CURRICULUM VITAE

Yohannes Shiferaw

UCLA Cardiovascular Research Laboratory
675 Young Drive South, MRL 3645
Department of Medicine and Cardiology
Los Angeles, CA 90095
U.S.A.

Telephone: (857)-205-2692 (Cell)
(310)-794-3594 (Office)
Email: yshiferaw@mednet.ucla.edu
Fax: (310)-206-5777
Date of birth: 11/30/74

Positions held

- Postdoctoral Research Associate
  Department of Cardiology, UCLA, 2003 – present.
- Postdoctoral Research Associate
  Department of Physics and Center for Interdisciplinary Research on Complex Systems, Northeastern University, 2001 – 2003.
- Research/Teaching Assistant
  Department of Physics, University of Pittsburgh, 1995 – 2000.

Education

- Ph.D. in Theoretical Physics,
  University of Pittsburgh, Pittsburgh, PA, August 2001
  Theses title: *The statistical properties of polymers in random media*
  Advisor: Professor Yadin Y. Goldschmidt
- M.S. in Physics,
  University of Pittsburgh, Pittsburgh, PA., August 1997
- B.S. in Physics,
  Franklin & Marshall College, Lancaster, PA, May 1995
  Theses title: *Corrections to the decay rate of orthopositronium*
  Advisor: Professor Gregory Adkins

Research Interests

- Computational biology
- Cardiac electrophysiology and arrhythmias
- Nonlinear dynamics and pattern formation
- Statistical mechanics of disordered systems
- Stochastic processes in biological systems

Research Experience

- **Postdoctoral research associate**, *Department of Medicine, UCLA, 2003-2004*
  - Developed an experimentally based Markov model for the cardiac L-type calcium channel. Incorporated the Markov model into a quantitative, experimentally based, ionic model of the rabbit ventricular myocyte.
  - Explored the spatiotemporal dynamics of calcium and voltage alternans in cardiac tissue, using analytic and simulation approaches. Solved a partial differential equation in two spatial dimensions to compute the dynamics of voltage and calcium in simulated cardiac tissue.
  - Collaborated with experimentalists at the Cedars Sinai Medical Center to develop experimental protocols to undercover the underlying mechanisms for discordant alternans in cardiac tissue.
  - Performed patch clamp experiments to measure the membrane voltage across isolated rabbit heart cells.
- **Postdoctoral research associate**, *Northeastern University, Dept. of Physics and Center for Interdisciplinary Research on Complex Systems, 2001-2003*
  - Developed an experimentally based mathematical model of intracellular calcium cycling in cardiac cells. Explored the nonlinear dynamics of voltage and calcium cycling under rapid pacing using nonlinear maps.
  - Explored the spatiotemporal dynamics of calcium alternans within cardiac cells. Developed a set of amplitude equations to describe the formation of spatial patterns of calcium alternans.
  - Performed large scale simulations of directional solidification of binary alloys.
- **Research assistant**, *University of Pittsburgh, Dept. of Physics and Astronomy, 1995-2001*
  - Studied the statistical mechanics of a Gaussian polymer chain immersed in quenched random media using replica field theory.
  - Simulated the statistical properties of polymer chain in a random potential by solving the Schrödinger equation in a random potential.
- **Research assistant**, *Franklin & Marshall College, Dept. of Physics and Astronomy, 1991-1995*
  - Applied quantum electrodynamics to compute second order corrections to the decay rate of orthopositronium.
  - Developed a novel variational approach to compute the energy levels of a hydrogen atom in a magnetic field (Zeeman effect).

Teaching experience

Teaching assistant/Fellow, *University of Pittsburgh, Dept. of Physics and Astronomy, 1995-2001*

Taught introductory physics recitation to engineering and premedical students. Taught a total of twelve semester classes, and four summer classes. Teaching responsibilities included reviewing lecture material, running problem solving sessions, and grading homework problems. Received the departmental teaching award for my services.

Postdoctoral research associate, *Northeastern University, Dept. of Physics, 2001-2003*

Helped supervise the research project of one undergraduate and one graduate student.

Postdoctoral research associate, *Department of Medicine, UCLA, 2003-2004*

Supervised the research project of a visiting physics graduate student, and a graduate student in the department of Neuroscience at UCLA.

