

Kevin Long
Department of Mathematics and Statistics
Texas Tech University
Lubbock, TX 97409
kevin.long@ttu.edu

EDUCATION

Princeton University Ph.D. in Astrophysics, 1990.

Thesis: *Kinematics and Dynamics of Barred Galaxies*

Advisor: David Spergel

University of Maryland, College Park B.S. in Astronomy, 1986.

High Honors in Astronomy

Thesis: *Tidal Disruption of Open Star Clusters by their Parent Molecular Clouds*

Advisor: Leo Blitz

Prince George's County Community College

Attended 1981-82.

POSITIONS HELD

Aug 2007-present	Texas Tech University , Lubbock, TX Department of Mathematics and Statistics Associate Professor, Aug 2008-present Visiting Assistant Professor, Aug 2007-Aug 2008
1998-2007	Sandia National Laboratories , Livermore, CA Computational Sciences and Mathematics Research Department Principal Member of the Technical Staff, 2004-2007 Senior Member of the Technical Staff, 2000-2004 Limited Term Technical Staff, 1998-2000
1996-1998	Beam Technologies , Ithaca, NY Research staff
1992-1995	SUNY at Brockport , Brockport, NY Assistant Professor, Physics Department
1990-1992	University of Massachusetts , Amherst, MA Postdoc, Physics Department
1986-1990	Princeton University , Princeton, NJ Graduate Research Assistant, Astrophysics Department Graduate Teaching Assistant, Astrophysics Department (Spring 1989)
1985-1986	University of Maryland , College Park, MD Undergraduate Teaching Assistant, Physics Department Undergraduate Research Assistant, Physics Department (Summer 85,86)
Summer 1984	National Bureau of Standards , (now NIST) Gaithersburg, MD Undergraduate Student Intern, Metallurgy Department

PUBLICATIONS

Articles (Refereed)

- R.A. Erickson, S. B. Cox, J.L. Oates, T.A. Anderson, C.J. Salice, K.R. Long, *A Daphnia population model that considers pesticide exposure and demographic stochasticity*, 2014, *Ecological Modeling*, 275:37-47
- P.T. Boggs, D.M. Gay, S.K. Griffiths, R.M. Lewis, K.R. Long, S. Nash, and R.H. Nilson, *Optimization Algorithms for Hierarchical Problems with Application to Nanoporous Materials*, 2012, *SIAM J. Optim.*, v.22(4), p.1285-1308
- K. Long, P.T. Boggs, and B.G. van Bloemen Waanders, *Sundance: High-Level Software for PDE-Constrained Optimization*, 2012, *Scientific Programming*, v.20(3) p.293-310.
- V.E. Howle, R.C. Kirby, K. Long, B. Brennan, and K. Kennedy, *Playa: High performance programmable linear algebra*, 2012, *Scientific Programming*, v.20(3) p.257-273.
- R.A. Erickson, K. Hayhoe, S.M. Presley, L.J.S. Allen, K. Long, and S.B. Cox, *Potential Impacts of Climate Change on the Ecology of Dengue and its Mosquito Vector the Asian Tiger Mosquito (Aedes albopictus)*, 2012, *Environmental Research Letters*, v. 7 (3), 034003
- R. Iyer, K. Long, and J. Milhollan, *Micromagnetics with Eddy Currents*, 2011, *Journal of Physics: Conference Series*, v.268, 012011.
- K. Long, R. C. Kirby, and B. van Bloemen Waanders, *Unified Embedded Parallel Finite Element Computations via Software-based Frechet Differentiation*, 2010, *SIAM Journal on Scientific Computing*, volume 32, number 6, pp 3323-3351.
- R. A. Erickson, S. M. Presley, L. J. S. Allen, K. R. Long, and S. B. Cox. *A dengue model with a dynamic, Aedes albopictus vector population*, 2010, *Ecological Modeling*, volume 221, pp. 2899-2908.
- R. A. Erickson, S. M. Presley, L. J. S. Allen, K. R. Long, and S. B. Cox. 2010. *A stage-structured, Aedes albopictus population model*, *Ecological Modeling* 221:1273-1282.
- R. Shuttleworth, H. Elman, K. Long (20%), and J. Templeton, *Scalable Solvers for Induced Charge Electrophoresis*, *International Journal for Numerical Methods in Fluids*, 2009, DOI: 10.1002/flid.2188
- H. Adalsteinsson, B. Debusschere, K. Long, and H. Najm, *Components for atomistic-to-continuum multiscale modeling of flow in micro- and nanofluidic systems*, *Scientific Programming* 2008, Volume 16, Number 4, Page 297.
- P. Boggs, K. Long, S. Margolis, and P. Howard, *Rapid Source Inversion for Chemical/Biological Attacks, Part 1: The Steady-State Case*, *SIAM Journal on Optimization*, Vol 17., No. 2, p. 430, 2006.
- M. Heroux, R. Bartlett, V. Howle, R. Hoekstra, J. Hu, T. Kolda, R. Lehoucq, K. Long, R. Pawlowski, E. Phipps, A. Salinger, H. Thornquist, R. Tuminaro, J. Willenbring, A. Williams, and K. Stanley, *An Overview of the Trilinos Project* *ACM Transactions on Mathematical Software*, Vol. 31, No. 3, September 2005.
- V. Akcelik, G. Biros, O. Ghattas, K. Long, and B. van Bloemen Waanders, *A Variational Finite Element Method for Source Inversion for Convective-Diffusive Transport*, *Finite Elements in Analysis and Design*, vol 39, p. 683, 2003.
- Mancuso, R.V. and Long, K.R. 1995, *The Astro-Blaster*, September 1995 issue of *The Physics Teacher*.
- Long, K. and Murali, C. 1992, *Analytical Potentials for Barred Galaxies*, *The Astrophysical Journal*, 397, 44

