamm Commons (Room 1044)

8:30am -- Welcome and Program Overview
8:45am  Christos Christodoulou, University of New Mexico
         Dorian Arnold, University of New Mexico
         Damian Rouson, Sourcery Institute

8:45am -- Session I: Short Presentations
1. Finding Your Way: The possibilities, pitfalls and practice of HPC Research, Hai Ah Nam, Los Alamos National Lab
2. Needles in the Haystack: Finding Problems at Extreme Scales,
Dorian Arnold, University of New Mexico
3. Designing and Building Microbial Engineers: Computation for Synthetic Biology, Sarah Richardson, Ignition Genomics
4. Don’t be Pipelined, Lissa Baseman, Los Alamos National Lab
5. HPC-Accelerated Development to Deployment of Carbon Capture Technologies, Xin Sun, Pacific Northwest National Lab

10:45am -- Morning Break
11:00am

11:00am -- Session II: Panel: Why not Me? How Budding Computationalists Can Engage in Research and Engineering Activities
Trilce Estrada, University of New Mexico,
Dominic Manno, Los Alamos National Laboratory
Sarah Richardson, Ignition Genomics
Yuliana Zamora, Los Alamos National Laboratory

Noon -- Lunch: Video Vignettes
1:30pm

1:45pm -- Session III: Short Presentations
3:15pm
1. How Modern Fortran Helped You Pack for this Trip, Damian Rouson, Sourcery Institute
2. Supporting Science at LANL with HPC Systems and Infrastructure, Dominic Manno, Los Alamos National Lab
3. Load Balancing throughout My Career, Karen Devine, Sandia National Labs

3:15pm -- Afternoon Break
3:30pm

3:30pm -- Session IV: Tutorial: The World of High-Performance Computing
5:00pm
Andree Jacobson, New Mexico Consortium
Bob Robey, Los Alamos National Lab

5:00pm Transportation to Hotel
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<tr>
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<tr>
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<td>Hyatt Regency, Infinity Room</td>
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<td><strong>Keynote: No More Hidden Figures: Representing and Keeping up in STEM</strong></td>
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<td>Stephanie McIver, University of New Mexico</td>
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<td>Hyatt Regency</td>
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<td>Session V: Presentations &amp; Panel: Education, Internship, Career and Other Opportunities</td>
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<td>Tony Baylis, Lawrence Livermore National Lab</td>
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<td>Emily Robinson, Los Alamos National Lab</td>
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<td>10:15am</td>
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<td>Session VI: Applying for Education, Internship and Career Opportunities</td>
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<td>12:30pm</td>
<td>Box Lunch</td>
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Speaker Biographies

**Dorian Arnold**  
*Associate Professor, Computer Science Department*  
University of New Mexico  
darnold@cs.unm.edu  
http://www.cs.unm.edu/~darnold

Dorian Arnold is an associate professor in the Department of Computer Science at the University of New Mexico. He is co-director of the Scalable Systems Laboratory at UNM where he directs research in the broad areas of high-performance computing and large scale distributed systems, with focuses on scalable middleware, run-time data analysis, fault-tolerance and HPC tools. Arnold collaborates with researchers from several national laboratories and universities, and his research projects twice have been selected as Top 100 R&D technologies, in 1999 and 2011. He holds a Ph.D. in Computer Science from the University of Wisconsin, an M.S. degree in Computer Science from the University of Tennessee and a B.S. degree in Mathematics and Computer Science from Regis University (Denver, CO).

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**Lissa Baseman**  
*Research Data Scientist, HPC Design Group*  
Los Alamos National Laboratory  
lissa@lissalytics.com  
http://www.lissalytics.com

Elisabeth (Lissa) Baseman is an applied machine learning researcher and data scientist at Los Alamos National Laboratory in the High Performance Computing Design group. She leads current efforts in machine learning for high performance computing problems, including memory fault characterization, SSD modeling, environmental sensor monitoring, and anomaly detection in system logs. Lissa’s work prior to joining the HPC Design group at LANL included time at MIT Lincoln Laboratory doing relational learning and social network analysis in the Human Language Technology group. Her work in graduate school focused on statistical relational learning for computational social science. Lissa completed her graduate work in computer science at the University of Massachusetts Amherst and her undergraduate studies in computer science at Amherst College.
Tony Baylis
Direcor, Office of Strategic Diversity and Inclusion Programs
Lawrence Livermore National Laboratory
baylis3@llnl.gov

Tony Baylis is the senior management advocate for diversity and inclusion for the Laboratory. Tony is responsible for overseeing the laboratory's interactions and successful execution in building, partnering and collaborating with governmental, educational, industrial, community interests and other stakeholders. LLNL has had a long history in working with Minority Serving Institutions, specifically relationships with American Indian Institutions, Hispanic Institutions and Historically Black College and Universities. He represents the Laboratory on the subjects of Diversity and Inclusion, STEM, Outreach Efforts, and Student Programs. Tony's career represents 29 years of administrative, project, program, technical, and organizational management. He has worked in a scientific and technical environment for over 20 years and has worked as a consultant in industry as well. Tony has extensive experience networking with a broad range of academic, industry, government and non-profit organizations that has educated him and helped him in his career. He is a DOE Minorities in Energy Champion for the department and also serves on a number of conference program committees and advisory boards that promote STEM and diversity in science and technical careers.

