Olga Pearce

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Research Interests

Parallel and distributed computing, parallel algorithms and optimizations, distributed data structures, parallel performance modeling and optimization, application load balancing, parallel programing models, generic parallel libraries and tools

Education

2014	**Ph.D., Computer Science**, *Texas A&M University*. *Load Balancing Scientific Applications.* Advisor: Prof. Nancy M. Amato, Ph.D.
2004	**B.S., Computer Science and Mathematics**, *Western Oregon University*, Magnum Cum Laude.
2000	**A.A., Business Administration**, *International Christian University*, Kyiv, Ukraine.

Awards

2015	LLNL Deputy Director's for Science and Technology (DDS&T) Excellence in Publication Award for work in load balancing.
2009-2014	**Lawrence Scholar Program (LSP) Fellowship**, *Lawrence Livermore National Laboratory*. *Technical Supervisor:* Bronis R. de Supinski, Ph.D.
2006-2009	**NSF Graduate Research Fellowship**, Texas A&M University.
2004-2007	**GAANN Fellowship**, Texas A&M University.
2004-2005	Association of Former Students Fellowship, Texas A&M University.
2007-2011	Broader Engagement grant recipient, Supercomputing Conference.
2007	Award to attend CRA-W/CDC Programming Languages Workshop.
2005-2007	Award to attend and speak at CRA-W Grad Cohort, Computing Research Association.
2004	Award to attend Grace Hopper Conference and DMP reunion, Computing Research Association.
2003,2004	**Distributed Mentor Project**; Computing Research Association.
2004	Outstanding Senior in Computer Science; Western Oregon University.
2003	Outstanding Achievement in Computer Science, Outstanding Achievement in Mathematics.
2003	Who's Who Among Students in American Colleges and Universities, Phi Kappa Phi member.
1997	**Future Leaders Exchange Program**; one of one hundred recipients nationwide. U.S. Department of State, Freedom Support Act.

Research Experience

2014-present	**Lawrence Livermore National Laboratory**, *Computer Scientist*. Developing techniques and tools for load balancing scientific applications.
2009-2014	**Lawrence Livermore National Laboratory**, *Lawrence Scholar*. - Developed a model enabling the comparison of and selection among balancing algorithms for a specific state of a simulation. - Developend a framework for decoupling and offloading the load balance computation, enabling lazy load balancing. - Developed an accurate and fast method to evaluate and balance the load in N-Body simulations with highly non-uniform density, based on adaptive sampling.

2004-2009	**Texas A&M University, Department of Computer Science**, *Research Assistant*.

- Worked on distributed data structures in the Standard Template Adaptive Parallel Library (STAPL), a parallel superset of the C++ Standard Template Library. Implemented and optimized a parallel vector.
- Designed and implemented a set of parallel algorithms for STAPL. Assisted in development of the adaptive algorithm selection framework for STAPL.
- Explored the idea of lock-free containers for multi-threaded programming.
- Worked on a Dynamic Graph Composition Library for updating graph metrics of large, dynamic graphs.

May-Oct 2007, July-Aug 2008	**Lawrence Livermore National Laboratory**, *Research Intern*.

Worked on load balancing a multi-physics simulation via domain repartitioning and domain replication. Devised techniques to cheaply estimate processor loads and decide when a load imbalance needs to be corrected. Incorporated multi-constraint repartitioning (data parallelism) and domain replication (task parallelism) as a way to correct imbalance.

Summer 2003, Summer 2004	**Texas A&M University, Department of Computer Science**, *Undergraduate Research Intern*.

Designed and implemented a parallel array data structure and multiple parallel algorithms for the Standard Template Adaptive Parallel Library (STAPL), a parallel library for C++, superset of STL.

