

SUMMARY

Technology executive, researcher and engineer with several years experience leading high impact R&D organizations. Presently the Fellow of Data Science at the Moore Foundation and Visiting Faculty in Computational Science at Caltech. Previously led both Caltech's Center for Advanced Computing Research and the Information Sciences Lab of the Hughes Research Laboratories.

APPOINTMENTS

2013-present *Gordon and Betty Moore Foundation*, Palo Alto, California
Fellow of Data Science

2004-present *California Institute of Technology*, Pasadena
2010-present Visiting Faculty, Computational Science, Division of Physics, Mathematics & Astronomy
2008-2014 Executive Director and co-Investigator, NNSA/Caltech Predictive Science Center
2006-2012 Founding co-Director, Center for the Integrative Study of Cell Regulation
2004-2013 Executive Director, Center for Advanced Computing Research

PAST APPOINTMENTS

1991-2004 *Hughes Research Laboratories*, Malibu, California
1999-2004 Director, Information Sciences Lab
1998-2004 Senior Scientist
1998-1999 Manager, Computational Physics Department
1991-1998 Staff (Senior 1996-1998) Computer Scientist

1995-1997 *Merrill Lynch*, World Financial Center, New York
Consultant, Global Equity Derivatives

1981-1991 *Trace Instruments*, Canoga Park, California
Principal Engineer and Manager of Software Engineering

EDUCATION

University of Southern California, Los Angeles
1993 Ph.D. Computer Science, 3.95/4.0 GPA
1988 M.S. Computer Science

California State University, Northridge
1984 B.S. Mathematical Physics and Computer Science (double major)

University of California, Los Angeles
1999 Certificate in Executive Management, *Anderson Graduate School of Management*

AWARDS and SOCIETY MEMBERSHIPS

Fellow, American Association for the Advancement of Science, 2013
Distinguished Scientist, Association for Computing Machinery, 2008

BIO

Dr. Mark A. Stalzer is a fellow at the Gordon and Betty Moore Foundation where he is a senior advisor on the Data-Driven Discovery (DDD) initiative. The goal of DDD is to dramatically accelerate scientific discovery in the emerging “Big Data” era. Mark was previously the Director of the Center for Advanced Computing Research (CACR) at Caltech, and the Director of the Information Sciences Lab at the Hughes Research Laboratories. He is a visiting faculty member in Computational Science at Caltech.

CACR is Caltech’s center of eScience and works with dozens of campus research groups providing advanced algorithms, software engineering, visualization, and effective use of high performance computers. CACR often hosts other centers such as the Caltech/National Nuclear Security Administration’s Predictive Science Center (PSAAP) and the Center for the Integrative Study of Cell Regulation (Cell Center). Mark served as the executive director of the PSAAP center that involved ~60 faculty, staff, post-docs and graduate students. The center developed novel uncertainty quantification methods for computer simulations and legacy data. Dr. Stalzer was also the founding co-director of the Cell Center that supported Caltech’s Division of Biology and CACR on work in neurobiology simulations, biological image analysis, and genomics. As a researcher, Mark worked on efficient implementations of stochastic simulation algorithms. The resulting code has been downloaded over 20,000 times and is used routinely for biochemical simulations.

At the Hughes Research Labs (HRL), Dr. Stalzer directed a team of 70 Ph.D. level researchers working on ~50 projects with funding of \$20M/year. The Information Sciences Lab did work in information fusion, image analysis, ad-hoc networking, information security, human-computer interaction, and computational physics. He also served on the HRL executive committee working on general corporate issues and interacting with the four Fortune 100 firms (Boeing, GM, Hughes, and Raytheon) that owned HRL. One success is that Mark, with a colleague, initiated work in quantum computing and communications that has generated over \$100M in funding.

As a senior scientist at HRL, Mark was the principal investigator on a large DARPA contract that dramatically accelerated electromagnetic scattering calculations with applications to stealth vehicle design. The program involved several Hughes researchers and engineers, as well as faculty members at Yale. Advancements were made in fast multipole methods, high-order discretizations of integral equations, and parallel implementations. The resulting speedup of nine orders of magnitude was briefed to the House Armed Services Committee, and the techniques are now considered standard practice.

Mark has a Ph.D. in computer science from the University of Southern California, a B.S. in mathematical physics and computer science from the California State University, Northridge, and is an alumnus of the Anderson Graduate School of Management at UCLA. Dr. Stalzer is the author of over 50 papers and reports and is published in Intl. J. for Numerical Methods in Engineering, J. Mechanics and Physics of Solids, J. Chemical Physics, Trans. Computational Biology and Bioinformatics, J. Computational Physics, Parallel Processing Lett., Proc. Supercomputing, and holds three patents with one pending. He is a fellow of the AAAS and an ACM distinguished scientist.