Karen Devine
Principal Member Technical Staff
Center for Computing Research
Sandia National Laboratories
kddevin@sandia.gov
http://www.sandia.gov/~kddevin/

Karen Devine is a Principal Member of the Technical Staff in the Center for Computing Research at Sandia National Laboratories. She earned her Ph.D. in Computer Science from Rensselaer Polytechnic Institute, studying load balancing and adaptive finite element methods with Dr. Joseph Flaherty. At Sandia, she is principal investigator for the Zoltan toolkit for combinatorial scientific computing, and is an active developer and leader in the Trilinos solver framework project.
Trilce Estrada
Assistant Professor
Computer Science Department
University of New Mexico
estrada@cs.unm.edu
http://www.cs.unm.edu/~estrada

Trilce Estrada is an assistant professor in the department of Computer Science at the University of New Mexico. She earned her PhD in 2012 from University of Delaware. Her research interests include self-managed distributed systems, Big Data analysis, crowd sourcing, and machine learning. Her overarching research goal is to solve computationally intensive and data intensive problems in science, health, and education, especially in scenarios where resources and trained professionals are scarce. She is also actively involved in improving participation of women in computing-related fields.

Andree Jacobson
Chief Information Officer
New Mexico Consortium
andree@newmexicoconsortium.org

Andree joined the New Mexico Consortium (NMC) in August 2010 as the Computer and Information Systems Manager and the project manager for the Parallel Reconfigurable Observational Environment (PRObE) project.

Andree holds a Master’s Degree in Computer Science and Electrical Engineering from Luleå University of Technology in Sweden and a Master’s Degree in Computer Science from the University of Arizona. He worked as a software developer for an environmental research laboratory at the University of Arizona, then taught undergraduate computer science at the University of New Mexico (UNM) for 5 years. During his time at UNM he also spent his summers teaching the highly successful Computer Systems, Clusters, and Networking Summer Institute for the Los Alamos National Laboratory.
Dominic Manno
File Systems Technical Lead
Los Alamos National Laboratory
dmanno@lanl.gov

Dominic is a Scientist with background in storage systems and software development. He is currently the file system technical lead for the HPC division at Los Alamos National Laboratory, which includes leading integration for LANL’s HPC file systems. Dominic contributes to HXHIM, a new storage system expected to support the next generation of super computers. He also serves as file system architect for LANL’s near-term storage systems. Dominic contributes as a mentor to students at LANL and is involved in giving technical talks to students during the Computer Systems, Clusters, and Networking Summer Institute – a program designed to introduce students to HPC.

Stephanie D. McIver
Director, Counseling Services,
Student Health and Counseling
University of New Mexico
smciver@unm.edu

Stephanie D. McIver, Ph.D., a clinical psychologist licensed in New Mexico and California, has practiced psychology for 25 years and is now the Director of Counseling Services at UNM’s Student Health and Counseling Center. She received her Master’s degree and Doctorate in Clinical Psychology at The Ohio State University, and her Bachelor’s degree in Psychology and Natural Science from Spelman College in Atlanta, Georgia. Before that she spent her childhood in Albuquerque attending Bandelier, Wilson and Highland High School. Prior to her return to NM she was the staff psychologist for Acute Psychiatry at Stanford University Medical Center and at the University of California- Santa Cruz, and a staff psychologist and adjunct faculty member at Santa Clara University in Santa Clara, California all while maintaining a private practice. Since returning to Albuquerque in 2007, she has worked in private practice and as a Military Family Life Consultant providing psychological services to military service members and their families. She also taught psychology at National American University in Rio Rancho. She is a co-founder and board member of the New Mexico Black Wellness Coalition and supports the Office of African American Affairs in their Health Outreach initiatives. Her clinical practice interests have been in Mood and Anxiety disorders, especially Post-Traumatic Stress Disorder (PTSD), Women’s issues, and multi-cultural/identity issues. Her areas of research have been in marriage and family issues, severe mental illness, and college student distress. In her free time (!) she raises two teenagers and sings and performs in local musical productions.
Hai Ah Nam  
Scientist 
Computational Physics & Methods Group (CCS-2) 
Los Alamos National Laboratory  
hnam@lanl.gov