Committees

2015-Present	**Lawrence Livermore National Laboratory (LLNL)**, *Computation Directorate representative on Livermore Graduate Scholar Committee*.
2017	**ACM/IEEE Supercomputing Conference (SC)**, *Technical Program Committee*, Performance Measurement, Modeling, and Tools.
2017	**International Conference on Parallel Processing (ICPP)**, *Technical Program Committee*, Systems.
2017	**IEEE International Conference on Cluster Computing (Cluster)**, *Technical Program Committee*, Application, Algorithms, and Libraries.
2017	**IEEE International Parallel & Distributed Processing Symposium (IPDPS)**, *Technical Program Committee*, Software.
2016	**Grace Hopper Conference**, *Computer Systems Engineering Committee*.
2015	**ACM/IEEE Supercomputing Conference (SC)**, *Technical Posters Committee, Birds of a Feather Committee (Area: Programming Languages, Models, and Compilers)*.
2011	**Small Business Innovation Research (SBIR)**, *DOE Office of Science Grant Review Committee*.
2011	**ACM/IEEE Supercomputing Conference (SC)**, *Student Cluster Challenge Committee*.
2010-2011	**ACM/IEEE Supercomputing Conference (SC)**, *Tutorials Committee*.
2008	**ACM/IEEE Supercomputing Conference (SC)**, *Broader Engagement Committee*.

Professional Activities

Reviewing	SC'17, ICPP'17, Cluster'17, IPDPS'17, SBAC-PAD'16, GH'16, IPDPS'16, TPDS'13, SC'11, PPoPP'08, SC'07, IPDPS'07, ICS'07, HIPS'07, IPDPS'06, ICS'06, DISC'05, LCPC'05, PPoPP'05.
Volunteering	DOE Exascale Research Conference'12, SC'07 Student Cluster Challenge, Grace Hopper'06, SC'05.
Memberships	ACM.

University Activities

2004-2014	**Member**, *Computer Science Graduate Student Association (CSGSA)*, Texas A&M University.
2006-2008	**President**, *Aggie Women in Comp. Science (AWICS)*, ACM-W Chapter, Texas A&M University.
2006	**Invited Interview**, *Explore Computer Science website*.
2004-2006	**Mentoring Officer**, *Aggie Women in Computer Science (AWICS)*, ACM-W Chapter, Texas A&M.
2004	**Organizing Member**, *Pi Mu Epsilon Chapter*, Western Oregon University.
2002-2004	**Member**, *Math Club*, Western Oregon University.
1998-2000	**Class Representative**, *Student Government*, International Christian University.
1998-2000	**Project Member**, *Student Organization "Initiative"*, Leadership seminars for high school students.

Teaching and Mentoring

2015-present **Student Research Mentoring**, *Lawrence Livermore National Laboratory*.
- (Fall 2016) Emily Craig, CS/Math major (BS), Mount Holyoke College in Massachusetts. Senior thesis: Considering the impact of directional variance in bandwidth and latency on optimal data partitions in heterogeneous systems.
- (Summer 2016) Hadia Ahmed, CS major (PhD), University of Alabama at Birmingham. Studied performance impact of initial load imbalance and dynamic imbalance in the modified version of CoMD, an ExMatEx proxy application.
- (Summer 2015) Rasmus Larsen, CS major (MS), University of Copenhagen. Enabled overdecomposition and dynamic work redistribution in CoMD, an ExMatEx proxy application. Implemented a mechanism for introducing initial load imbalance and varying the imbalance throughout the simulation to facilitate exploration of various load balancing schemes.

2007 **Student Team Mentoring**, *Cluster Challenge*, ACM/IEEE Supercomputing Conference (SC).
- Mentored teams participating in the challenge, provided technical expertise in parallel performance and parallel applications ported by the teams to their clusters during the challenge.

2005-2009 **Student Research Mentoring**, *Texas A&M University*.
- Jeremy Vu, CSE major, Texas A&M University. Worked on parallel algorithms in STAPL.
- Harshvardhan, CS major, Texas A&M. Worked on STAPL Graph, Dynamic Graph Composition Library.
- Kelli Bacon, CRA-W DMP Program. CE major, Gonzaga U. Dynamic Graph Composition Library.
- Saransh Mittal, CSE major, Indian Inst. of Technology, Bombay. Dynamic Graph Composition Library.
- Anna Tikhonova, CRA-W DMP Program. CS major, U. of San Francisco. Parallel algorithms in STAPL.

2006 **Fellow**, *Graduate Teaching Academy*, Texas A&M University.

2006 **Student Mentoring Award**, *Aggie Women in Comp. Science (AWICS)*, Texas A&M University.