OTHER ACTIVITIES

Grand Award Judge, Intel International Science and Engineering Fair, Los Angeles 2014.
Speaker, Rebooting Computing Summit II, Santa Cruz 2014.
Plenary speaker, Advanced Photon Source Users Meeting, Argonne National Lab 2013.
Visiting Scientist, Aspen Center for Physics, Summer 2009 & 2012.
Invited speaker, AstroInformatics, Caltech, Sorrento, Italy & Redmond, WA, 2010-2012.
Chair, Bylaws Committee, Coalition for Academic Scientific Computation, 2011-2013.
Reviewer, Mission Computing Technology, Jet Propulsion Lab 2005, 2006, 2009 & 2011.
Program committee, Space Mission Challenges for Information Technology, IEEE 2009, 2010 & 2011.
Chair, Applications Architecture Power Puzzle Panel, ACM/IEEE Supercomputing 2009.
Participant, Exploring the Future of Cloud Computing, World Economic Forum 2009.
Reviewer, Bioengineering Sciences and Technology, NIH 2009.
Participant, Workshop on Developing a Coherent Cyberinfrastructure, EDUCAUSE/CASC 2008.
Co-chair, Applications, Frontiers of Extreme Computing (Zettaflops), Santa Cruz 2007.
Co-organizer, Workshop on Interdisciplinary Strategic Issues for e-Science, Caltech 2007.
Co-chair, Workshop on Computational Science and Engineering, Caltech 2006.
National Academy of Engineering Frontiers Class of 2001.
Technical papers committee, ACM/IEEE Supercomputing 2000.

PROGRAMS

Co-PI, Scientific Software Innovation Institute for Advanced Analysis of X-Ray and Neutron Scattering Data (SIXNS), National Science Foundation, 2012-2014, \$478K.
Co-PI, MRI-R2: Acquisition of a compute cluster for high-fidelity simulations of gravitational wave sources- Facilitating LIGO and enabling multi-messenger astronomy, NSF, 2010-2013, \$1.05M
Co-PI, Bringing a Bayesian perspective to the study of large earthquakes and their impacts on the built environment, NSF, 2010-2014, \$700K.
Executive Director & co-PI, Center for Predictive Modeling and Simulation of High-Energy Density Dynamic Response of Materials, National Nuclear Security Administration, 2008-2014, \$17M.
PI, An open and scalable stochastic simulation library for biology, National Institutes of Health, 2007-2011, \$1.9M.
Co-Director, Center for the Integrative Study of Cell Regulation, Moore Foundation, 2006-2012, \$5.6M.
PI, Cluster expansion for applied and computational mathematics, NSF, 2006-2007, \$153K.
PI, ETF early operations (Teragrid), NSF, 2004-2007, \$500K.
PI, Fast methods for electromagnetic modeling, Defense Advanced Research Projects Agency, 1996-2000, \$5.5M.

PATENTS

Mark A. Stalzer, A system for the rapid processing and storage of data. Patent pending 2011.
Mark A. Stalzer, Storage reduction method for fast multipole field calculations (6,175,815).
Mark A. Stalzer, Scalable parallel processing apparatus and method for performing fast multipole scattering calculations (5,933,794).
James K. Berger and Mark A. Stalzer, Printed circuit board assembly tester (5,126,953).

REFEREED PAPERS* (15) and CONFERENCES (14)

*Mark Stalzer and Chris Mentzel. A review of influential works in data-driven discovery. In preparation for *Science Advances*, Jan 2015.
*Bo Li, Mark Stalzer, and Michael Ortiz. A massively parallel implementation of the Optimal Transportation Meshfree method for explicit solid dynamics. *International Journal for Numerical Methods in Engineering*, 100(1):40-61, 2014. DOI 10.1002/nme.4710.
*Andrew Lucas, Mark Stalzer, and John Feo. Parallel implementation of fast randomized algorithms for low rank matrix decomposition. *Parallel Processing Letters*, 24(1), 2014. DOI 10.1142/S0129626414500042.

