

Kipton Barros

Center for Nonlinear Science and Theoretical Division,
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CITIZENSHIP USA

EDUCATION **Boston University**, Boston, MA, 2005-2009
Ph.D., *Phase Transition Kinetics in Systems with Long-Range Interactions*
Area: Theoretical physics, nonequilibrium statistical mechanics
Advisor: William Klein

Carnegie Mellon University, Pittsburgh, PA, 1997-2001
B.S. in Computer Science, minor in Discrete Mathematics

PROFESSIONAL APPOINTMENTS **Los Alamos National Lab**, Los Alamos, NM, 2009-2010
Postdoctoral Researcher, Center for Nonlinear Science and Theoretical Division
Advisor: Turab Lookman

Northwestern University, Evanston, IL, 2009-2010
Postdoctoral Fellow, Department of Materials Science and Engineering, and
Department of Applied Mathematics
Advisor: Erik Luijten

NIST, Gaithersburg, MD, Summer 2007
NSF IGERT funded visitor, Polymers Division
Mentor: Jack Douglas

Clark University, Worcester, MA, 2004-2005
Visitor, Department of Physics, Clark University
Helped write *An Introduction to Computer Simulation Methods*, 3rd ed.
Mentor: Harvey Gould

NeuroPhysics Corporation, Shirley, MA, 2003-2004
Software engineer, molecular imaging methods

Green Hills Software, Santa Barbara, CA, 2001-2002
Software engineer, high performance compilers

Los Alamos National Laboratory, Los Alamos, NM, Fall 1999, Sum. 2000
Undergraduate visitor, P-21, Biophysics Group
Mentors: John George and David Rector

AWARDS **Graduate Book Prize**, 2009, Department of Physics, Boston University
GSNP Student Speaker Award, \$1000 prize, 2009, APS March Meeting
NSF IGERT Fellowship, 2006–2008, Center for Computational Science,
Boston University

Chairman's Book Prize, 2007, Department of Physics, Boston University
Dean's Fellow, 2005–2006, Boston University
Presidential Scholarship, 1997–2001, Carnegie Mellon University

COMPUTATIONAL SKILLS Algorithm design, numerical analysis, Monte-Carlo methods, machine learning, CUDA for graphics processors (GPUs)

OPEN SOURCE SOFTWARE **QUDA**, A library for lattice Quantum Chromodynamics (QCD) on GPUs
<http://lattice.bu.edu/quda/>

STP Project, Interactive simulations to teach statistical and thermal physics
<http://stp.clarku.edu/simulations>

Scikit, A library to visualize and interact with scientific simulations in Java
<http://code.google.com/p/scikit/>

DISSERTATION *Phase Transition Kinetics in Systems with Long-Range Interactions*
<http://physics.bu.edu/~kbarros/pubs/kb-thesis.pdf>

Topics: fluid-crystal and crystal-crystal nucleation in Landau-Ginzburg models, Langevin representation of Monte-Carlo Ising dynamics, nonlinear extensions to Cahn-Hilliard-Cook evolution

Techniques: Field theory, coarse graining, stochastic equations, asymptotics

PUBLICATIONS C. R. Berardi, K. Barros, J. F. Douglas, and W. Losert, *Direct observation of stringlike collective motion in a two-dimensional driven granular fluid* *Direct*, Phys. Rev. E **81** 041301 (2010)
<http://link.aps.org/abstract/PRE/v81/e041301>

M. A. Clark, R. Babich, K. Barros, R. C. Brower, and C. Rebbi, *Solving Lattice QCD systems of equations using mixed precision solvers on GPUs*, To appear in Computer Physics Communications
<http://arxiv.org/abs/0911.3191>

K. Barros, P. Krapivsky, and S. Redner, *Freezing into stripe states in two-dimensional ferromagnets and crossing probabilities in critical percolation*, Phys. Rev. E (Rapid Comm.) **80** 040101 (2009)
<http://link.aps.org/abstract/PRE/v80/e040101>

R. Dominguez, K. Barros, and W. Klein, *Early stage kinetics of systems with spatial symmetry breaking*, Phys. Rev. E **79** 041121 (2009)
<http://link.aps.org/abstract/PRE/v79/e041121>

K. Barros, R. Dominguez, and W. Klein, *Beyond Cahn-Hilliard-Cook: Early time behavior of symmetry breaking phase transition kinetics*, Phys. Rev. E **79** 042104 (2009)
<http://link.aps.org/abstract/PRE/v79/e042104>

K. Barros, R. Babich, R. Brower, M. A. Clark, and C. Rebbi, *Blasting through lattice calculations using CUDA*, PoS (Lattice 2008) 045
<http://arxiv.org/abs/0810.5365>

H. Wang, K. Barros, H. Gould, and W. Klein, *Approaching equilibrium and the distribution of clusters*, Phys. Rev. E **76**, 041116 (2007)
<http://link.aps.org/abstract/PRE/v76/e041116>

A. O. Schweiger, K. Barros, and W. Klein, *Transient nucleation near the mean-field spinodal*, Phys. Rev. E **75**, 039902 (2007)
<http://link.aps.org/abstract/PRE/v75/e039902>

INVITED TALKS

Dielectric effects in self-assembly of binary colloid mixtures, seminar for the Department of Physics and the Center for Computational Science, Boston University, February 25, 2011

Ordering dynamics in the Ising ferromagnet, seminar at the Department of Physics, Bucknell University, November 15, 2009

Liquid to Solid Nucleation Through Onion-structure Droplets, seminar at the Center for Nonlinear Studies, Los Alamos National Laboratory, February 24, 2009

Massively parallel computing with graphics processors and CUDA, seminar at the Center for Computational Science, Boston University, January 30, 2009

Graphics cards for high performance computational physics, guest lecture, course 6.963, Massachusetts Institute of Technology, January 26, 2009

Blasting through lattice calculations using CUDA, seminar at the Lattice QCD group, Massachusetts Institute of Technology, October 7, 2008

CONTRIBUTED TALKS

Efficient calculation of electrostatic interactions within dynamic dielectric environments,
APS March Meeting, Portland, March 19, 2010

The quenched Ising ferromagnet: freezing into a metastable state of striped domains,
Boulder Summer School, Nonequilibrium Statistical Mechanics, July 8, 2009

Liquid to solid nucleation through onion-structure droplets,
APS March Meeting, Pittsburgh, March 16 and 19, 2009

Generalizing Alexander-McTague: A new form of crystalline nucleation,
10th Greater Boston Area Statistical Mechanics Meeting, Brandeis University, October 18, 2008

Nucleation in a long-range repulsive model,
APS March Meeting, New Orleans, March 14, 2008

Nucleation in the long-range repulsive clump model, 9th Greater Boston Area
Statistical Mechanics Meeting, Brandeis University, October 13, 2007

Langevin dynamics for the long-range Ising model, 8th Greater Boston Area
Statistical Mechanics Meeting, Brandeis University, October 21, 2006