

Lawrence Rauchwerger

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Education

Ph.D. in Computer Science, University of Illinois at Urbana-Champaign, 1995.

Ph.D. Thesis: *Run-Time Parallelization: A Framework for Parallel Computation*.

Thesis advisor: David Padua.

M.S. in Electrical Engineering, Stanford University, 1987.

M.S. Research Area: Manufacturing Science and Technology for VLSI (Equipment Modeling).

Engineer in Electronics and Telecommunications, Polytechnic Institute, Bucharest, Romania, 1980.

Diploma Project: Design and Implementation of an Alphanumeric and Graphic Display.

Research Interests

Parallel and distributed C++ libraries

Compilers and architectures for parallel and distributed computing

Adaptive runtime optimizations

Professional Experience

TEXAS A&M UNIVERSITY, College Station, TX (9/96 – present)

Eppright Professor, Department of Computer Science and Engineering (7/14 – present),

Professor, Department of Computer Science and Engineering (9/06 – present), Associate Prof. (9/01-8/06), Assistant Prof. (9/96-8/01), Dept. Computer Science and Engineering.

Deputy Director, Inst. for Applied Mathematics and Computational Science (IAMCS) (8/13–)

Assistant Director, Center for Large-Scale Scientific Simulations (CLASS) (9/11–)

Co-Director, PARASOL Laboratory (3/98 –)

Chair, Council of Principal Investigators (9/11–8/12)

Vice-Chair, Council of Principal Investigators (8/10–8/11)

INRIA SACLAY, Ile-de-France, France.

Visiting Professor, (9/04 – 11/04, 7/06 – 8/06, 7/08)

IBM T.J. WATSON RESEARCH CENTER, Yorktown Heights, NY,

Academic Visitor, (10/03–8/04)

Summer Intern, (Summer 1992)

AT&T RESEARCH LABORATORIES, Murray Hill, NJ.

Visiting Scientist, (6/96-8/96)

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN, IL,

Visiting Assistant Professor, Center for Supercomputing R&D, University of Illinois. (9/95-5/96)

Research Assistant, Center for Supercomputing R&D, University of Illinois. (1/89-5/92, 1/94-5/94)

Teaching Assistant, Department of Computer Science, University of Illinois. (1/93-12/93)

CENTER FOR INTEGRATED SYSTEMS, STANFORD UNIVERSITY, Stanford, CA
Research Assistant, (1986–1988)

VARIAN ASSOCIATES INC., Thin Film Technology Division, R&D, Palo Alto, CA.
R & D Engineer,(1984–1985)

BECKMAN INSTRUMENTS INC., SCIENTIFIC INSTRUMENTS DIVISION, Irvine, CA.
Design Engineer, (1983-1984)

THE FELIX COMPUTER COMPANY, R. & D. Department, Bucharest, Romania
Design Engineer, (1980–1982).

Honors & Awards

Best Paper Award Finalist, Harshvardhan, A. Fidel, N. M. Amato, L. Rauchwerger, “An Algorithmic Approach to Communication Reduction in Parallel Graph Algorithms”, in *Proc. of the Int. Conf. on Parallel Architectures and Compilation Techniques (PACT)*, Sept. 2015.

Best Paper Award, M. Zandifar, M. Abduljabbar, A. Majidi , N. M. Amato, L. Rauchwerger, D. Keyes, “Composing Algorithmic Skeletons to Express High-Performance Scientific Applications”, in *Proc. of the Int. Conf. on Supercomputing (ICS)*, June 2015.

TEES Senior Fellow, College of Engineering, Texas A&M University, 2014.

Best Paper Award, Harshvardhan, A. Fidel, N. M. Amato, L. Rauchwerger, “KLA: A New Algorithmic Paradigm for Parallel Graph Computations”, in *Proc. of the Int. Conf. on Parallel Architectures and Compilation Techniques (PACT)*, Aug. 2014.

Eppright Professor (endowed professorship), 2014.

ACM Distinguished Scientist, 2014.

Award for Graduate Teaching Excellence (selected by students), Department of Computer Science and Engineering, Texas A&M University, 2014.

Paper Selected for ACM International Conf. on Supercomputing (ICS) 25th Anniversary Volume, 2014.
ACM ICS 2000 paper, “Adaptive reduction parallelization techniques”, H. Yu and L. Rauchwerger, one of 35 papers selected out of 1800 papers published by this conference in the 25 years from 1987-2012.

IEEE Fellow, 2012,

for contributions to thread-level speculation, parallelizing compilers, and parallel libraries.

Halliburton Professorship, College of Engineering, Texas A&M University, 2009.

IBM Faculty Award, 2008.

IBM Faculty Award, 2007.

Intel Faculty Award, 2005.

TEES Fellow, College of Engineering, Texas A&M University, 2005.

TEES Fellow, College of Engineering, Texas A&M University, 2002.

Best Student Paper Award, S. Rus, L. Rauchwerger and J. Hoeflinger, “Hybrid Analysis: Static & Dynamic Memory Reference Analysis”, in *Proc. of the ACM 16-th Int. Conf. on Supercomputing (ICS02)*, New York, NY, June 2002, pp. 274–284.

NSF Faculty Early Career Development (CAREER) Award, 1998–2002.

TEES Select Young Faculty Award, College of Engineering, Texas A&M University, 2000.

Intel Foundation Graduate Fellowship, 1994.

NASA (Langley) High Performance Computing Consortium (HPCC) Graduate Fellowship, 1994.

Professional Service & Activities

Editorial Board Member

Journal of Information Science and Engineering (JISE), Academia Sinica, since 2011.

Int. Journal of Parallel Processing (IJPP), since 2003.

Guest Editor:

Int. Journal of Parallel Computing, 2002, Special Issue on Selected Papers from IWACT'2001.

Journal of Parallel Computing, Special Issue on Parallel Processing for Irregular Applications, 2000.