- *Mark Stalzer. FlashBlades: System architecture and performance analysis. In *Proceedings Second Workshop on Architectures and Systems for Big Data*, Jun 2012, Portland, OR. ACM International Conference Proceedings Series.
- *A. Kidane et al. Rigorous model-based uncertainty quantification with application to terminal ballistics. Part I: Systems with controllable inputs and small scatter. *Journal of the Mechanics and Physics of Solids*, 60(5):983-1001, 2012. DOI 10.1016/j.jmps.2011.12.001.
- *M. Adams et al. Rigorous model-based uncertainty quantification with application to terminal ballistics. Part II: Systems with uncontrollable inputs and large scatter. *Journal of the Mechanics and Physics of Solids*, 60(5):1002-1019, 2012. DOI 10.1016/j.jmps.2011.12.002.
- *Sean Mauch and Mark Stalzer. An efficient method for computing steady state solutions with Gillespie's direct method. *Journal of Chemical Physics*, 133:144108, 2010. DOI 10.1063/1.3489354. PMID 20949988.
- *Sean Mauch and Mark Stalzer. Efficient formulations for exact stochastic simulation of chemical systems. *IEEE/ACM Transactions Computational Biology and Bioinformatics*, 8(1):27-35, 2011, (online Apr 2009). DOI 10.1109/TCBB.2009.47. PMID 21071794. The open source is available at sourceforge.net/projects/cain/, and it has been downloaded over 20,000 times.
- Paul Springer et al. Porting some key Caltech & JPL applications to a PS3 cluster - A wild ride. *High Performance Embedded Computing Workshop*, Lexington, MA, Sep 2008. MIT Lincoln Laboratory.
- *John J. Ottusch, Mark A. Stalzer, John L. Visser, and Stephen M. Wandzura. Scalable electromagnetic scattering calculations for the SGI Origin 2000. In *Proceedings SC99*, Portland, OR, Nov 1999. IEEE.
- *Lawrence S. Canino, John J. Ottusch, Mark A. Stalzer, John L. Visser, and Stephen M. Wandzura. Numerical solution of the Helmholtz equation in 2d and 3d using a high-order Nystrom discretization. *Journal of Computational Physics*, 146:627-663, 1998. Cited 191 times (Oct 2014).
- *Mark F. Gyure and Mark A. Stalzer. A prescription for the multilevel Helmholtz FMM. *IEEE Computational Science & Engineering*, 5(3):39-47, Jul 1998. Cited 95 times (Oct 2014).
- *Vladimir Rokhlin and Mark A. Stalzer. Scalability of the fast multipole method for the Helmholtz equation. In *Eight SIAM Conference on Parallel Processing for Scientific Computing*, Minneapolis, MN, Mar 1997. SIAM.
- *Mark A. Stalzer. A parallel fast multipole method for the Helmholtz equation. *Parallel Processing Letters*, 5(2):263-274, 1995.
- *Mark A. Stalzer. Parallelizing the fast multipole method for the Helmholtz equation. In *Seventh SIAM Conference on Parallel Processing for Scientific Computing*, San Francisco, CA, Feb 1995. SIAM.
- Lisa Hamilton, John J. Ottusch, Mark A. Stalzer, R. Steven Turley, John Visser, and Stephen Wandzura. The fast multipole method for large 3d scatterers. In *Progress in Electromagnetics Research Symposium*, Seattle, WA, Jul 1995. University of Washington.
- Lisa R. Hamilton, John J. Ottusch, Mark A. Stalzer, R. Steven Turley, John L. Visser, and Stephen M. Wandzura. The fast multipole method for large 2d scatterers. In *11th Annual Review of Progress in Applied Computational Electromagnetics*, Monterey, CA, Mar 1995. Applied Computational Electromagnetics Society.
- Lisa R. Hamilton, John J. Ottusch, Mark A. Stalzer, R. Steven Turley, John L. Visser, and Stephen M. Wandzura. Accuracy estimation and high order methods. In *11th Annual Review of Progress in Applied Computational Electromagnetics*, Monterey, CA, Mar 1995. Applied Computational Electromagnetics Society.
- Lisa Hamilton, Mark Stalzer, R. Steven Turley, John Visser, and Stephen Wandzura. FastScat benchmark data. In *Proceedings HAVE FORM Symposium*, Wright Patterson AFB, OH, Feb 1995.
- Lisa R. Hamilton, Perry A. Macdonald, Mark A. Stalzer, R. Steven Turley, John L. Visser, and Stephen M. Wandzura. Electromagnetic scattering computations using high-order basis functions and the method of moments. In *IEEE Antennas and Propagation Society International Symposium Digest*, Seattle, WA, Jun 1994. IEEE.
- Lisa Hamilton, Mark Stalzer, R. Steven Turley, John Visser, and Stephen Wandzura. Surface modeling in C++. In *IEEE Antennas and Propagation Society International Symposium Digest*, Seattle, WA, Jun 1994. IEEE.
- Lisa Hamilton, Mark Stalzer, R. Steven Turley, John Visser, and Stephen Wandzura. Three dimensional scattering computation using the fast multipole method. In *Progress in Electromagnetics Research Symposium*, Pasadena, CA, Jul 1993. Jet Propulsion Laboratory.