2002-2004 **Teaching Assistant**, *Department of Mathematics*, Western Oregon University.

2002-2004 **Tutor**, *Dept. of Computer Science and Dept. of Mathematics*, Western Oregon University.

2001-2004 **Youth Mentor**, *HOST Youth and Family Program*, Northwest Human Services.

Professional Experience

2003-2004 **Software Engineer**, *Department of Computer Science*, Western Oregon University.
Designed a multi-user web-based, database backend application for the Oregon Department of Agriculture.

2002-2004 **Lab Assistant**, *Department of Computer Science*, Western Oregon University.

2001-2003 **Youth Worker**, *Northwest Human Services*, Salem, Oregon.

2000-2001 **Electrical Test Operator**, *Tyco Printed Circuit Group*, Dallas, Oregon.

Skills

General C/C++, Java, Python, git, svn, CVS, autotools, CMake.

High Performance Computing Parallel performance tool development in C/C++. MPI profiling tools, runtime systems. Parallel algorithms and data structures. Measurement, analysis, and tuning of parallel applications on large clusters (IBM Blue Gene, Linux). Experience with large physics codes at LLNL.

Load Balancing Measurement tools, load analysis metrics, (hyper)graph partitioners, load balancing algorithms.

Graduate Coursework Algorithm Analysis, Parallel Algorithms, Generic Programming, Programming Languages, C++ Language Design, Computer Architecture, Compiler Design, Machine Learning, Numerical Methods, Supercomputing, and Runtime Systems.

Languages English (fluent), Ukrainian (native), Russian (fluent)

Publications

Refereed Publications in Conferences and Journals

[1] David Beckingsale, **Olga Pearce**, Ignacio Laguna, and Todd Gamblin. Apollo: Reusable Models for Fast, Dynamic Tuning of Data-Dependent Code. In *IEEE International Parallel & Distributed Processing Symposium (IPDPS'17)*, Orlando, Florida, USA, May 29 - June 2, 2017.

[2] David Boehme, Todd Gamblin, David Beckingsale, Peer-Timo Bremer, Alfredo Giménez, Matthew LeGendre, **Olga Pearce**, and Martin Schulz. Caliper: Performance Introspection for HPC Software Stacks. In *ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (SC'16)*, Salt Lake City, Utah, USA, November 13-18, 2016. LLNL-CONF-699263. (18%).

[3] **Olga Pearce**, Hadia Ahmed, Rasmus W. Larsen, and David F. Richards. Enabling Work Migration in CoMD to Study Dynamic Load Imbalance Solutions. In *Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS'16) held as part of ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (SC'16)*, Salt Lake City, Utah, USA, November 13, 2016. LLNL-CONF-704368. (22%).

[4] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. MPMD Framework for Offloading Load Balance Computation. In *IEEE International Parallel & Distributed Processing Symposium (IPDPS'16)*, Chicago, Illinois, USA, May 23-27, 2016. LLNL-CONF-678165. (23%).

[5] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Tom Arsenlis, and Nancy M. Amato. Load Balancing N-Body Simulations with Highly Non-Uniform Density. In *International Conference on Supercomputing (ICS'14)*, Munich, Germany, June 10-13, 2014. LLNL-CONF-648577. (21%).

[6] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Quantifying the Effectiveness of Load Balance Algorithms. In *International Conference on Supercomputing (ICS'12)*, Venice, Italy, June 25-29, 2012. LLNL-CONF-523343. (22%).

[7] Gabriel Tanase, Antal A. Buss, Adam Fidel, Harshvardhan, Ioannis Papadopoulos, **Olga Pearce**, Timmie G. Smith, Nathan Thomas, Xiabing Xu, Nedal Mourad, Jeremy Vu, Mauro Bianco, Nancy M. Amato, and Lawrence Rauchwerger. The STAPL Parallel Container Framework. In *ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP)*, pages 235–246, 2011. (16%).

[8] Antal A. Buss, Harshvardhan, Ioannis Papadopoulos, **Olga Pearce**, Timmie G. Smith, Gabriel Tanase, Nathan Thomas, Xiabing Xu, Mauro Bianco, Nancy M. Amato, and Lawrence Rauchwerger. STAPL: Standard Template Adaptive Parallel Library. In *3rd Annual Haifa Experimental Systems Conference (SYSTOR)*, 2010.