Int. Journal of Parallel Computing, 2000, Special Issue on Selected Papers from ACM Int. Conf. of Supercomputing, 1999.

Steering Committee Member:

ACM Int. Conf. on Supercomputing (ICS), (2014–present)

ACM/IEEE Int. Conf. on Parallel Architectures and Compilation Techniques (PACT), (2007–2009; 2011–present).

Workshop on Languages and Compilers for Parallel Computing (LCPC), 2007 – present.

General Chair:

20th Int. Conf. on Parallel Architectures and Compilation Techniques (PACT), 2011.

Program (Co-)Chair:

ACM Principles and Practice of Parallel Programming Conference (PPoPP), Austin, TX., 2017.

The 25th ACM Int. Conf. on Parallel Architectures and Compilation Techniques (PACT), Haifa, Israel, 2016.

ACM Int. Conf. on Supercomputing (ICS), Munich, Germany, 2014.

The 8th Int. Conf. on High-Performance and Embedded Architectures and Compilers (HiPEAC), Berlin, Germany, 2013.

IEEE Int. Symp. on Comp. Architecture and High Performance Computing (SBAC-PAD), Petropolis, Brazil, 2010.

ACM/IEEE Int. Conf. on Parallel Architectures and Compilation Techniques (PACT), Brasov, Romania, 2007.

16th Int. Workshop on Languages and Compilers for Parallel Computing (LCPC), College Station, TX 2003.

Program Committee Member (Selected):

ACM/IEEE Int. Conf. on Parallel Architecture and Compilation Techniques (PACT), 1999, 2010, 2012, 2013, 2014, 2015.

Int. Conf. on High Performance Embedded Architectures & Compilers (HiPEAC), 2007, 2008, 2009, 2011, 2012, 2013, 2014.

IFIP Int. Conf. on Network and Parallel Computing (NPC), 2014.

IEEE/ACM Int. Parallel and Distributed Processing Symp. (IPDPS), 2002, 2006, 2007, 2010, 2014, 2015, 2016.

ACM Int. Symp. on Code Generation and Optimization (CGO), 2015.

ACM SIGPLAN Symp. Programming Languages Design and Implementation (PLDI), 2013.

Int. Conf. on Advanced Parallel Processing Technology (APPT 2013), Stockholm, Sweden, 2013.

IEEE/ACM Int. Symp. on Computer Architecture and High Performance Computing (SBAC-PAD), 2009, 2011, 2012.

IEEE Cluster, Beijing, China, 2012.

ACM SIGPLAN Symp. Principles and Practice of Parallel Programming (PPoPP), 2005, 2011, 2016.

ACM 4th Annual Int. Systems and Storage Conf. (SYSTOR), Haifa, Israel, 2011.

IEEE Int. Symp. on Workload Characterization (IISWC), 2011.

IEEE/ACM Int. Conf. on High Performance Computing (HiPC), India, 2000, 2003, 2007, 2008, 2011.

Int. Workshop on Languages and Compilers for Parallel Computing (LCPC), 2002, 2004, 2005, 2010.

IEEE/IFIP Int. Conf. on Embedded and Ubiquitous Computing (EUC-10), 2010.

Int. Conf. on Parallel Processing (ICPP), 1999, 2000, 2010.

IEEE Int. Conf. on Parallel and Distributed Systems (ICPADS), 2007, 2009.

IEEE Int. Symp. on Computer Architecture (ISCA), 2008.

Exploiting Parallelism using Transactional Memory and Hardware Assisted Methods (EPHAM), 2008.

IEEE Int. Conf. on Computational Science and Engineering (CSE), 2008.

ACM SIGPLAN Symp. on Library-Centric Software Design (LCSD), 2007.

IEEE Int. Conf. for High Performance Computing and Communications (SC07), 2007.

Int. W-shop on High-Level Parallel Programming Models and Supportive Environments(HIPS), 2007.

ACM Int. Conf. on Supercomputing (ICS), 2000, 2006, 2007, 2014, 2015.

IEEE Int. Conf. on Computer Design (ICCD), 2006.

Int. Conf. on High Performance Computing and Communications (HPCC), 2006.

ACM Int. Conf. on Computing Frontiers, Italy, 2006.

Int. IEEE W-shop on High Performance Computational Biology (HICOMB), 2005.

Int. Conf. on High Performance Computing and Communications (HPCC-05), Italy, 2005.

Workshop on Patterns in High Performance Computing, Champaign, IL, 2005.

IEEE High Performance Computer Architecture Conf. (HPCA), 2001, 2002, 2004.

Int. Conf. on Compiler Construction (CC), 1999, 2000.

External Review Committee:

IEEE Int. Symp.on Computer Architecture (ISCA) 2010.

Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2016, 2015, 2014.

ACM Symp. Principles and Practice of Parallel Programming (PPoPP) 2014, 2013, 2012.

ACM Symp. Programming Languages Design and Implementation (PLDI) 2015, 2014.

Conference Organization

Workshop and Tutorial Chair: *ACM Symp. Principles and Practice of Parallel Programming (PPoPP)*, Orlando, FL., 2014

Exhibits Chair: *ACM Int. Conf. on Supercomputing (ICS'02)*, New York, NY, June 2002.

Workshop and Publications Chair: *High Performance Computer Architecture Conf. (HPCA-6)*, Toulouse, France, January 2000.

Panelist/Reviewer:

Israel Science Foundation (ISF), 2016.

NSF 2013, 2000, 2009, 2012, 2011, 2008, 2002, 1999, 1998.

Deutsche Forschungsgemeinschaft, 2013.

Austrian Science Foundation (2012).

Swiss National Science Foundation (2011).

Science Foundation Ireland (2010, 2009).

External Reviewer: University of Houston's Grants to Enhance and Advance Research (GEAR) Program, 2008.