- Long, K., Ostriker, J.P., and Aguilar, L.A. 1992, *Would a Galactic Bar Destroy the Globular Cluster System?*, *The Astrophysical Journal*, 388, 362.
- Long, K. 1988, *Tidal Disruption of Open Clusters in their Parent Molecular Clouds*, *The Astrophysical Journal*, 341, 796.
- Paczynski, B. and Long, K. 1988, *Distribution of Intensities of Gamma-Ray Bursts*, *The Astrophysical Journal*, 333, 694.

Proceedings (refereed)

- J. Carrell, K. Long, H.-C. Zhang, and S. Imam, *Modeling of Heat Transfer in Shape Memory Polymer Nanocomposites*, 2012, ASME Conference Proceedings, IMECE-2012-87702.
- A. R. Terrel and K. Long, *Evaluation of Level Set Topology Optimization Formulations for Design of Minimum-Dispersion Microfluidic Devices*, Proceedings of the Nanoscience, Engineering, and Computation Institute at Sandia, Sept 2006.
- J. P. Reese, K. Long, C. T. Kelley, W. G. Gray, and C. T. Miller, *Simulating Non-Darcy Flow Through Porous Media using Sundance*, in Proceedings of the XVI International Conference on Computational Methods in Water Resources, Copenhagen, Denmark, June 2006.
- K. R. Long, *Sundance: a rapid prototyping tool for parallel PDE optimization*, in *Large-Scale PDE-Constrained Optimization, Lecture Notes in Computational Science and Engineering*, Volume 30, pp. 331-341, Springer, 2003, editors L. T. Biegler, O. Ghattas, M. Heinkenschloss, B. G. van Bloemen Waanders.
- K. Long and B. van Straalen, *PDESolve: an Object-Oriented PDE Analysis Environment*, in proceedings of the 1998 SIAM Workshop on *Object-Oriented Methods for Interoperable Scientific and Engineering Computing*, editors M. E. Henderson, C. R. Anderson, and S. L. Lyons, SIAM, 1999.
- A.H. Kahn, K.R. Long, S. Ryckebusch, T. Hsieh, and L.R. Testardi, 1986, *Determination of Electrical Conductivity Profiles from Frequency-Sweep Eddy Current Measurement*, in *Review of Progress in Quantitative Non-Destructive Evaluation*, 5B, p. 1383.