- Lisa Hamilton, Mark Stalzer, R. Steven Turley, John Visher, and Stephen Wandzura. Methods of moments scattering computations using high-order basis functions. In *IEEE Antennas and Propagation Society Symposium Digest*, Ann Arbor, MI, Jun 1993. IEEE.
- Lisa Hamilton, Mark Stalzer, R. Steven Turley, John Visher, and Stephen Wandzura. The importance of accurate surface models in RCS computations. In *IEEE Antennas and Propagation Society Symposium Digest*, Ann Arbor, MI, Jun 1993. IEEE.
- Lisa Hamilton, Mark Stalzer, R. Steven Turley, John Visher, and Stephen Wandzura. The fast multipole method for the Helmholtz equation. In *Physics Computing 1993*, Albuquerque, NM, Jun 1993. APS Division of Computational Physics and Computers in Physics.
- Lisa Hamilton, Mark Stalzer, R. Steven Turley, John Visher, and Stephen Wandzura. Scattering computation using the fast multipole method. In *IEEE Antennas and Propagation Society Symposium Digest*, Ann Arbor, MI, Jun 1993. IEEE.
- *Lisa Hamilton, Mark Stalzer, R. Steven Turley, John Visher, and Stephen Wandzura. FastScat: an object-oriented program for fast scattering computation. *Scientific Programming*, 2(4):171-178, 1993.
- Stephen Wandzura, R. Steven Turley, and Mark Stalzer. Implementing enhanced integral equation solvers. In *Electromagnetic Code Consortium*, Huntsville, AL, Apr 1992.
- Mark A. Stalzer. Mathematical Guarding: A new approach to board assembly testing. In *Proceedings IEEE International Test Conference*, Washington, DC, Sep 1987. IEEE.

REPORTS (25)

- Michael Ortiz and Mark Stalzer. Center for Predictive Modeling and Simulation of High-Energy Density Dynamic Response of Materials. Final Report, Apr 2014. Annual Reports (5), Feb 2013-2009. CACR.
- Christian Ott, Lee Lindblom, Mark Scheel, and Mark Stalzer. MRI-R2: Acquisition of a compute cluster for high-fidelity simulations of gravitational wave sources-Facilitating LIGO and enabling multi-messenger astronomy. Final Report, Jun 2013. TAPIR/CACR.
- Mary Kennedy and Mark Stalzer. Center for Integrative Study of Cell Regulation. Annual Reports (6), Nov-Dec 2012-2007. CACR.
- Mark Stalzer. An open and scalable simulation library for biology. Final Report, Jan 2012. CACR.
- Mark Stalzer, Emmanuel Candes, Oscar Bruno, and Thomas Hou. Cluster expansion for applied and computational mathematics. Final Report, Dec 2007. CACR.
- Mark Stalzer. ETF early operations: CACR/CIT. Final Report, May 2007. CACR.
- Paul Dimotakis, Daniel Lang, Jan Lindheim, Santiago Lombeyda, John McCorquodale, Dan Meiron, James Pool, and Mark Stalzer. Development of the distributed Teravoxel data system: acquisition, networking, archiving, analysis, and visualization. Final Report, 2006. CaltechCACR:2006.101.
- Larry S. Canino, Harry F. Contopanagos, Mark F. Gyure, Lisa R. Hamilton, John J. Ottusch, Richard S. Ross, Mark A. Stalzer, Geoff D. Simms, John L. Visher, Stephen M. Wandzura, Ronald Coifman, Leslie Greengard, T. Hagstrom, Vladimir Rokhlin, and Norman Yarvin. Fast methods for electromagnetic modeling. Final Report, Aug 2000. HRL.
- John J. Ottusch, Geoff D. Simms, Mark A. Stalzer, John L. Visher, and Stephen M. Wandzura. Fast methods for electromagnetic modeling. Annual Report, Aug 1999. HRL.
- Larry S. Canino, Mark F. Gyure, Lisa R. Hamilton, John J. Ottusch, Richard S. Ross, Mark A. Stalzer, John L. Visher, Stephen M. Wandzura, Ronald Coifman, Leslie Greengard, Vladimir Rokhlin, and Norman Yarvin. Fast methods for electromagnetic modeling. Annual Reports (2), Jul 1998, Jul 1997. HRL.
- Larry S. Canino, Mark F. Gyure, Lisa R. Hamilton, John J. Ottusch, Richard S. Ross, Mark A. Stalzer, R. Steven Turley, John L. Visher, and Stephen M. Wandzura. Fast methods for electromagnetic modeling. Annual Report, Jul 1996. HRL.
- Larry S. Canino, Mark F. Gyure, Lisa R. Hamilton, John J. Ottusch, Richard S. Ross, Mark A. Stalzer, R. Steven Turley, John L. Visher, and Stephen M. Wandzura. Fast multipole methods for scattering computation. Final Report, Sep 1995. HRL.
- Lisa R. Hamilton, Mark A. Stalzer, R. Steven Turley, John L. Visher, and Stephen M. Wandzura. Fast multipole methods for scattering computation. Annual Reports (3), Aug 1994, Aug 1993, Aug 1992. HRL.
- Mark A. Stalzer. *Symbolic verification of real-time controllers*. Ph.D. Dissertation, Dec 1993. USC.