Professional Society

IEEE Computer Society (IEEE CS) Member, IEEE Fellows Evaluation Committee, 2015, 2016

Secretary IFIP WG 3.10

Associate Member HiPEAC.

Significant Texas A&M University Service and Activities

Council of Principal Investigators (CPI) (elected), 2009 – present. the CPI is a “senate” for externally funded researchers at the university.

– Member of Executive Committee, 2010 – 2014.

– Past Chair, 2012 – 2013.

– Chair, 2011 – 2012.

– Vice Chair, 2010 – 2011.

Chancellor's Research Initiative Advisory Committee, appointed 2013.

Texas A&M System PricewaterhouseCoopers administrative review committee, 2013 – 2015.

Office of Sponsored Research Services PI/Faculty Advisory Committee (PIFAC) TEES representative, 2012–2014.

Task Force on Research Data Stewardship at Texas A&M, 2011 – 2012.

High Performance Computing Steering Committee, 1999 – 2016.

Search Committee for VP for Administration, 2010.

IAMCS Faculty search committee, for computational science, senior position, 2011–2014..

Senator, Faculty Senate, 2001–2005.

Significant Departmental/College Service and Activities

College of Engineering Research Council, 2013 – present.

Graduate Advisory Committee (GAC), 2001–2002, 2006–present

Faculty Search Committee, 2002–2003, 2004–2005, 2006–2007, 2007–2008, 2013, 2015-2016 (co-chair).

Promotion and Tenure Committee, 2011 – 2012.

Department Head Search Committee, 2001–2002.

Endowed Chair Search Committee, 2001–2002.

Computer Engineering Committee, 2002-2003.

Colloquium Committee. 1998–1999, 1999–2000, 2001–2002 (Chair), 2002–2003 (Chair), 2012–present (Co-Chair).

Advisory Committee, 2001-2002.

Computer Services Advisory Committee, 1997–1998.

Graduate Admissions and Awards Committee, 2000–2001, 2004–2005, 2006-2007.

Library Committee. 1998–1999, 1999–2000 (Chair).

Total Quality Management, (TQM). 1997–1998.

Courses Taught

“Parallel Programming Models”, given at Seoul National University, Seoul, Korea in May 2011. The course was intended for graduate students.

“Sustainable High Performance Computing via Domain Specific Libraries”, for the **CEA-EDF-INRIA Summer School** organized by the CEA (Commite d’Energie Atomique, i.e., the French Nuclear Science National Lab), EDF (Electricite de France - the electricity company of France) and INRIA (Institut National de Recherche Informatique et Automatique, the French National Lab for computer science), held in Cadarache, France, June 28-July 9, 2010. Only 2–3 professors from France and the US are invited each year. URL: <http://www.inria.fr/actualites/colloques/cea-edf-inria/>

“Parallel Programming Models”, ACACES 2007: Third International Summer School on Advanced Computer Architecture and Compilation for Embedded Systems July 15–20, 2007, L’Aquila, Italy. It is one of the most prestigious summer schools for PhD students in Europe to which only selected international lecturers are invited. URL:<http://www.hipeac.net/acaces2007/>

Decaf Compiler project is used as additional class project for the text “Engineering a Compiler” by Keith Cooper and Linda Torczon, Elsevier Morgan Kaufman, 2004 and 2010.

Graduate Courses at Texas A&M:

CPSC-605: Advanced Compiler Design

CPSC-614: Graduate Computer Architecture

CPSC-654: Supercomputing

CPSC-681: Graduate Seminar

CPSC-689: Advanced Topics in Compiler Design

CPSC-689: Special Topics: Runtime Systems for Parallel Computing

Undergraduate at Texas A&M:

CPSC-434: Compiler Design

CPSC-434: Compiler Design (Honors)

CPSC-481: Undergraduate Seminar

Research Supervision

Post Doctoral

Roman Kuzel, Ph.D., 2016 – present.

Milan Hanus, Ph.D., 2015 – present, Postdoc, Dept. of Computer Science and Engineering, Texas A&M.

Tim Smith, Ph.D., 2012 – present. Postdoc, Dept. of Computer Science and Engineering, Texas A&M.

Nathan Thomas, Ph.D., 2012 – present, Postdoc, Dept. of Computer Science and Engineering, Texas A&M.

Eva Burrows, Ph.D., 2014. First position: Lecturer, University of Bergen, Bergen, Norway.

Cosmin Oancea, Ph.D., 2009 – 2011. First position: Assistant Professor, Dept. of Computer Science, University of Copenhagen, Denmark.

Mauro Bianco, Ph.D., 2007 – 2010. First position: Scientist, Swiss National Supercomputing Centre, Switzerland.

Graduated PhD Students

Ioannis Papadopoulos, 2016. “STAPL-RTS: A Runtime System for Massive Parallelism”, First Position: Mathworks, Boston, MA.

Nathan Thomas, 2012. “The STAPL Paragraph Executor: Scalable, Parallel Execution in a Generic Library”,
First Position: Postdoc, Dept. of Computer Science and Engineering, Texas A&M, College Station, TX.

Tim Smith, 2012. “Parallel Program Composition with Paragraphs”,
First Position: Postdoc, Dept. of Computer Science and Engineering, Texas A&M, College Station, TX.

Gabriel Tanase, (Co-Adviser, Nancy Amato), 2010. “The STAPL Parallel Container Framework”
First position: Research Staff Member, IBM T.J. Watson Research Center, Yorktown Heights, NY.

Alin Jula, 2008. “Improving Locality with Dynamic Memory Allocation”
Current position: Senior Software Engineer, Google, Mountain View, CA.

Silvius Rus, 2006, “Hybrid Analysis and its Application to Dynamic Compiler Optimization”
First position: Senior Software Engineer, Google, Mountain View, CA.