Extended Abstracts (refereed)

- K. Long, *Efficient Discretization and Differentiation of Partial Differential Equations through Automatic Functional Differentiation*, 4th International Conference on Automatic Differentiation, July 2004

Technical Reports (non-refereed)

- B. Debusschere, M. Hickner, F. Zendejas, H. Adalsteinsson, H. Tran, K. Long, H. Najm, D. Chinn, M. Kent, and B. Simmons, *Computational and Experimental Study of Nanoporous Membranes for Water Desalination and Decontamination*, 2008, Sandia National Laboratories Technical Report SAND2008-7603.
- B. van Bloemen Waanders, S. Altman, B. Carnes, J. Hill, K. Long, L. McGrath, and Y. Marzouk, *Decontamination of Water Networks: A Numerical and Experimental Investigation of Biofilms*, 2008, Sandia National Laboratories Technical Report SAND2008-8127.
- K. Long, *Sundance 2.0 Tutorial*, Sandia National Laboratories Technical Report SAND2004-4793
- M. Heroux, R. Bartlett, V. Howle, R. Hoekstra, J. Hu, T. Kolda, R. Lehoucq, K. Long, R. Pawlowski, E. Phipps, A. Salinger, H. Thornquist, R. Tuminaro, J. Willenbring, A. Williams, and K. Stanley, *An Overview of Trilinos*, Sandia National Laboratories Technical Report SAND2003-2927.

- B. van Bloemen Waanders *et. al.*, *Algorithm and Simulation Support for Response Strategies for Contamination Events in Air and Water Systems*, Sandia National Laboratories Technical Report SAND2006-0074.
- B. van Bloemen Waanders, R. Bartlett, K. Long, P. Boggs, and A. Salinger *Large-scale Nonlinear Programming for PDE-Constrained Optimization* Sandia Technical Report, SAND2002-3198

Manuscripts Currently Submitted

- K.R. Long, K.D. McKale, and L. Juan, *Fast Computation of Inverse Transcendental Functions of Polynomial Chaos Expansions Through Iterated Means*, submitted to *International Journal on Numerical Analysis and Modeling*, Dec 2014.

PROFESSIONAL PRESENTATIONS

Conference Presentations

- K. Long, P. Boggs, and B. van Bloemen Waanders, *Software Tools for PDE-constrained Optimization*, SIAM Conference on Computational Science and Engineering, Boston MA, 27 Feb 2013.
- K. Long and K. D. McKale, *New Tricks for an Old Dog: Archimedes, Gauss, and the Fast Computation of Stochastic Inverse Transcendentals*, US DOE Applied Math PI Meeting, Reston, VA, 17 Oct 2011.
- K. Long, *Scientific Computing in the Real World*, Texas Applied Math Meeting for Students, 2 April 2011, Lubbock, TX
- K. Long and K. D. McKale, *Archimedes, Gauss, and Uncertainty Quantification: A new (old) approach to the efficient computation of stochastic transcendentals*, 2011 Uncertainty Quantification Workshop, University of Southern California, Los Angeles, CA, 7 March 2011.
- K. Long, *Automated Embedded Uncertainty Quantification in PDE Simulations*, Workshop on Uncertainty Quantification in Multiscale Systems, Johns Hopkins University, 20 July 2010.
- K. Long, *Automated Self-Assembly of Components for Multiphysics Simulation*, SIAM Conference on Parallel Computing, Seattle, WA, 26 Feb 2010.
- K. Long, *Sundance Hands-On Tutorial*, DOE ACTS Workshop, 20 Aug 2008, Lawrence Berkeley National Laboratory
- K. Long, *Combinatorial Dataflow Analysis for Differentiation of High-Level PDE Simulations*, SIAM Annual Meeting, 11 July 2008, San Diego, CA.
- K. Long, *Sundance: A Trilinos package for efficient developers of efficient simulators*, Copper Mountain Trilinos Workshop, 7 Apr 2008, Copper Mountain, CO. 11 July 2008, San Diego, CA.
- B. Debuschere, H. Adalsteinsson, K. Long, H. Najm, M. Hickner, P. Ponce, B. Simmons, and R. Davalos, *Multiscale Simulation of Ionic Flux through a Nanopore*, American Physical Society Division of Fluid Dynamics, Nov 2006.
- K. Long, *Rapid Development of Efficient Codes for PDE Simulation and Optimization*, Sandia CIS External Review, Albuquerque, NM, August 2005
- K. Long and M. Heroux, *The Trilinos Solver Framework*, ACTS Workshop, Lawrence Berkeley Laboratory, Sept 2002
- P. Boggs and K. Long, *Tightly-Coupled SQP Algorithms from Loosely-Coupled Components*, First SIAM Conference on Computational Science and Engineering, Washington DC, Sept 2000
- K. Long and B. van Straalen, *PDESolve: an Object-Oriented Environment for PDE Simulations*, SIAM Workshop on Interoperable Object-Oriented Computing, IBM Research Center, Oct 1998