Hai Ah is a computational physicist with a background in low-energy nuclear physics and high-performance computing. She is a co-PI of the Nuclear Structure and Nuclear Reactions DOE INCITE (Innovative and Novel Computational Impact on Theory and Experiment) project, the NUCLEI DOE SciDAC project, and worked for over six years at the Oak Ridge Leadership Computing Facility at ORNL prior to joining LANL. Hai Ah is team lead for the Trinity Center of Excellence, helping to prepare critical tri-lab ASC codes for Trinity and future architectures. She enjoys working with students and was chair of the SC Student Cluster Competition (2010, 2015), an intense undergraduate competition to prepare the next generation of HPC scientists.

Sarah Richardson  
Founder, Chief Scientific Officer,  
Ignition Genomics  
sarah@ignitiongenomics.com

A specialist in the design of genomes, Dr. Richardson leads Ignition’s construction of genetic toolkits for non-model organisms and the reconciliation of computational genomics with experimental genomics. An award-winning scientist with cross-functional expertise in the manipulation and domestication of non-model organisms for synthetic biology, Dr. Richardson previously worked on massive scale synthetic biology projects and the integration of computational genomics with experimental genomics as a Distinguished Postdoctoral Fellow of Genomics at the Lawrence Berkeley National Laboratory. Dr. Richardson earned her B.S. in Biology at the University of Maryland College Park in 2004 and her Ph.D. in Human Genetics and Molecular Biology from the Johns Hopkins University School of Medicine in 2011.

Dr. Richardson was awarded a prestigious Department of Energy Computational Science Graduate Fellowship from Johns Hopkins in 2007. Additional honors include the Turock Award for Promising Young Scientists in 2006 from Johns Hopkins, her selection as a Graduate Research Fellowship Finalist in 2007 from the National Science Foundation, and the Nupur Dinesh Thekdi Award in 2012. In 2015, Dr. Richardson was named a SynBio LEAP Fellow, based on her “leadership potential and vision for shaping a future in biotechnology.” In 2015 she was also one of five promising young female scientists to receive a $60,000 postdoctoral fellowship award from L’Oréal USA; she proposed to study CRISPR systems and the domestication of non-model bacteria.
Bob Robey
*Staff Scientist*,
Los Alamos National Laboratory
brobey@lanl.gov

Bob Robey is a Research Scientist in the Eulerian Applications group at Los Alamos National Laboratory. He is the lead author of CLAMR mini-app, an open source adaptive mesh refinement shallow water hydrocode and a half-dozen other open source codes. Some of his interests include parallel algorithm research and computational physics methods research. He has over 20 years of experience in shock wave research including the operation of large explosively driven shock tubes and writing compressible fluid dynamics codes. He helped establish the High Performance Computing Center at the University of New Mexico and the Maui High Performance Computing Center. He is a co-lead of the Parallel Computing Summer Research Internships program and prior to that was one of the key contributors to the Computational Physics summer workshop program. He is currently President of the Board of the New Mexico Supercomputing Challenge, a high school and middle school computational modeling program that has been going for 27 years.

Emily Robinson
*Undergraduate and Graduate Internship Coordinator*
Los Alamos National Laboratory
errobinson@lanl.gov

A native Californian, Emily Robinson moved to New Mexico in January of 2012 after completing her Master’s Degree in High Education and Russian History from the University of San Diego. Previous to her position as the Undergraduate and Graduate Internship Coordinator at the Los Alamos National Laboratory, she served as the STEM academic advisor at the University of New Mexico-Los Alamos for three years. She joined the LANL student programs team in February 2015. She enjoys reading, painting and photography in her spare time.
**Damian Rouson**  
*Founder & President*  
Sourcery Institute  
damian@sourceryinstitute.org  
www.sourceryinstitute.org/damian-rouson.html

Damian Rouson is a mechanical engineer with extensive experience in software design and development for multi-physics modeling, including classical, quantum, and magnetohydrodynamic turbulence and multiphase flow. He co-authored the textbook *Scientific Software Design: The Object-Oriented Way* (Cambridge University Press, 2011) and has been contracted to teach related courses at supercomputer centers and universities in the U.S. and Europe. He has been a PI or Co-I on research funded by the National Science Foundation, the Office of Naval Research, and the National Institute of Standards and Technology and has held visiting and tenure-track appointments at universities in the U.S. and in Europe. He holds a B.S. from Howard University and an M.S. and Ph.D. from Stanford University, all in Mechanical Engineering. He is also a licensed Professional Engineer (P.E.) in the State of California.