Hao Yu, 2004, “Run-time Optimizations of Adaptive Irregular Applications.”
Current position: Research Staff Member, IBM T.J. Watson Research Center, Yorktown Heights, NY.

Ye Zhang, (UIUC) , 1999, (co-advised with Prof. Josep Torrellas, University of Illinois), “Hardware for Speculative Run-time Parallelization in Distributed Shared-Memory Multiprocessors”,
First position: Member of Technical Staff, Oracle Corporation, Redwood City, CA.

Graduated Masters Students

Antal Buss (Co-Adviser, Nancy Amato), M.C.S., Fall 2015.

Vincent Marsy (Co-Adviser, Nancy Amato), M.S., Summer 2015.

Nicolas Castet (Co-Adviser, Nancy Amato), M.S., Summer 2013.

Shishir Sharma (Co-Adviser, Nancy Amato), M.S., Summer 2013,

Olivier Rojo (Co-Adviser, Nancy Amato), M.C.S., Summer, 2012.

Shuai Ye, M.C.S., Summer, 2011,

Francis Dang, M.S., Spring 2007,

Tao Huang, M.S., Spring 2007,

Steven Saunders, M.S., Spring 2003,

Timmie Smith, M.C.S., Summer 2002,

William McLendon III, M.S., Fall 2001,

Mothi Mohan Ram Thoppae, M.S. (EE), Fall 2001,

Francisco Arzu, M.S. Summer 2000,

Julio Carvallo De Ochoa, M.S., Summer 2000,

Devang Patel, M.S. August 1998,

Current Ph.D. Students

Adam Fidel, research area: Parallel C++ Library.
Mani Zandifar, research area: Parallel C++ Library.
Harshvardan, research area: Parallel C++ Library.
Diego Martinez, research area: Parallel C++ Library.
Glen Hordemann, research area: Parallel C++ Library.
Alireza Majidi, research area: Parallel C++ Library.
Brandon West, research area: Parallel C++ Library.
Colton Riedel, research area: Parallel C++ Library.
Francisco Coral, research area: Parallel C++ Library.

Current M.S. Students

Dielli Hoxha, research area: Parallel C++ Library.
Junjie Shen, research area: Parallel C++ Library.
Tianhua Yang research area: Parallel C++ Library.

Undergraduate Research Projects (selected)

Rauchwerger has supervised tens of undergraduate students from Texas A&M and other national and international schools. Most of these undergraduate students have gone to graduate school at Texas A&M or elsewhere. There are some noteworthy examples:

- Daniel Latypov, is currently working as an undergraduate researcher working on skeletons for parallel programming.
- Armando Solar, BS in Computer Science TAMU, continued graduate school at UC Berkeley and is now an associate professor at MIT.
- Alexandar Vitorovic, from Belgrade University, visited for 3 months in Fall 08 and later continued graduate school at EPFL, Switzerland.
- Anna Tikhonova came in Summer 2005 on the CRA-W DMP Program, and then continued graduate school at UC Davis, CA.
- Michael Peter came from TU Dresden, Germany as an exchange undergraduate student and then continued graduate school at TU Dresden, Germany.
- Timmie Smith, stayed on at Texas A&M and is now a postdoc in the Parasol Lab.
- William Harris came from Purdue University in Summer 06, and then continued graduate school at the Univ. of Wisconsin

Invited Presentations (Selected, last 10 years)

“Best Practices for Asynchronous Many-Task Programming Models and Runtimes”, Panel, Supercomputing 2016. (proposed).
“SGL: An Approach for Future Exascale Graph Processing”, RoMol 2016 Workshop, Barcelona, Spain, March 17-18,
“AMT Programming Models”, Panel, Supercomputing 2015.

“STAPL Run-time System”, BOF, Supercomputing 2014.

“Don’t Parallelize! Think Parallel and Write Clean Code”,
 University of California, Riverside, March 2013.

Multiprocessor Architectures and Their Effective Operation Workshop, Universita Politecnica di
 Catalonia, Barcelona, June 2012.

25th Anniversary Workshop on Languages and Compilers for Parallel Computing, Tokyo, Sept, 2012.

“STAPL: An Adaptive Parallel Programming Environment”, Xi’an Jiatong University, Xi’an, P.R. China,
 June 2012.

“STAPL: A Parallel Programming Infrastructure”, University of Bergen, Norway, May 2011.

“Parallel Programming Languages - a short course”, Seoul National University, Seoul, Korea, May 2011.

“STAPL: A Parallel Programming Infrastructure”, King Abdulah University (KAUST), Saudi Arabia,
 May 2010.

Keynote Invited Talk: “STAPL: An Adaptive Parallel Programming Environment”
 at the The Fifth Int. Workshop on Automatic Performance Tuning(iWAPT), Berkeley, CA, Jun 22,
 2010

“The STAPL Parallel Container Framework”, Dagstuhl Seminar ”Program Composition and Optimiza-
 tion : Autotuning, Scheduling, Metaprogramming and Beyond” , Dagstuhl, Germany, 2010.

Distinguished Invited Talk:”Parallel Programming Paradigms: How far can they get us?”, at the Interna-
 tional Workshop on Multi-Core Programming and Applications, Taipei, Taiwan, Nov., 2009.

“STAPL: A Parallel Programming Infrastructure”, ScalPerf, Bertinoro, Italy, Sept., 2009.

Panel: “Can machine learning help to solve the multicore code generation issues?” at the third SMART09
 workshop (in conjunction with HiPEAC Conference), Paphos, Cyprus, Feb., 2009.

“Parallel Programming Models”,
 Seoul National University, Seoul, Korea, 2011.

Summer School CEA-EDF-INRIA, Cadarache, France, 2010.

ACACES 2007: Third International Summer School on Advanced Computer Architecture and Com-
 pilation for Embedded Systems July 15–20, 2007 L’Aquila, Italy (short course).

