

Future Directions for NSF Advanced Computing Infrastructure to Support US Science in 2017-2020

Committee

William D. Gropp

Co-Chair

William Gropp is the Thomas M. Siebel Chair in Computer Science at the University of Illinois at Urbana-Champaign where he is also founding Director of the Parallel Computing Institute. He held the positions of assistant (1982-1988) and associate (1988-1990) professor in the Computer Science Department at Yale University. In 1990, he joined the Numerical Analysis group at Argonne, where he was a Senior Computer Scientist in the Mathematics and Computer Science Division, a Senior Scientist in the Department of Computer Science at the University of Chicago, and a Senior Fellow in the Argonne-Chicago Computation Institute. From 2000 through 2006, he was also Deputy Director of the Mathematics and Computer Science Division at Argonne. In 2007, he joined the University of Illinois at Urbana-Champaign as the Paul and Cynthia Saylor Professor in the Department of Computer Science. In 2008, he was appointed Deputy Director for Research for the Institute of Advanced Computing Applications and Technologies at the University of Illinois. His research interests are in parallel computing, software for scientific computing, and numerical methods for partial differential equations. He has played a major role in the development of the MPI message-passing standard, is one of the designers of the PETSc parallel numerical library, and has developed efficient and scalable parallel algorithms for the solution of linear and non-linear equations. Gropp is a Fellow of ACM, IEEE, and SIAM, and a member of the National Academy of Engineering. He received the Sidney Fernbach Award from the IEEE Computer Society in 2008 and the TCSC Award for Excellence in Scalable Computing in 2010. William Gropp received his B.S. in Mathematics from Case Western Reserve University in 1977, a MS in Physics from the University of Washington in 1978, and a Ph.D. in Computer Science from Stanford in 1982.

Robert Harrison

Co-Chair

Robert Harrison is the director, Institute of Advanced Scientific Computing, at Stony Brook University and director, Computational Science Center, Brookhaven National Laboratory. The core mission of the new Stony Brook institute is to advance the science of computing and its applications to solving complex problems in the physical sciences, the life sciences, medicine, sociology, industry and finance. It works closely with the Brookhaven center, which specializes in data-intensive computing. Harrison's research interests are focused on scientific computing and the development of computational chemistry methods for the world's most technologically advanced supercomputers. From 2002 to 2012 he was Director of the Joint Institute of Computational Science, Professor of Chemistry and Corporate Fellow at the University of Tennessee and Oak Ridge National Laboratory. Prior appointments positions at the Environmental Molecular Sciences Laboratory, Pacific Northwest Laboratory and Argonne National Laboratory. He has a prolific career in high-performance computing with over one hundred publications on the subject, as well as extensive service on national advisory committees. He received his B.A. from Churchill College, University of Cambridge and Ph.D. in Organic and Theoretical Chemistry from the University of Cambridge in 1984.

Mark R. Abbott

Member

MARK R. ABBOTT is dean of the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University (OSU). Dr. Abbott has been at OSU since 1988 and has been dean of the college since 2001. Prior to his appointments at OSU, he served as a member of the technical staff at the Jet Propulsion Laboratory (JPL) and as a research oceanographer at Scripps Institution of Oceanography. Dr. Abbott's research focuses on the interaction of biological and physical processes in the upper ocean and relies on both remote sensing and field observations. He is a pioneer in the use of satellite ocean color data to study coupled physical/biological processes. As part of a NASA Earth Observing System interdisciplinary science team, Dr. Abbott led an effort to link remotely sensed data of the Southern Ocean with coupled ocean circulation/ecosystem models. His field research included the first deployment of an array of bio-optical moorings in the Southern Ocean as part of the U.S. Joint Global Ocean Flux Study (JGOFS). Dr. Abbott was a member of the National Science Board from 2006 to 2012 and served as a consultant to the Board until 2013. He is the vice chair of the Oregon Global Warming Commission. He is currently a member of the board of trustees for the Consortium for Ocean Leadership and the board of trustees of NEON, Inc.. His past advisory posts include chairing the Coastal Ocean Applications and Science Team for NOAA and chairing the U.S. Joint Global Flux Study Science Steering Committee. He has also been a member of the Director's Advisory Council for the JPL and NASA's MODIS and SeaWiFS science teams and the Earth Observing System Investigators Working Group. He was recently named the 2011 recipient of the Jim Gray eScience Award, presented by Microsoft Research. He received his B.S. in conservation of natural resources from the University of California, Berkeley and his Ph.D. in ecology from the University of California, Davis. Dr. Abbott is a national associate member of the National Academies and is currently a member of the NRC's Space Studies Board, chair of the Committee on Earth Science and Applications from Space, a member of the Committee to Advise the US Global Change Research Program, and a member of the Panel on the Review of the Draft 2013 National Climate Assessment (NCA) Report. Amongst his prolific NRC service, Dr. Abbott served on the NRC's Committee on Evaluating NASA's Strategic Direction, the Committee on the Assessment of NASA's Earth Science Programs, the Committee on the Role and Scope of Mission-Enabling Activities in NASA's Space and Earth Science Missions, and the Panel on Land-Use Change, Ecosystem Dynamics and Biodiversity for the 2007 Earth science and applications from space decadal survey.