[9] Gabriel Tanase, Xiabing Xu, Antal A. Buss, Harshvardhan, Ioannis Papadopoulos, **Olga Pearce**, Timmie G. Smith, Nathan Thomas, Mauro Bianco, Nancy M. Amato, and Lawrence Rauchwerger. The STAPL pList. In *22nd International Workshop on Languages and Compilers for Parallel Computing (LCPC)*, pages 16–30, 2009.

[10] Nathan Thomas, Gabriel Tanase, **Olga Tkachyshyn**, Jack Perdue, Nancy M. Amato, and Lawrence Rauchwerger. A Framework for Adaptive Algorithm Selection in STAPL. In *ACM SIGPLAN Principles and Practice of Parallel Programming (PPoPP)*, pages 277–288, 2005. (31%).

Unreferered Publications and Technical Reports

[11] Rasmus Wriedt Larsen and **Olga Pearce**. Enabling Load Balancing in CoMD through Overdecomposition. Technical Report LLNL-TR-678978, Lawrence Livermore National Laboratory, November 2015.

[12] Rich Hornung, Holger Jones, Jeff Keasler, Rob Neely, **Olga Pearce**, Si Hammond, Christian Trott, Paul Lin, Courtenay Vaughan, Jeanine Cook, Mahesh Rajan, Rob Hoekstra, Ben Bergen, Josh Payne, and Geoff Womeldorff. ASC Tri-lab Co-design Level 2 Milestone Report. Technical Report LLNL-TR-677453, Lawrence Livermore National Laboratory, Sandia National Laboratories, Los Alamos National Laboratory, September 2015.

[13] Anna Tikhonova, Gabriel Tanase, **Olga Tkachyshyn**, Nancy M. Amato, and Lawrence Rauchwerger. Parallel algorithms in STAPL: Sorting and the selection problem. Technical Report TR05-005, Parasol Lab, Department of Computer Science, Texas A&M University, August 2005.

[14] Jie Liu, **Olga Tkachyshyn**, Cory Kissinger, and Brian McGee. Teaching parallel programming and building parallel computers. In *International Conference on Frontiers in Education: Computer Science and Computer Engineering*, pages 149–155, June 2005.

[15] **Olga Tkachyshyn**, Ping An, Gabriel Tanase, and Nancy M. Amato. pArray as an efficient static parallel container in STAPL. Technical Report TR03-003, Parasol Lab, Department of Computer Science, Texas A&M University, August 2003.

Ph.D. Dissertation

[16] **Olga Pearce**. *Load Balancing Scientific Applications*. PhD thesis, Texas A&M University, College Station, TX, December 2014. LLNL-TH-663256.

Posters and Presentations

[17] **Olga Pearce**, Hadia Ahmed, Rasmus W. Larsen, and David F. Richards. Enabling Work Migration in CoMD to Study Dynamic Load Imbalance Solutions. In *Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS'16) held as part of ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (SC'16)*, Salt Lake City, Utah, USA, November 13, 2016. LLNL-PRES-708520.

[18] David Beckingsale, **Olga Pearce**, and Todd Gamblin. Lightweight, Reusable Models for Dynamically Tuning Data-Dependent Code. In *SC'16*, Salt Lake City, UT, November 2016.

[19] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. MPMD Framework for Offloading Load Balance Computation. In *IEEE International Parallel & Distributed Processing Symposium (IPDPS'16)*, Chicago, Illinois, USA, May 26, 2016. LLNL-PRES-691340.

[20] David Boehme, Todd Gamblin, Peer-Timo Bremer, **Olga Pearce**, and Martin Schulz. Caliper: Composite Performance Data Collection in HPC Codes. In *SC'15*, Austin, TX, November 2015.

[21] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Improving Application Performance Through Affordable Load Balancing. In *Grace Hopper Conference*, Houston, TX, October 14, 2015. LLNL-POST-667498.

[22] Rich Hornung, Holger Jones, Jeff Keasler, Rob Neely, **Olga Pearce**, Si Hammond, Christian Trott, Paul Lin, Courtenay Vaughan, Jeanine Cook, Mahesh Rajan, Rob Hoekstra, Ben Bergen, Josh Payne, and Geoff Womeldorff. ASC Tri-lab Co-design Level 2 Milestone Report. September 2015. LLNL-TR-677453.