“Automatic Parallelization with Hybrid Analysis”,
 Waseda University, Tokyo, Japan, Nov. 2009
 Tokyo University, Tokyo, Japan, Nov. 2009
 National Tsinghua University, Taiwan, Nov., 2009.
 University of Houston, Houston, TX, April 2009.
 UT San Antonio, San Antonio, TX, Nov. 2008.
 ScalPerf, Bertinoro, Italy, Sept. 2008.
 UT Austin, Austin, TX, March 2008.
 IIT Kanpur, India, Dec. 2007.
 IBM Austin Research Labs, Austin, TX, March 2007.
 Dagstuhl Seminar 07361 on Programming Models for Ubiquitous Parallelism, Schloss Dagstuhl,
 Wadern, Germany, Sept. 2007.
 School of Information and Computer Science, Irvine, CA, Feb. 2007,
 SIAM Conf. on Computational Science and Engineering, San Francisco, CA, Feb., 2006.
 HP, Cupertino, CA, Feb. 2006
 Compiler & Architecture Int. Seminar, IBM Haifa Research Labs, Haifa, Israel, Dec., 2005.
 IBM, T.J. Watson, Yorktown Heights, NY, April, 2005.
 Fudan University, Shanghai, China, Dec., 2005.

“STAPL: A High Productivity Parallel Programming Environment”,
Universite de Versailles, Versailles, July 2008
Electricite de France (EDF), Paris, July, 2008
Dagstuhl Seminar 07361 on Programming Models for Ubiquitous Parallelism, Schloss Dagstuhl,
Wadern, Germany, Sept. 2007.
IFIP WG 2.11 Annual Meeting, Schloss Dagstuhl, Wadern, Germany, Jan. 25, 2006.
“Efficient Massively Parallel Adaptive Algorithms for Time-Dependent Transport on Arbitrary Grids.”
SIAM Conf. on Computational Science and Engineering, San Francisco, CA, Feb., 2006.

Invited Participant (Selected)

Global Grand Challenges Summit, London, March 2013.
Microsoft Faculty Summit, Redmond, WA, various years including July 2007, July 2008, July 2014, July 2016.
Various NSF, DOE workshops

Research Grants

“XPS: FULL: DSD: Asynchronous PDE Algorithms for Turbulent Flows at Exascale”, *The National Science Foundation*, PI: Diego Donzis, co-PIs: L. Rauchwerger, N. Amato, S. Girimaji, Raktim Bhattacharya \$850,000, 09/01/14–08/31/17.
“AF: Small: Motion Planning Techniques fro Protein Motion” (CCF-1423111), *The National Science Foundation*, PI: N. Amato, Co-PIs: L. Rauchwerger, S. Thomas, \$416,000, 07/01/14–06/30/17.
“Center for Exascale Radiation Transport (CERT),” *Dept. of Energy, PSAAP II, Single-Discipline Center of Excellence for Academic Computational Science Partnerships*, PI: J. Morel, Co-PIs: M. Adams, L. Braby, R. McClarren, J. Ragusa, L. Rauchwerger, Co-Is: N.M. Amato, D. Bingham (SFU), T. Conroy (U. Regina), T. Manteuffel (U. Colorado), S. McCormick (U. Colorado), D. Perez-Nunez. \$10,000,000, 10/01/13–08/31/18.
“SmartApps: Smart Applications for Multicores”, *Samsung Global Research Outreach (GRO) program* PIs: L. Rauchwerger and N. Amato, \$141,858, 11/09/12–03/08/14.
“Automatic Function Extraction form X86 Binaries”, (SRI: 52-009000) PI: L. Rauchwerger, \$45,000, 01/19/2012–03/30/2012.
“The Center for Exascale Simulations of Advanced Reactors (CESAR): A Nuclear Energy-based Co-Design Code Project” (DE-AC02-06CH11357), *The Dept. of Energy, PSAAP Program* PI: R. Rosner (U. Chicago), TAMU PI: M. Adams, TAMU Co-PIs: N. Amato, J. Morel, L. Rauchwerger, \$20,000,000 (\$1,500,000 TAMU), 09/01/11–08/31/16.
“Collaborative R&D in Support of LLNL Missions” (B575363), *Lawrence Livermore National Security*, PI: J. Morel, co-PIs: M. Adams, N. Amato, R. Arroyave, A. Benzerger, D.R. Boyle, T. Cagin, W.S. Charlton, S.S. Chirayath, J.-L. Guermond, R. McClarren, S.M. McDeavitt, B. Popov, L. Rauchwerger, M.J. Schuller, A. Solodov, R.E. Tribble, \$2,448,000, 06/06/12–09/30/15.
“A Compositional Approach to Scalable Parallel Software” (CCF-0833199), *The National Science Foundation (HECURA Program)*, PI: L. Rauchwerger, co-PIs: N. Amato, B. Stroustrup, \$1,232,000, 09/01/08–08/31/15.
“RI: Small: Scalable Roadmap-Based Methods for Simulating and Controlling Behaviors of Interacting Groups: from Robot Swarms to Crowd Control” (IIS-0917266), *The National Science Foundation*, PI: N. Amato, co-PI: L. Rauchwerger, \$450,000, 09/01/09–08/31/14.