- Chase, J.R. and Long, K.R. 1995, *Analytical Approximations for Potentials of Nearly Spherical Galaxies.*, presented at the 1995 National Conference on Undergraduate Research.
- Long, K. and Weinberg, M. D. 1993, *Tidal Influences on Satellite Shapes.*, presented at the January 1993 meeting of the American Astronomical Society.
- Long, K. and Weinberg, M. D. 1993, *Effect of a Galactic Bar on the Distribution of Long-Period Variables.* published in *Back to the Galaxy*, the proceedings of the 3rd annual Maryland Conference on Astrophysics.

FUNDING

- Co-PI for *Metanumerical Computing for Emerging Architectures: Automated Embedded Algorithms for Partial Differential Equations on Multicore Platforms*, NSF, \$499,654, Oct 2011-Nov 2014.
- PI for *Finite Element Discretization of Materials with Networks of Nanoscale Pores*, subcontract from Sandia National Laboratories, funded for \$34996 for one year beginning Apr 2011
- PI for *Finite Element Discretization of Materials with Networks of Nanoscale Pores*, subcontract from Sandia National Laboratories, funded for \$30808 for one year beginning Nov 2009
- PI for *Quantifying Prediction Fidelity in Multiscale Multiphysics Simulations*, DOE Office of Science, funded for \$74,915 over one year beginning Oct 2009, continued for \$71,000 for year beginning Oct 2010.
- PI for *Uncertainty Quantification for Petascale Simulation of Carbon Sequestration through Fast Ultra-Scalable Stochastic Finite Element Methods*, NSF, funded for \$269,899 over three years beginning July 2009
- Co-PI on NSF project, *Automated Intrusive Algorithms for Numerical Solution of Partial Differential Equations via Software-Based Frechet Differentiation*, with R. Kirby and V. Howle, Funded for \$355,685 over 3 years, beginning 1 Oct 2008.
- Co-PI on TTU Research Enhancement Foundation project, *Automated Scientific Computing: High-Level, High-Performance Finite Element Software*. Funded for \$35,000, 1 Sept 2008-31 Aug 2009
- PI on TTU subcontract for *Finite Element Methods for Local Density Functional Theory Simulations of Electronic Structure Calculations*, from Sandia National Laboratories, Fall 2008, \$22,310.
- PI on TTU subcontract for *Computational and Experimental Study of Nanoporous Membranes for Water Desalination and Decontamination*, from Sandia National Laboratories, Summer 2008, \$13,975.
- Co-investigator on *Computational and Experimental Study of Nanoporous Membranes for Water Desalination and Decontamination*, 2006, through DOE LDRD program at Sandia National Laboratories, Livermore. PI Bert Debusschere. Total funding is \$1.68 million (3 years).
- Principal investigator on *Efficient Algorithms for Robust Decision Making through PDE-Constrained Optimization*, 2004, through DOE CSRF program at Sandia National Laboratories, Livermore. Total funding \$675,000 (3 years).
- Principal investigator on *Shape and Topology Optimization for Improving the Performance of Microfluidic Sensors*, 2003, through DOE LDRD program at Sandia National Laboratories, Livermore. Total funding \$620,000 (3 years).
- Principal investigator on *Topology Optimization for Improving the Performance of Microfluidic Sensors*, 2002, through DOE CSRF program at Sandia National Laboratories, Livermore. Total funding \$150,000 (1 year).
- Co-investigator on *Computational Tools for Rapid Response to Toxic Release in Buildings*, 2002, through DOE CSRF program at Sandia National Laboratories, Livermore. PI Paul Boggs. Total funding \$450,000 (3 years).