[23] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Improving Application Performance Through Affordable Load Balancing. In *LLNL Computation Directorate External Review Committee Meeting*, Livermore, CA, March 10, 2015. LLNL-POST-667498.

[24] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Decoupled Load Balancing. In *Symposium on Principles and Practice of Parallel Programming (PPoPP)*, San Francisco, CA, February 8, 2015. LLNL-CONF-665393, LLNL-POST-666820.

[25] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Tom Arsenlis, and Nancy M. Amato. Load Balancing N-Body Simulations with Highly Non-Uniform Density. In *JOWOG 34 Applied Computer Science*, Albuquerque, NM, February 4, 2015. LLNL-PRES-666427.

[26] **Olga Pearce**. Load Balancing Scientific Applications. In *SC'14 Doctoral Showcase*, New Orleans, LA, November 20, 2014. LLNL-MI-657788, LLNL-PRES-664457. (36%).

[27] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Tom Arsenlis, and Nancy M. Amato. Load Balancing N-Body Simulations with Highly Non-Uniform Density. In *Postdoc Poster Symposium*, Livermore, CA, July 9, 2014. LLNL-POST-653183.

[28] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Tom Arsenlis, and Nancy M. Amato. Load Balancing N-Body Simulations with Highly Non-Uniform Density. In *Parasol Seminar*, College Station, TX, June 20, 2014. LLNL-PRES-654858.

[29] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Tom Arsenlis, and Nancy M. Amato. Load Balancing N-Body Simulations with Highly Non-Uniform Density. In *International Conference on Supercomputing*, Munich, Germany, June 11, 2014. LLNL-PRES-654858.

[30] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Tom Arsenlis, and Nancy M. Amato. Load Balancing N-Body Simulations with Highly Non-Uniform Density. In *Salishan Conference on High Speed Computing*, Gleneden Beach, Oregon, April 23, 2014. LLNL-POST-653183.

[31] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Interaction-Based Load Balancing in N-Body Simulations. In *Postdoc Poster Symposium*, Livermore, CA, June 20, 2013. LLNL-POST-639346.

[32] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Interaction-Based Load Balancing in N-Body Simulations. In *Emerging Technologies in HPC Software Development*, Livermore, CA, June 12, 2013. LLNL-PRES-638872.

[33] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Quantifying the Effectiveness of Load Balance Algorithms. In *International Conference on Supercomputing*, Venice, Italy, June 28, 2012. LLNL-PRES-562253.

[34] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Quantifying the Effectiveness of Load Balance Algorithms. In *Salishan Conference on High Speed Computing*, Gleneden Beach, Oregon, April 25, 2012. LLNL-POST-548645.

[35] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Quantifying the Effectiveness of Load Balance Algorithms. In *Parasol Seminar*, Texas A&M University, College Station, TX, February 10, 2012. LLNL-PRES-527851.

[36] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. A Topology-aware Application-independent Load Model for Parallel Codes. In *Stockpile Stewardship Support Project Workshop (SSSP)*, Texas A&M University, College Station, TX, November 10, 2011. LLNL-POST-507591.

[37] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. A Topology-aware Application-independent Load Model for Parallel Codes. In *LLNL Lawrence Scholar Poster Session (LSP)*, Livermore, CA, October 25, 2011. LLNL-POST-507591.

[38] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Load Balance: Correlating Application-Independent Measurements with Application-Semantic Computational Models. In *Supercomputing 2010 (SC'10)*, New Orleans, LA, November 16, 2010. LLNL-POST-461997.

[39] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Modeling Load in Parallel Codes. In *Broader Engagement, Supercomputing 2010 (SC'10)*, New Orleans, LA, November 13, 2010. LLNL-PRES-462101.

[40] **Olga Pearce**, Todd Gamblin, Bronis R. de Supinski, Martin Schulz, and Nancy M. Amato. Load Balancing Petascale Applications. In *LLNL Computation Postdoctoral Poster Session*, Livermore, CA, June 29, 2010. LLNL-POST-432915.