- “Motion Planning Based Techniques for Modeling & Simulating Molecular Motions” (CCF-0830753), *The National Science Foundation*, PI: N. Amato, co-PI: L. Rauchwerger, \$386,000, 09/15/08–09/14/14.
- “Support of Stockpile Stewardship Program,” *Lawrence Livermore National Security*, PI: J. Morel, co-PIs: M. Adams, N. Amato, R. Arroyave, A. Benzerga, T. Cagin, J.-L. Guermond, Y. Jin, B. Mallick, B. Popov, L. Rauchwerger, \$2,936,677, 09/09/08–06/30/11.
- “Institute for Applied Mathematics and Computational Science (IAMCS),” (KUS-C1-016-04), *King Abdullah University of Science and Technology (KAUST)*, PI: J. Calvin, co-PIs: M. Adams, G. Almes, N. Amato, P. Balbuena, W. Bangerth, R. Carroll, C. Douglas, C. Economides, Y. Efendiev, M. Genton, J.-L. Guermond, C. Hansen, J. Hendler, J. Huang, T. Ioerger, C. Johnson, M. Jun, G. Kanschat, P. Kuchment, R. Lazarov, F. Liang, B. Mallick, J. Pasciak, G. Petrova, B. Popov, L. Rauchwerger, H. Sang, G. Qin, W. Rundell, V. Sarin, B. Stroustrup, V. Taylor, J. Walton, W. Zhao. \$25,000,000, 06/01/08–05/31/14.
- “Hybrid Analysis for Advanced Restructuring Compilers”, *IBM*, PI: L. Rauchwerger. \$15,000 2007 and \$20,000 2008.
- “ARI-LA: A Framework for Developing Novel Detection Systems Focused on Interdicting Shielded HEU” (2008-DN-077-ARI018-02), *The National Science Foundation (DNDO-NSF Academic Research Initiative)*, PI: W. S. Charlton, co-PIs: M. Adams, N. Amato, W. Bangerth, D. R. Boyle, S. G. Choi, Y. Ding, G. M. Gaukler, J.-L. Guermond, G. Kanschat, P. Kuchment, Y. Kuo, S. P. Khatri, E. W. Lindquist, W. F. Miller, Jr., J. C. Ragusa, L. Rauchwerger, C. Sprecher, A. Vedlitz, \$7,500,000, 9/1/07–8/31/13.
- “Center for Radiative Shock Hydrodynamics (CRASH),” *DOE NNSA under the Predictive Science Academic Alliances Program (PSAAP)* (DE-FC52-08NA28616), PI: P. Drake (Michigan). co-PIs: K. Powell (Michigan), J. Holloway (Michigan), Q. Stout (Michigan), M. Adams (Nuclear Engineering, TAMU), N. Amato (CSE, TAMU), T. Gombosi (Michigan), S. Karni (Michigan), E. Larsen (Michigan), B. van Leer (Michigan), B. Mallick (Statistics, TAMU), W. Martin (Michigan), J. Morel (Nuclear Engineering, TAMU), P. Roe (Michigan), L. Rauchwerger (CSE, TAMU). I. Sokolov (Michigan), K. Thornton (Michigan), G. Toth (Michigan). \$17,000,000 (Texas A&M portion \$1,850,000), 04/15/08–03/31/13.
- “CCF: Collaborative Research: Next Generation Compilers for Emerging Multicore Systems,” *The National Science Foundation* (CCF-0702765), PI: L. Rauchwerger co-PIs: G. Dos Reis, B. Stroustrup, (TAMU), D. Padua, M. Garzaran (UIUC). \$480,000 (Texas A&M portion), June 01, 2007 – May 31, 2014.
- “CRS–AES: Collaborative Research: SoftCheck: Compiler and Run-Time Technology for Efficient Fault Detection and Correction in Low nm-Scale Multicore Chips,” *The National Science Foundation* (CNS-0615267), PIs: Maria Garzaran (UIUC) and L. Rauchwerger \$110,000 (Texas A&M portion), August 2006 – July 2008.
- “STAPL: A High Productivity Parallel Programming Infrastructure,” *Intel Corporation*, PI: L. Rauchwerger, \$60,000, November 03, 2005.
- “SmartApps: Middle-ware for Adaptive Applications on Reconfigurable Platforms,” *The Dept. of Energy, Office of Science (Operating/Runtime Systems for Extreme Scale Scientific Computation Program)*, (DE-FG01-04ER04-13), PI: L. Rauchwerger, co-PIs: M. Adams (Nuclear Engineering), N. Amato, B. Stroustrup, O. Krieger (IBM), J. Moreira (IBM), V. Sarkar (IBM), D. Quinlan (LLNL), \$1,500,000 (Texas A&M portion) September 1, 2004 – August 31, 2007.
- “ITR/NGS: STAPL: A Software Infrastructure for Computational Biology and Physics” (ACI-0326350), *The National Science Foundation (Medium ITR Program)*, PI: L. Rauchwerger, co-PIs: N. Amato, B. Stroustrup, M. Adams (Nuclear Engineering), \$416,000, November 1, 2003 – October 31, 2007.

- “Efficient Massively Parallel Adaptive Algorithm for Time-Dependent Transport on Arbitrary Spatial Grids,” *The Dept. of Energy*, PI: M. Adams (Nuclear Engineering), co-PIs: N. Amato, P. Nelson, L. Rauchwerger, \$1,668,827, May 1, 2002 – March 31, 2006.
- “Geometry Connectivity and Simulation of Cortical Networks”, *Texas Higher Education Coordinating Board*, PI: N. Amato co-PI: L. Rauchwerger \$240,000 January 1, 2002 - August 31, 2004.
- “ITR/SY: Smart Apps: An Application Centric Approach to Scientific Computing” , *The National Science Foundation* (ACR-0113971), PI: L. Rauchwerger, co-PI: N. Amato, \$463,809, September 1, 2001 – August 31, 2005.
- “ITR/AP: A Motion Planning Approach to Protein Folding Simulation”, *The National Science Foundation* (CCR-0113974), PI:N. Amato, co-PI: L. Rauchwerger, \$318,000, September 1, 2001 – August 31, 2005.
- “Adaptive Parallel Processing for Dynamic Applications” *The National Science Foundation* (CAREER Program) (CCR-9734471), PI: L. Rauchwerger, \$237,000, June 1, 1998 – May 31, 2004
- “SmartApps: Smart Applications for Heterogeneous Computing,” (EIA-9975018), *The National Science Foundation* (*Next Generation Software Program*), PI: L. Rauchwerger, co-PI: N. Amato, J. Torrellas (Univ. Illinois at Urbana-Champaign), \$610,000 October 1, 1999 – August 31, 2003.
- “PARASOL: An Adaptive Framework for Parallel Processing” (ACI-9872126), *The National Science Foundation*, PI: L. Rauchwerger, co-PI: N. Amato, \$199,662, January 1, 1999 – December 31, 2002.
- “Efficient Massively-Parallel Implementation of Modern Deterministic Transport Calculations” (B347886), *Dept. of Energy* (*ASCI ASAP Level 2 and 3 Programs*), PI: M. Adams (Nuclear Engineering), co-PIs: N. Amato, P. Nelson, L. Rauchwerger, \$889,000, October 21, 1998 – March 31, 2002.
- “Parallel Algorithms for Graph Cycle Detection,” *Sandia National Laboratory*, PI: L. Rauchwerger, \$93,448, September 1, 1999 – January 15, 2002.
- “Develop the How-to of a Qualified Compiler and Linker”, *Aerospace Vehicle Space Institute (AVSI)*, PI: L. Rauchwerger, March 01, 2001 – January 31, 2002. \$45,500,