- Co-investigator on *Large-Scale Nonlinear Programming for PDE-Constrained Optimization*, 1999, through DOE LDRD program at Sandia National Laboratories, Albuquerque. PI Bart van Bloemen Waanders.
- Co-investigator on *A Tool for Analysis and Optimization of the Dynamics of High-Lift Control Devices*, SBIR through NASA. PI Gahl Berkooz. Total funding \$599,154 (2 years)
- Co-investigator on *An Object-Oriented Toolbox for Distributed Parameter Control Design with Application to JSF*, SBIR through USAF AFOSR. PI Gahl Berkooz. Total funding \$100,000 (9 months).
- Co-investigator on *A toolbox for partial differential equation based optimization with an application to optimizing materials processing*, SBIR through USAF AFOSR. PI Gahl Berkooz. Total funding \$750,000 (2 years).
- Co-investigator on *A Domain Specific Library and API for Simulation of Partial Differential Equations in Heterogeneous Environments*, SBIR through DARPA. PI Gahl Berkooz. Total funding \$306,481 (2 years).

TEACHING

Courses taught

- At TTU
 - Spring 2015: Numerical Analysis (4310); Higher Mathematics for Scientists and Engineers II (3351)
 - Fall 2014: Topics in Numerical Analysis: Numerical Methods for Ordinary Diff (5344); Higher Mathematics for Scientists and Engineers II (3351)
 - Spring 2014: Numerical Analysis II (5335); Higher Mathematics for Scientists and Engineers II (3351)
 - Fall 2013: Numerical Analysis I (5334); Higher Mathematics for Scientists and Engineers II (3351)
 - Spring 2013: Principles of Classical Applied Analysis II (5311); Topics in Numerical Analysis: High-Performance Numerical Linear Algebra (5345)
 - Fall 2012: Principles of Classical Applied Analysis I (5310); Topics in Numerical Analysis: A Practical Introduction to Finite Element Methods (5344)
 - Spring 2012: Numerical Analysis II (5335)
 - Fall 2011: Numerical Analysis I (5334)
 - Spring 2011: Principles of Classical Applied Analysis II (5311)
 - Fall 2010: Principles of Classical Applied Analysis I (5310)
 - Spring 2010: Principles of Classical Applied Analysis II (5311)
 - Fall 2009: Principles of Classical Applied Analysis I (5310); Higher Mathematics for Scientists and Engineers II (3351)
 - Spring 2009: Principles of Classical Applied Analysis II (5311)
 - Fall 2008: Higher Mathematics for Scientists and Engineers I (3350)
 - Spring 2008: Higher Mathematics for Scientists and Engineers I (3350)
 - Fall 2007: Calculus II (1351)
- At SUNY
 - Fall 1995: Classical Physics; General Astronomy with Lab
 - Spring 1995: Statistical Mechanics and Thermodynamics; General Astronomy with Lab
 - Fall 1994: Classical Physics; General Astronomy with Lab

- Spring 1994: Classical Mechanics; General Astronomy with Lab
- Fall 1993: Modern Physics; General Astronomy with Lab
- Spring 1993: Classical Mechanics; General Astronomy with Lab
- Fall 1992: Statistical Mechanics and Thermodynamics; General Astronomy with Lab

RESEARCH DIRECTION

Chair or Co-Chair of Doctoral Committees

- Richard Erickson (Environmental Toxicology), *Quantifying the Effects of Toxicants on Ecological Populations*
- Senay Tewalde (Mechanical Engineering), in progress, thermal detection of retinal tumors
- Chandani Dissanayake, in progress, multiscale PDE-constrained optimization
- Josh Engwar, in progress, computational electromagnetics
- Simon Rush, in progress, wake interference in wind farms

