CHRISTOPHER A. SERINO

CONTACT INFORMATION

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EDUCATION

Boston University, Boston, MA USA

Ph.D., Physics, January 2012

- Thesis: "Statistical Properties of Systems with Damage and Defects"
- Adviser: W. Klein

M.A., Physics, January 2009

The Boulder School in Condensed Matter and Materials Physics, Boulder, CO USA

"Nonequilibrium Statistical Mechanics: Fundamental Problems and Applications", July 2009

Trinity College of Oxford University, Oxford, UK

David and Kathleen Scott Visiting Scholar, June 2006

University of Massachusetts Amherst, Amherst, MA USA

B.S., Physics, September 2006

- Thesis: "Study of the Branching Ratio for the Decay $B^0 \to \pi^0\pi^0\pi^0$"
- Adviser: C. Dallapiccola

HONORS & AWARDS

University of Massachusetts Amherst *Magna Cum Laude* with Honors in Physics

University of Massachusetts Amherst David and Kathleen Scott Award

College of Natural Sciences and Mathematics Luise Bronner Award

Phi Beta Kappa National Honors Society

Golden Key National Honors Society

Alpha Delta Lambda National Freshman Honors Society

Department of Physics Chang Freshman Award

PUBLICATIONS

C. A. Serino, K. F. Tiampo, and W. Klein "New Approach to Gutenberg-Richter Scaling" *Phys. Rev. Lett.* **106**, 108501 (2011)

C. A. Serino and S. Redner "Pearson walk with shrinking steps in two dimensions" *J. Stat. Mech.* P01006 (2010)

C. A. Serino, W. Klein, and J. B. Rundle "Cellular automaton model of damage" *Phys. Rev. E* **81**, 016105 (2010)

PAPERS IN PREPARATION

J. Xia, C. A. Serino, M. Anghel, H. Gould, W. Klein and J. B. Rundle "Simulations of the Olami-Feder-Christensen model of earthquakes with variable range stress transfer"

Rachele Dominguez, K. F. Tiampo, C. A. Serino and W. Klein "Scaling of earthquake models with inhomogeneous stress dissipation" to be published in "Complexity and Extreme Events in Geosciences" *AGU Geophysical Monograph Series*, AGU, Washington, D. C.

R. Dominguez, K. F. Tiampo, C. A. Serino, and W Klein "Scaling of earthquake models with inhomogeneous stress dissipation" arXiv:1101.3584v1 [physics.geo-ph]

Conference Presentations

"What can we learn from observed variations in the Gutenberg-Richter law b-value?", Boston University Department of Physics Condensed Matter Theory seminar (2011)

"A simple model fault system", APS March Meeting, Dallas, TX (2011)

"Approaching Gutenberg-Richter through damage and defects", Preliminary Oral Exam, Boston, MA (2010)

"New scaling in an old earthquake model", Greater Boston Area Statistical Mechanics Meeting, Waltham, MA (2010)

"A cellular automaton model of catastrophic failure", APS March Meeting, Pittsburg, PA (2009)

"Statistical mechanics of damage", Greater Boston Area Statistical Mechanics Meeting, Waltham, MA (2008)

"Measurement of time dependent CP asymmetry in $B^0 \to K_s K_s K_s$ decays, with one $K_s \to \pi^0\pi^0$", G. Cavoto, C. Dallapiccola, E. Di Marco, F. Ferroni, N. G. Piacquadio, M. Pierini, and C. A. Serino, *BaBar Document* 1257, (2005)

Research Experience

Boston University, Boston, MA USA

Condensed Matter Theory Research Fellow **January 2008 - Present**

My research, under the direction of W. Klein, has been concerned with the statistical physics of materials whose bulk properties are affected by accumulated damage and / or quenched defects. Simplified models are studied both numerically and theoretically to investigate questions such as: How does localized damage lead to global catastrophic failure or fracture? How does the range of interaction affect the rate and geometry of the failure mechanism? Can equilibrium methods be used to describe the system as being in a metastable state just prior to a catastrophic event? Do defects change the phase diagram and / or the limit of metastability, and if so, how? What is the mechanism responsible for the burst size distribution observed in materials under increasing stress or ion bombardment?

I have also investigated the properties of a tiring random walker in collaboration with S. Redner. The walk occurs on a continuous two-dimensional plane where the step length is exponentially decreased with the discrete time step. This walk is also considered in dimensions greater than two. In particular, the distribution of end points for the walk is analyzed.

I have also contributed to projects lead by various researchers concerning the properties of quenched dilute spin systems, the dynamics of solid to solid nucleation, the latency of queueing networks that violate at least one of the assumptions of Jackson's theorem, and models of multicellular cooperation and competition within the framework of flux balance analysis.

Los Alamos National Laboratory, Los Alamos, NM USA

Statistical Sciences Visiting Researcher **August 2008**

I spent a month at CCS 6 (Statistical Sciences Group) hosted by F. Alexander. I continued my condensed matter theory research and collaborated on various projects with lab members.