Fellowship, Equipment, and Software Grants

- ”Student Travel Support for the 20th International Conference on Parallel Architecture and Compiler Techniques (PACT), October 2011,” *The National Science Foundation*, PI: Lawrence Rauchwerger, Co-PI: Nancy M. Amato, \$12,000, June, 2011 – August 31, 2012.
- ”Student Travel Support for the 16th International Conference on Parallel Architecture and Compiler Techniques (PACT), September 2007,” *The National Science Foundation*, PI: Lawrence Rauchwerger, Co-PI: Nancy M. Amato, \$12,000, September 1, 2007 – August 31, 2008.
- ”CRI: A Cluster Testbed for Experimental Research in High Performance Computing” *The National Science Foundation*, PI: V. Taylor co-PI: N. Amato, L. Rauchwerger, \$537,000, May 15, 2006 – April 30, 2014.
- “Workshop NGS: Support for the Workshop on Languages and Compilers for Parallel Computing (LCPC),” *The National Science Foundation*, PI: Lawrence Rauchwerger, Co-PI: Nancy M. Amato, \$15,000, September 1, 2003 – August 31, 2004.
- “MRI: Development of Brain Tissue Scanner,” *The National Science Foundation*, PI: B. McCormick, co-PIs: N. Amato, J. Fallon (UCI), L. Rauchwerger, \$105,000 + \$153,000 funds from Texas A&M. September 1, 2000–July 31, 2001.
- “Education/Research Equipment Grant – HP V-class Shared Memory Multiprocessor Upgrade,” *Hewlett-Packard*, PI: Lawrence Rauchwerger and Nancy Amato, May 2000, approximately \$580,000.

“Research Equipment Grant – 16 Processor V-class Shared Memory Multiprocessor Server,” *Hewlett-Packard Co.*, PI: L. Bhuyan, co-PIs: N. Amato, L. Rauchwerger, \$1,200,000, 1998.

“Fellowships in Robotics, Training Science, Mobil Computing and High Performance Computing” (P200A80305), *U.S. Dept. of Education (GAANN Fellowship Program)*, PI: R. Volz, co-PIs: N. Amato, L. Everett, J. Welch, co-Investigators: L. Rauchwerger, J. Trinkle, N. Vaidya, J. Yen, Texas A&M University, \$601,224, August 15, 1998 – August 14, 2001.

Publications in Refereed Journals, Conferences and Workshops

(Organized by topic; most papers available at <http://parasol.tamu.edu/~rwerger/>)

Parallel Libraries & Applications

- [1] Harshvardhan, Adam Fidel, Nancy Amato and Lawrence Rauchwerger, “An Algorithmic Approach to Communication Reduction in Parallel Graph Algorithms”, in *Proc. of the Int. Conf. on Parallel Architectures and Compilation Techniques (PACT)* (**Best Paper Award Finalist**), Oct. 2015.
- [2] Ioannis Papadopoulos, Nathan Thomas, Adam Fidel, Dielli Hoxha, Nancy M. Amato, and Lawrence Rauchwerger, “Asynchronous Nested Parallelism for Dynamic Applications in Distributed Memory”, in *Proc. Workshop on Languages and Compilers for Parallel Computing (LCPC)*, Sept. 2015 (to appear).
- [3] Mani Zandifar, Mustafa Abduljabbar, Alireza Majidi, Nancy Amato, Lawrence Rauchwerger and David Keyes, Composing Algorithmic Skeletons to Express High-Performance Scientific Applications, in the Proc. 26th Int. Conf. on Supercomputing (ICS), 2015. (**Best Paper Award**)
- [4] Ioannis Papadopoulos, Nathan Thomas, Adam Fidel, Nancy M. Amato, Lawrence Rauchwerger, STAPL-RTS: An Application Driven Runtime System, in the Proc. 26th Int. Conf. on Supercomputing (ICS), 2015.
- [5] Harshvardhan, Brandon West, Adam Fidel, Nancy M. Amato, Lawrence Rauchwerger, A Hybrid Approach To Processing Big Data Graphs on Memory-Restricted Systems, in Proc. Int. Par. and Dist. Proc. Symp. (IPDPS), May 2015.
- [6] M. Zandifar, N. Thomas, N. M. Amato, L. Rauchwerger. “The STAPL Skeleton Framework”, in *Proc. Workshop on Languages and Compilers for Parallel Computing (LCPC)*, Sep. 2014.
- [7] Harshvardhan, A. Fidel, N. M. Amato, L. Rauchwerger, “KLA: A New Algorithmic Paradigm for Parallel Graph Computations”, in *Proc. of the Int. Conf. on Parallel Architectures and Compilation Techniques (PACT)*, Aug. 2014, (**Best Paper Award**).
- [8] W. Daryl Hawkins, Teresa S. Bailey, Marvin L. Adams, Peter N. Brown, Adam J. Kunen, Michael P. Adams, Timmie Smith, Nancy M. Amato, Lawrence Rauchwerger, Validation of Full-Domain Massively Parallel Transport Sweep Algorithms, *Trans. Amer. Nucl. Soc.*, **111**, 2014, pp. 699–702.
- [9] A. Fidel, Sam Ade Jacobs, S. Sharma, N. M. Amato, L. Rauchwerger, “Using Load Balancing to Scalably Parallelize Sampling-Based Motion Planning Algorithms”, 28th IEEE International Parallel & Distributed Processing Symposium, Phoenix, AZ, May, 2014.