Member of Doctoral Committees

- James E. Bragg (TTU Electrical Engineering) *Ferrimagnetic-Based Coaxial Nonlinear Transmission Lines*
- Cory Farley (TTU Mechanical Engineering) *Reactions of aluminum with halogen containing oxides*
- Nick Landes (TTU Civil Engineering) *Experimental Studies and Mathematical Modeling of Simultaneous Nitrification/Denitrification in Membrane-Aerated Biofilm Reactors*
- Anton Kliewer (TTU Math) *Monte Carlo Methods for Jump Diffusion Processes*
- Janelle Charles (TTU Math) *Probability distribution estimation using control theoretic smoothing splines*
- Brian Miller (TTU Math) *On the integration of elementary functions: Computing the logarithmic part*
- Masaki Ogura (TTU Math) *Mean Stability of Switched Linear Systems*
- Dinesh Ekanayake (TTU Math) *Robust control of saturating, non-monotone hysteretic systems with nonlinear frequency-dependent power losses*
- Matthew Lochman (TTU Math) *An extremal problem for convex continua*
- Janitha Gunatilake (TTU Math) *Hierarchical Bases and a Multilevel Finite Element Solver*
- Rochana Meegaskumbura (TTU Math) *Control Theoretic Smoothing Splines with Derivative Constraints*
- Alexandre Cunha (Carnegie Mellon University, Computational Science and Engineering) *A fully Eulerian method for shape optimization with application to Navier Stokes flows*

Chair of Masters' Committees

- Brad Armstrong, MS Thesis, *Numerical Simulation of 1D Compressible Flow*
- Simon Rush, MS Report, *Spectral Methods in Uncertainty Quantification*
- Kimberly Kennedy, MS Thesis, *Implementing Conjugate Gradients with Incomplete Cholesky Preconditioning in Playa*

- Vipin Palande, MS Report, *Experimental Study of a Factorization-Free Algorithm for Identifying the Eigenvalues Missed by an Eigensolver*
- Jedediah Goehlke, MS Thesis, *A Validation Study of a Software Implementation of the Gauge Finite Element Method for the Incompressible Navier-Stokes Equations*
- Kaleb McKale, MS Thesis, *Archimedes, Gauss, and Stochastic Computation: a New (Old) Approach to Fast Computation of Stochastic Transcendentals*
- Jon Milhollan, MS Thesis, *A Numerical Study of Ferromagnetic Bodies with Dynamic Boundary Conditions*
- Chandani Dissanayake, MS Report, *Regularized Image Matching Through Finite Element Methods*

Member of Masters' Committees

- Richard Erickson
- Sarah Osborn
- Anna Krylova
- Morgan Blackwell
- King David Manga
- Joe Tipton
- Jarod Clopton
- Ashlee Fuchs
- Josef Cepak (Mechanical Engineering)

Student Interns Supervised (Sandia)

- Catherine Beni (2005-2007, Caltech, NPSC Graduate Fellow)
- Andy Terrel (2006, University of Chicago)
- Jill Reese (2004-2005, North Carolina State University)
- Patricia Howard (2003-2005, WPI, Rice)
- Allen Harvey (2003, undergraduate, SUNY at Brockport)
- Clemens Kadow (2002, Carnegie Mellon University)
- Mike Boldt (2002, undergraduate, St. John's University)
- John Gentile (2001, undergraduate, SUNY at Brockport)

Student Interns Supervised (BEAM)

- Adam Florence (1997, Cornell)

SERVICE

Departmental service

- Search Committee for Department Chair (2015)
- Numerical Analysis Prelim Committee (2009-present)
- Hiring Committee (2011-2013)
- Teaching review for graduate TAs (2007-present)
- Arts & Sciences Research Council (2012-present)

Program Reviews

- External Review Committee Member, Review of TTU Department of Physics Graduate Program, 2014

Refereeing

- SIAM Journal on Scientific Computing
- Scientific Programming
- ACM Transactions on Mathematical Software
- AIMS Conference on Dynamical Systems, Differential Equations, and Applications

Proposal Reviews

- US DOE Office of Science, Advanced Scientific Computing Research (ASCR) Applied Math research program