Robert L. Grossman

Member

Robert Grossman is a faculty member at the University of Chicago. He is the Director of the Center for Data Intensive Science (CDIS), a Senior Fellow and Core Faculty in the Computation Institute and the Institute for Genomics and Systems Biology, and a Professor of Medicine in the Section of Genetic Medicine. He also serves as the Chief Research Informatics Officer for the Biological Sciences Division. His research group focuses on data intensive computing, data science, and bioinformatics. He is the founder and a partner of Open Data Group, which provides analytic services to help companies build predictive models over big data, and is the Director of the not-for-profit Open Cloud Consortium, which provides cloud computing infrastructure to support the research community. He was elected a fellow of the AAAS in 2013. Dr. Grossman earned his PhD in applied mathematics at Princeton University in 1985 and an AB in mathematics from Harvard University in 1980.

Peter M. Kogge

Member

Peter Kogge is a Professor of Computer Science and Engineering and Concurrent Professor of Electrical Engineering at the University of Notre Dame. Kogge was with IBM, Federal Systems Division, from 1968 until 1994, and was appointed an IEEE Fellow in 1990, and an IBM Fellow in 1993. In 1977 he was a Visiting Professor in the ECE Dept. at the University of Massachusetts, Amherst. From 1977 through 1994, he was also an Adjunct Professor in the Computer Science Dept. of the State University of New York at Binghamton. In August, 1994 he joined the University of Notre Dame as first holder of the endowed McCourtney Chair in Computer Science and Engineering (CSE). Starting in the summer of 1997, he has been a Distinguished Visiting Scientist at the Center for Integrated Space Microsystems at JPL. He is also the Research Thrust Leader for Architecture in Notre Dame's Center for Nano Science and Technology. For the 2000-2001 academic year he was the Interim Schubmehl-Prein Chairman of the CSE Dept. at Notre Dame. From August, 2001 until December 2008 he was the Associate Dean for Research, College of Engineering. Starting in the fall of 2003, he also has been a Concurrent Professor of Electrical Engineering. His current research areas include massively parallel processing architectures, advanced VLSI and nano technologies and their relationship to computing systems architectures, non von Neumann models of programming and execution, parallel algorithms and applications, and their impact on computer architecture. While at IBM one of his groups designed the first multi-processor PIM device with significant DRAM memory that may also arguably be the world's first multi-core chip. This EXECUBE chip integrated 4 Mbits of DRAM with over 100K gates of logic to support on a single chip a complete 8-core binary hypercube parallel processor which could run in both SIMD and MIMD modes, and a paper on its architecture received the Daniel Slotnick Award at the 1994 International Conference on Parallel Processing. He also designed and built the RTAIS parallel processor which demonstrated a pure SIMD PIM-like architecture optimized for supporting a LINDA-like parallel processing model, with real time scheduling included. Prior parallel machines included the IBM 3838 Array Processor which for a time was the fastest single precision floating point processor marketed by IBM, and the Space Shuttle Input/Output Processor which has flown on every Shuttle mission, and probably represents the first true parallel processor to fly in space. The IOP also represents one of the earliest examples of multi-threaded architectures. Dr. Kogge, received his B.S. in electrical engineering from the University of Notre Dame, his M.S. in Systems & Engineering from Syracuse University, and his Ph.D. in Electrical Engineering from Stanford University in 1973.

Padma Raghavan

Member

Padma Raghavan is the Associate Vice President for Research and Director of Strategic Initiatives at the Pennsylvania State University, where she is also Distinguished Professor of Computer Science and Engineering. Raghavan is the founding Director of the Penn State Institute for CyberScience, the coordinating unit on campus for developing interdisciplinary computation and data-enabled science and engineering. Prior to joining Penn State in August 2000, she served as an associate professor in the Department of Computer Science at the University of Tennessee. Raghavan's research is in the area of high-performance computing and computational science and engineering. She has over ninety five peer-reviewed publications in three major areas including: scalable parallel computing; energy-aware supercomputing, i.e., performance and power scalability of advanced computer systems; and computational modeling, simulation and knowledge extraction. Raghavan currently serves on the editorial boards of the SIAM series on Computational Science and Engineering, the SIAM Series on Software, Environments and Tools, the Journal of Parallel and Distributed Computing, the Journal of Computational Science and the IEEE Transactions on Parallel and Distributed Systems. She serves on the program committees of major conferences sponsored by ACM, IEEE and SIAM, and she co-chaired Technical Papers for Supercomputing 2012 and the 2011 SIAM Conference on Computational Science and Engineering. Raghavan also serves on various advisory and review boards including the National Academies Panel on Digitization and Communication Science, the Network for Earthquake Engineering Simulation, and the Computer Research Association's Committee on the Status of Women in Computing Research. Raghavan is a Fellow of the IEEE and she received an NSF CAREER Award and the Maria Goeppert-Mayer Distinguished Scholar Award from the University of Chicago and the Argonne National Laboratory for her research on parallel sparse matrix computations. Raghavan received her Ph.D. in computer science from Penn State.