University of Massachusetts Amherst Amherst, MA USA

Physics Research Assistant and BaBar Associate Member **June 2005 - September 2006**

My research in experimental particle physics, under the supervision of C. Dallapiccola, concerned CP-violating three-body weak decays of the B^0 meson. Data was collected by the BaBar experiment at SLAC's asymmetric B-factory. An upper limit on the branching ratio for the decay $B^0 \to \pi^0\pi^0\pi^0$ was established.

Applied Mathematics Research Assistant **January 2005 - May 2005**

My research, supervised by P. Kevrekidis, consisted of numerical studies of a non-linear partial differential equation formulated as a mean field description for the time evolution of a Bose-Einstein condensate. We considered three different initial configurations to check for the existence of a solution: an in-phase and out-of-phase Thomas-Fermi solution and a soliton configuration. These configurations relaxed to static solutions which could be temporally evolved. The linear stability of this time evolution was investigated.

Chemistry Research Assistant **January 2003 - January 2005**

My research, under the supervision of J. Fermann, focused on developing software to help introduce concepts in university level, introductory, inorganic chemistry. One program explored the reaction rates and time-dependent concentrations of the reaction $A \rightleftharpoons B \rightleftharpoons C$ as a function of the activation energies, temperature, and initial concentrations. Another program simulated and displayed the dynamics of a two-species, interacting gas. By controlling the temperature and volume students could perform experiments to determine relationships among the state variables. By varying the mass, size, charge, and Pauling electronegativity of each species, students could examine reaction dynamics.

Skills

Java • MATLAB • cellular automata • Monte Carlo methods • mean field theory

Academic Experience

Boston University, Boston, MA USA

Grader **January 2008 - Present**

I graded and wrote solutions to weekly homework assignments. In addition to grading for PY 355, I helped run a weekly "problem session." During these two hour sessions, the students broke up into groups of three or four to work out problems on a blackboard that were assigned by the professor. I would go around and assist groups that were stuck, check for incorrect solutions, and ask additional questions to help the students master the material. For this course, topics included: multivariable differential and integral calculus, curvilinear coordinate systems, linear algebra, functions of a complex variable, contour integration, ordinary and partial differential equations, special functions, Fourier series, and integral transforms. Level 500 courses are first year graduate courses while level 300 courses are sophomore / junior level courses.

- PY 511 - Quantum Mechanics I
- PY 501 - Mathematical Physics
- PY 355 - Methods of Theoretical Physics

Teaching Fellow **September 2006 - January 2008**

I taught, either, three weekly recitation sections that met for fifty minutes, or, two bi-weekly teaching laboratories that met for three hours. Both labs and recitations enrolled approximately thirty students. Additionally, I helped proctor and grade exams and held three office hours per week. Recitation sections normally consisted of about thirty minutes of informal lectures on topics covered in the primary lecture sections but were still confusing or unclear to most students. During this time, I would normally guide the class through one or two problems similar to the assigned homework. Approximately ten minutes was spent on a "conceptual exercise" put together by a faculty lecturer to gauge

the progress of the students. Any remaining time was generally dedicated to open questions concerning general topics or specific problems. Teaching laboratories consisted of about twenty to thirty minutes of introducing the equipment, procedure, and theoretical background to the students, while the remainder of the session was spent performing the experiment. During this time, I went around to the various groups to assist with any difficulties and answer questions that arose during the session. Topics included: Newtonian mechanics, fluid dynamics, kinetic theory of gasses, thermodynamics, and classical electrostatics and magnetostatics. The level 200 courses are calculus based while the level 100 courses are non-calculus based.

- PY 241 - Principles of General Physics I
- PY 212 - General Physics II
- PY 211 - General Physics I
- PY 105 - Elementary Physics I

University of Massachusetts Amherst, Amherst, MA USA

Teaching Assistant **January 2005 - May 2005**

I was the teaching assistant for introduction to computational physics, a sophomore / junior level course, which met twice weekly for two hours. New topics would normally be introduced by the professor at the start of the session in a lecture of no more than one hour. Occasionally, I would give this lecture. At the completion of the lecture, the professor (or I) would assign a project meant to take the students two to four class periods to complete. I would go around during class and answer questions about implementing various algorithms and to help debug student's code. I would also help students take the physics problem assigned and reformulate in terms of a numerical problem to be solved computationally. After the last class period dedicated to a particular problem, but before the assignment was to be handed in, I held two "extra help" sessions where the students could finish up there assignments and ask questions to clear up any confusion they still had. Topics included: linear, non-linear, and stochastic ordinary differential equations, linear partial differential equations, numerical integration, Monte Carlo techniques, and fast Fourier transforms. The course was taught using MATLAB.

- Physics 281 - Introduction to Computational Physics

Personal Information

Date of Birth:	21 January 1984
Citizenship:	U.S.A.
Marital Status:	Married
Gender:	Male