- [10] W. Daryl Hawkins, Timmie Smith, Michael P. Adams, Lawrence Rauchwerger, Nancy M. Amato, Marvin L. Adams, Teresa S. Bailey, and Robert D. Falgout, “Provably Optimal Parallel Transport Sweeps on Regular Grids,” *Proc. International Conference on Mathematics, Computational Methods & Reactor Physics*, Idaho, May 2013.
- [11] W. Daryl Hawkins, Timmie Smith, Michael P. Adams, Lawrence Rauchwerger, Nancy Amato, Marvin L. Adams, “Efficient Massively Parallel Transport Sweeps,” in *Trans. Amer. Nucl. Soc.*, **107**, 2012, pp. 477–481.
- [12] Harshvardhan, Adam Fidel, Nancy M. Amato, and Lawrence Rauchwerger, “The STAPL Parallel Graph Library,” in *Proc. 24th International Workshop on Languages and Compilers for Parallel Computing (LCPC)*, Tokyo, Japan, October 2012.
- [13] G. Tanase, A. Buss, A. Fidel, Harshvardhan, I. Papadopoulos, O. Pearce, T. Smith, N. Thomas, X. Xu, N. Mourad, J. Vu, M. Bianco, N. Amato and L. Rauchwerger, “The STAPL Parallel Container Framework”, in *Proc. of ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP)*, San Antonio, TX, February 2011.
- [14] R.P. Drake, F.W. Doss, R.G. McClarren, M.L. Adams, N. Amato, D.Bingham, C.C. Chou, C. DiStefano, K. Fidkowsky, B. Fryxell, T.I.Gombosi, M.J. Grosskopf, J.P. Holloway, B. van der Holst, C.M.Huntington, S. Karni, C.M. Krauland, C.C. Kuranz, E. Larsen, B. vanLeer, B. Mallick, D. Marion, W. Martin, J.E. Morel, E.S. Myra, V. Nair, K.G. Powell, L. Rauchwerger, P. Roe, E. Rutter, I.V. Sokolov, Q. Stout, B.R. Torralva, G. Toth, K. Thornton, A.J. Visco, Radiative Effects in Radiative Shocks in Shock Tubes, in *High Energy Density Physics*, 2011, pp. 130–140.
- [15] A. Buss, A. Fidel, Harshvardhan, T. Smith, G. Tanase, N. Thomas, X. Xu, M. Bianco, N. Amato and L. Rauchwerger, “The STAPL pView”, in *Proc. 22nd International Workshop on Languages and Compilers for Parallel Computing (LCPC)*, Houston, TX, October 2010.
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- [18] A. Jula and L. Rauchwerger, “Two Memory Allocators that Use Hints to Improve Locality”, *ACM SIGPLAN Int. Symposium on Memory Management (ISMM’09)*, Dublin, Ireland, June 2009.
- [19] A. Buss, T. Smith, G. Tanase, N. Thomas, M. Bianco, N. Amato and L. Rauchwerger, “Design for Interoperability in STAPL”, *Proc. of the 21-th Workshop on Languages and Compilers for Parallel Computing (LCPC)*, Edmonton, Canada, Aug. 2008.
- [20] Tanase, G., Bianco, M., Amato, N. M., and Rauchwerger, L. 2007. The STAPL pArray. In /Proceedings of the 2007 Workshop on Memory Performance: Dealing with Applications, Systems and Architecture/ (Brasov, Romania, September 16 - 16, 2007). MEDEA ’07. ACM, New York, NY, 73-80. DOI= <http://doi.acm.org/10.1145/1327171.1327180>

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- [22] A. Jula and L. Rauchwerger “Custom Memory Allocation for Free: Improving Data Locality with Container-Centric Memory Allocation,” in *Proc. of the 19-th Workshop on Languages and Compilers for Parallel Computing (LCPC)*, New Orleans, Louisiana, Nov 2006.
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- [24] L. Rauchwerger and N. Amato, “SmartApps: Middle-ware for Adaptive Applications on Reconfigurable Platforms”, *ACM SIGOPS Operating Systems Reviews*, Special Issue on Operating and Runtime Systems for High-End Computing Systems, **40**(2):73–82, 2006.
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- [33] W. McLendon III, B. Hendrickson, S. Plimpton, L. Rauchwerger, “Finding Strongly Connected Components in Parallel in Particle Transport Sweeps”, in *Proc. of 13-th Symposium on Parallel Algorithms and Architectures*, (SPAA) Crete, Greece, July 2001, pp. 141–154.
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- [35] Jeff Huang and Lawrence Rauchwerger, “Finding Schedule Sensitive Branches”, in *ESEC/FSE 2015 Proc. of the 2015 10th Joint Meeting on Foundations of Software Engineering*, Sept. 2015.
- [36] C. Oancea and L. Rauchwerger, “Scalable Conditional Induction Variable (CIV) Analysis”, *Int. Symposium on Code Generation and Optimization (CGO)*, San Francisco, CA, Feb. 2015.
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