Daniel A. Reed

Member

Daniel A. Reed is currently the Vice President for Research and Economic Development, as well as Professor of Computer Science, Electrical and Computer Engineering, and Medicine at the University of Iowa. He also holds the University Computational Science and Bioinformatics Chair at Iowa. Dr. Reed was Corporate Vice President at Microsoft from 2009 - 2012, responsible for global technology policy and extreme computing, and Director of Scalable and Multicore Computing at Microsoft from 2007 until 2009. Prior to joining Microsoft, he was the founding director of the Renaissance Computing Institute at the University of North Carolina at Chapel Hill, where he also served as Chancellor's Eminent Professor and Vice Chancellor for Information Technology. Before joining the University of North Carolina at Chapel Hill in 2003, Dr. Reed was Director of the National Center for Supercomputing Applications (NCSA), Gutgsell Professor and Head of the Department of Computer Science at the University of Illinois at Urbana-Champaign.

Dr. Reed was appointed to the President's Council of Advisors on Science and Technology (PCAST), by President Bush, in 2006 and served on the President's Information Technology Advisory Committee (PITAC) from 2003-2005. As chair of PITAC's computational science subcommittee, he was lead author of the report "Computational Science: Ensuring America's Competitiveness." On PCAST, he co-chaired the Networking and Information Technology subcommittee [with George Scalise of the Semiconductor Industry Association] and co-authored a report on the Networking and Information Technology Research and Development (NITRD) program called "Leadership Under Challenge: Information Technology R&D in Competitive World."

Dr. Reed is the past chair of the Board of Directors of the Computing Research Association (CRA) and currently serves on its Government Affairs Committee. CRA represents the research interests of the university, national laboratory and industrial research laboratory communities in computing across North America. Dr. Reed received his B.S. from the University of Missouri-Rolla and his M.S. and Ph.D. from Purdue University, all in Computer Science.

Valerie Taylor

Member

Dr. Valerie Taylor is the Senior Associate Dean of Academic Affairs in the Dwight Look College of Engineering and the Regents Professor and Royce E. Wisenbaker Professor in the Department of Computer Science and Engineering at Texas A&M University. In 2003, she joined Texas A&M as the Department Head of Computer Science and Engineering, where she remained in that position until 2011. Prior to joining Texas A&M, Dr. Taylor was a member of the faculty in the Electrical Engineering and Computer Sciences Department at Northwestern University for 11 years. She has authored or coauthored more than 100 papers in the area of high performance computing. She is also the Executive Director of the Center for Minorities and People with Disabilities in IT (CMD-IT). Dr. Taylor is an IEEE Fellow and has received numerous awards for distinguished research and leadership, including the 2001 IEEE Harriet B. Rigas Award for a woman with significant contributions in engineering education, the 2002 Outstanding Young Engineering Alumni from the University of California, Berkeley, the 2002 CRA Nico Habermann Award for increasing the diversity in computing, and the 2005 Tapia Achievement Award for Scientific Scholarship, Civic Science, and Diversifying Computing. Dr. Taylor is a member of Association for Computing Machinery. Dr. Taylor earned her B.S. in Electrical and Computer Engineering and M.S. in Computer Engineering from Purdue University in 1985 and 1986, respectively, and a Ph.D. in Electrical Engineering and Computer Sciences from the University of California, Berkeley, in 1991.

Dr. Katherine A. Yelick

Member

Katherine Yelick is a Professor of Electrical Engineering and Computer Sciences at the University of California at Berkeley and is also the Associate Laboratory Director for Computing Sciences at Lawrence Berkeley National Laboratory. She is the co-author of two books and more than 100 refereed technical papers on parallel languages, compilers, algorithms, libraries, architecture, and storage. She co-invented the UPC and Titanium languages and demonstrated their applicability across architectures through the use of novel runtime and compilation methods. She also co-developed techniques for self-tuning numerical libraries, including the first self-tuned library for sparse matrix kernels which automatically adapts the code to properties of the matrix structure and machine. Her work includes performance analysis and modeling as well as optimization techniques for memory hierarchies, multicore processors, communication libraries, and processor accelerators. She has worked with interdisciplinary teams on application scaling, and her own applications work includes parallelization of a model for blood flow in the heart. She has received multiple research and teaching awards and is a member of the California Council on Science and Technology and was a member of the National Academies committee on Sustaining Growth in Computing Performance. Dr. Yelick earned her Ph.D. in Electrical Engineering and Computer Science from MIT in 1991.