

Spencer Stirling

Please email me for my address
Salt Lake City, Utah 84108 USA
Please email me for my phone number
stirling [AT] spencerstirling.com
<http://www.spencerstirling.com>
citizenship: US

- CURRENT ◇ **Assistant Professor (Mathematics) and Postdoctoral Researcher (Physics)**
University of Utah, Utah USA
2008 - Present: Topological quantum field theories (TQFTs); Ribbon/modular tensor categories; Braided categorical quantum mechanics; Strongly-correlated condensed matter physics (e.g. Levin-Wen string-nets); Topological quantum computing
joint Physics/Mathematics appointment
- EDUCATION ◇ **Ph.D. Mathematics, University of Texas at Austin**, Texas USA
2001 - 2008: Mathematical physics (topological quantum field theories, modular tensor categories, quantum mechanics, geometry)
Dissertation: *Abelian Chern-Simons theory with toral gauge group, modular tensor categories, and group categories*
Advisor: Daniel S. Freed
- ◇ **Visiting fellow, Institute for Theoretical Physics, Utrecht University**, the Netherlands.
2002-2003: Quantum field theory, statistical field theory, general relativity
- ◇ **B.S. Physics and B.S. Mathematics, University of Utah**, Utah USA
1996-2001: Magna cum laude in both degrees
- ◇ **Undergraduate researcher, Department of Physics, The Ohio State University**, Ohio USA
Summer 2000, 2001: Big Bang nucleosynthesis
- ◇ **Valedictorian, Taylorsville High School, Utah**, Utah USA
1996: Sterling scholar
- RESEARCH INTERESTS Topological quantum field theories and topological phases of matter
Applications of ribbon/modular tensor categories to strongly-correlated condensed matter physics (e.g. Levin-Wen models, fractional quantum Hall effect)
(Braided) categorical quantum mechanics
Quantum foundations, information, and computation
Mathematical physics, category theory, and geometry
- PREDOCTORAL RESEARCH ◇ **Big Bang nucleosynthesis, Department of Physics, The Ohio State University**
Summer 2000, 2001: Research Experience for Undergraduates (REU)
Advisor: Robert Scherrer
- **Computational modeling** of Big Bang nucleosynthesis. Research over two summers to model the abundance of light elements created during the Big Bang. Modified legacy **Fortran** code to take into account inhomogeneous neutrino concentration and developed code in **C**, **C++**, **Perl**, and **Bash** to analyze data and automate modeling over a wide range of cases.
publication: see below

- ◇ **Scanning capacitance microscopy, Department of Physics, University of Utah**
1998-2000: Undergraduate Semiconductor research
Advisor: Clayton Williams
 - **Computational modeling** of semiconductor imaging techniques. Designed and constructed a sensitive probe to measure the dielectric constant of thin films on semiconductor surfaces. Custom **hardware programming**. Promoted to modeling for the main research group with proprietary Medici (2D) and Davinci (3D) software from Avant. Developed wrapper code in **C, C++, and Bash** to create detailed models of electron/hole concentration and drift velocities in doped semiconductor samples.
publication: see below

- PUBLICATIONS
- ◇ Spencer D. Stirling, *Counterexamples in Levin-Wen string-net models, group categories, and Turaev unimodality*, arXiv:1004.1737.
 - ◇ Spencer D. Stirling and Yong-Shi Wu, *Braided categorical quantum mechanics I*, arXiv:0909.0988.
 - ◇ Spencer D. Stirling, *Abelian Chern-Simons theory with toral gauge group, modular tensor categories, and group categories*, arXiv:0807.2857.
 - ◇ Spencer D. Stirling and Robert J. Scherrer, *Big bang nucleosynthesis with gaussian inhomogeneous neutrino degeneracy*, Phys. Rev. D66 (2002) 043531.
 - ◇ V.V. Zavyalov, J.S. McMurray, S.D. Stirling, C.C. Williams, and H. Smith, *Two dimensional dopant and carrier profiles obtained by scanning capacitance microscopy on an actively biased cross-sectioned metal-oxide-semiconductor field-effect transistor*, J. Vac. Sci. Technol. B 18, 549 (2000).

- COMPUTER SKILLS
- ◇ 15+ years Linux (mostly Debian) system administration. Networking; workstations; web, email, and file servers; backup servers
 - ◇ Recent scientific computation in C (quantum group calculations with separate consistency verification software for use in condensed matter physics)
 - ◇ Previous professional (industry) C/C++ application development
 - ◇ Previous scientific modeling in C/C++ (undergraduate level)
 - ◇ Various levels of exposure to Perl, Bash, Tcl/Tk, Java, MySQL, PHP, CGI, Fortran, Python
 - ◇ Previous corporate MS Windows system administration
 - ◇ Excellent technical writing skills
 - ◇ Excellent oral and written communication skills
 - ◇ Author of online Linux technical documentation, <http://www.spencerstirling.com/computergeek/computernotes.html>