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**Xin Sun**  
*Laboratory Fellow, Team Lead*  
Pacific Northwest National Laboratory  
xin.sun@pnnl.gov  
pnnl.gov/science/staff/staff_info.asp?staff_num=7106

Creativity, insight, and application are the hallmarks of Dr. Xin Sun’s applied mechanics and computational materials research at Pacific Northwest National Laboratory. Her advances in lightweight and high-strength materials (including steels) and modeling are vital to energy efficiency and renewable energy and have led to notable weight savings in the U.S. automotive industry. Xin is developing simulation and modeling capabilities for solid oxide fuel cells. Her modeling of physics properties are included as part of the solid oxide fuel cell multiphysics modeling code, or SOFC-MP, a commercial software tool, developed at PNNL, used by fuel cell developers. She also uses the continuum damage mechanics model, developed under DOE-funded programs, to understand fracture mechanisms behind transparent armor for the U.S. Army—work that may enable more resilient battlefield vehicles. A prolific contributor to the scientific community, Xin is on the *ISRN Mechanical Engineering* editorial board and serves as an associate editor on the *ASME Journal of Offshore Mechanics and Arctic Engineering* and *American Welding Society Welding Journal*. She also mentors staff and interns at PNNL and Washington State University, where she is a mechanical and materials engineering professor. Xin earned a naval architecture and ocean engineering undergraduate degree from China’s Shanghai Jiao Tong University. She earned a master’s degree in mechanical engineering and a master’s and doctorate in naval architecture and marine engineering, all from the University of Michigan, Ann Arbor.
Yuliana Zamora
Parallel Computing Research Student
Los Alamos National Laboratory
yzamora@lanl.gov

Yuliana Zamora is becoming a leading expert on the new Intel KNL architecture soon to be in production at LANL. She has given presentations at the Intel Xeon Phi User Group (IXPUG) and the 2016 Supercomputing Conference on the use of high-level OpenMP to get the most efficiency out of the KNL architecture. She has also worked on porting the SELF code to the Titan GPUs at a recent GPU hackathon in Knoxville with remarkable speedup in just a week.
List of Participants

1. Bandita Adhikari, University of Connecticut-Health Center (badhikari@uchc.edu)
2. Elizabeth Armstrong, University of Utah (elizabeth.armstrong@chemeng.utah.edu)
3. James Gadson, Allen University (Jamesgad@gmail.com)
4. Svetlana Gelpi-Dominguez, University of Connecticut (svetlana.gelpi@uconn.edu)
5. Henok Ghebrechristos, University of Colorado Denver (henok.ghebrechristos@ucdenver.edu)
6. Zeinab Golabkesh, The George Washington University (zeinab.golabkesh@gmail.com)
7. Hayley Goldblatt, Eastern New Mexico University (hayley.goldblatt@enmu.edu)
8. Juan Gonzalez, The University of Texas at El Paso (jfgonzalez3@miners.utep.edu)
9. Shashank Jaiswal, Purdue University (jaiswal0@purdue.edu)
10. Lauren Kett, University of Miami (l.kett@miami.edu)
11. Bobae Kim, Texas A&M University--College Station (bzk0029@tamu.edu)
12. Mamta Kumari, Norfolk State University (m.kumari@spartans.nsu.edu)
13. Iris Linck, University of Colorado Denver (iris.linck@ucdenver.edu)
14. Ivana Marincic, University of Chicago (imarincic@uchicago.edu)
15. Megan Morrison, University of Washington (mmtree@uw.edu)
16. Truong Nguyen, Wright State University (nguyen.142@wright.edu)
17. Chukwuemelie Onwubuya, Allen University (emelieonw@gmail.com)
18. Bernadette Randles, UCLA (randles@ucla.edu)
19. Jefferson Ridgeway, Elizabeth City State University (jdridgeway4@gmail.com)
20. Amal Rizvi, Illinois Institute of Technology (arizvi1@hawk.iit.edu)
21. Xochitl Sosa Vazquez, UC Merced (xsosavazquez@ucmerced.edu)
22. Catherine Spooner, Fayetteville State University (cspooner@broncos.uncfsu.edu)
23. Chris Stroemel, Washington State University (christian.stroemel@wsu.edu)
24. Katarzyna (Kasia) Swirydowicz, Virginia Tech (kswirydo@vt.edu)
25. Kaila Trawitzki, New Jersey Institute of Technology (kbt4@njit.edu)
26. Jessica Vázquez, Inter-American University of Puerto Rico (contact@jmvazquez.com)
27. Chrys Watson Ross, University of New Mexico (chrysm@cs.unm.edu)
28. Yiyue Zou, the Pennsylvania State University, University Park (yxz5480@psu.edu)
Thank you for your participation in the 2017 Pipeline Workshop!