- TEACHING EXPERIENCE
- ◇ **Assistant Professor, Department of Mathematics and Department of Physics, University of Utah**
2008 - Present:
 - Partial Differential Equations for Engineers
 - Quantum Field Theory (with Carleton Detar)
 - Graduate Statistical Mechanics (with Daniel Mattis)
 - Algebra for Business and Social Science

- ◇ **Assistant Instructor, Department of Mathematics**, University of Texas at Austin
2005 - 2008:
 - Calculus
 - Precalculus
 - Arithmetic, geometry, and probability for educators
- ◇ **Teaching Assistant, Department of Mathematics**, University of Texas at Austin
2004 - 2005:
 - Honors differential equations (under William Guy)
 - Vector calculus (under Charles Friedman)
 - Calculus (under Efraim Armendariz)
- ◇ **Teaching Assistant, Department of Physics**, University of Utah
1998 - 2001:
 - Mechanics, wave phenomena, electromagnetism (under Charlie Jui, Pierre Sokolsky, Gale Dick each for 1 year)

INDUSTRY
EXPERIENCE

- ◇ **C/C++ programmer**, Create-A-Check, Inc., Salt Lake City, Utah USA
1996-1998
 - C/C++ custom programming (accounting software).
 - Designed and implemented product testing infrastructure, responsible for major software releases.
 - Author of large amount of internal technical documentation.
 - Provided advanced support to customers with escalated issues beyond abilities of regular support.
 - Small (50+ machines) corporate MS Windows network management.
- ◇ **Linux network administrator**, World Institute for Conservation and Environment, Shepherdstown, West Virginia USA
2001-Present
 - Nonprofit web and email servers, file servers, backup servers, and firewalling

AWARDS

- ◇ **Geometry Research Group Fellowship**, Department of Mathematics, University of Texas at Austin (2007)
- ◇ **NSF VIGRE Fellowship**, Department of Mathematics, University of Texas at Austin (2001, 2003)
- ◇ **Theoretical Physics (TPU) Fellowship**, Utrecht University, the Netherlands (2002)
- ◇ **International Study Abroad Scholarship**, University of Texas at Austin (2002)
- ◇ **NSF REU Research Scholarship**, Department of Physics, The Ohio State University (2000)
- ◇ **University of Utah, 1996-2001**
 - Honors at Entrance Scholarship
 - Kennecott Scholarship
 - Semiconductor Research Corporation Research Scholarship
 - Utah Mathematics Faculty Nominee Scholarship
 - Stephen E. Newman, Jr. Mathematics Scholarship
 - Physics Outstanding Junior Scholarship
 - Physics Outstanding Sophomore Scholarship

◇ **Taylorsville High School, 1996**

- Valedictorian
- Sterling Scholar

INVITED
TALKS

- ◇ **Fudan University**, Shanghai, China (July 2010)
Topological Phases and Emergent Phenomena in Physics
- ◇ **Macalester College**, St. Paul, Minnesota (April 2010)
Quantum Invariants of 3-Manifolds and Modular Categories conference
- ◇ **Baylor University**, Waco, Texas (Oct. 2009)
Fusion Categories and Applications conference
- ◇ **University of Queensland**, Quantum Information Science Initiative, Brisbane, Australia (Feb. 2008)
2-week featured lecturer - mini-course about TQFTs and modular tensor categories
- ◇ **Texas A&M**, College Station, Texas (Apr. 2008)

CONFERENCES

- ◇ **Topological Phases and Emergent Phenomena in Physics**, Fudan University: Shanghai, China (July 2010)
- ◇ **Strongly-Correlated Systems and Tensor Categories**
Institute for Advanced Study, Tsinghua University:
Beijing, China (June 2010)
- ◇ **Quantum Invariants of 3-Manifolds and Modular Categories**, Macalester College: St. Paul, Minnesota (2010)
- ◇ **Fusion Categories and Applications**, Baylor University: Waco, Texas (2009)
- ◇ **Modular Categories and Applications**, Indiana University: Bloomington, Indiana (2009)
- ◇ **NSF-CBMS Conference on Knots and Topological Quantum Computing**, University of Central Oklahoma: Edmond, Oklahoma (2008)
- ◇ **Oporto Conference on Knot Homology and Physics**, University of the Algarve: Faro, Portugal (2007)
- ◇ **Texas Geometry and Topology Conference**, Rice University: Houston, Texas (2006)
- ◇ **Texas Geometry and Topology Conference**, University of Texas at Austin: Austin, Texas (2005)
- ◇ **Texas Geometry and Topology Conference**, Texas Tech: Lubbock, Texas (2005)
- ◇ **Loop Quantum Gravity in the Americas**, Perimeter Institute: Waterloo, Ontario (2004)

INTERESTS

Hiking/mountaineering, camping, skiing. Music and movies. Linux.