Grant proposals written

- *Title*: Voltage-calcium Dynamics: Cell Models and Therapeutics
  Submitted to: National Institute of Health (NIH)
  Author Status: Co-PI along with five faculty members in the department of Cardiology at UCLA.
  Description: Proposal to develop gene-based therapeutics to treat fibrillation. My role is to develop data driven mathematical models that will guide the experimental component.
  Status: Under review
- *Title*: Voltage-calcium Dynamics in Simplified Tissue Models
  Submitted to: NIH
  Author Status: Co-Pi along with one faculty member from the department of Cardiology at UCLA, and Professor Alain Karma in the physics department at Northeastern University.
  Description: Proposal to explore the spatiotemporal dynamics of calcium cycling and its role in the initiation and maintenance of fibrillation.
  Status: Under review

Invited presentations

- Pattern formation of voltage and calcium in cardiac cells
  2004, Duke Center for Nonlinear and Complex Systems, Duke University, Durham, NC.
- Coupled dynamics of voltage and calcium in cardiac cells
  2004, SIAM conference on the life sciences, Portland, OR.
- Mathematical modelling of calcium dynamics
  2003, Center for Interdisciplinary Research on Complex Systems, Northeastern University, Boston, MA.

Poster presentations

- Coupled dynamics of voltage and calcium in ventricular myocytes
  NASPE 2004, San Francisco, CA.
- New Pacing Protocol for the Induction of T-Wave Alternans at Slower Heart Rate and Improving the Prediction of Sudden Cardiac Death
  NASPE 2004, San Francisco, CA.

- Mathematical modelling of calcium dynamics
  Gordon Research Conference 2003, New London, NH.
- Model of intracellular calcium cycling in ventricular myocytes
  NASPE 2003, Washington D.C.

Honors and Awards received

- University of Pittsburgh Department of Physics Award for Excellence in Undergraduate Teaching (2001).
- Frank Durell Enck Memorial prize in Physics (1995).
- Kershner Scholar in Physics and Astronomy (1995).
- Rank of 330 out of 2700 in nationwide Putnam mathematical competition (1993).
- Third in Albright mathematical competition (1992).
- Earned Honorable Mention in UMAP mathematical competition (1993).
- Sigma Pi Sigma National Physics Honor Society.

Publications

- Y. Shiferaw, D. Sato, J.N. Weiss, and A. Karma, ”Discordant alternans in cardiac tissue: the role of calcium cycling”, in preparation.
- Y. Shiferaw, D. Sato, and A. Karma, ”Subcellular Turing instability mediated by voltage and calcium diffusion in cardiac cells”, Submitted for publication in PNAS.
- Y. Shiferaw, D. Sato, and A. Karma, ”Coupled dynamics of voltage and calcium in paced cardiac cells”, Submitted for publication in Phys. Rev. E.
- Y.Y. Goldschmidt and Y. Shiferaw, ”Localization of polymers in random media: analogy with quantum particles in disorder”, to appear in *Statistics of Linear Polymers in Disodered Media*, Elsevier (Amsterdam).
- Y. Shiferaw, M.A. Watanabe, A. Garfinkel, J.N. Weiss, and A. Karma, ”Model of intracellular calcium cycling in ventricular myocytes”, Biophys. J. **85** 3666-3686 (2003).
- C. Stubbins, K. Das, and Y. Shiferaw, ”Low-lying energy levels of the hydrogen atom in a strong magnetic field”, J. Phys. B: At. Mol. Opt. Phys. **37** 2201-2209 (2004).
- Y. Y. Goldschmidt and Y. Shiferaw, ”Polymers with self-avoiding interaction in random medium: a localization-delocalization transition”, European Physical Journal B **32**, 1 (2003).
- Y. Y. Goldschmidt and Y. Shiferaw, ”Localization of polymers in a finite medium with fixed random obstacles”, European Physical Journal B **25**, 351 (2002).
- Y. Shiferaw and Y. Y. Goldschmidt, ”Localization of a polymer in random media: Relation to the localization of a quantum particle”, Phys. Rev. E **63**, 051803 (2001).
- Y. Shiferaw and Y. Y. Goldschmidt, ”Solvable model of a polymer in random media with long ranged disorder correlations”, Journal of Physics A: Math. Gen. **33** 4461 (2000).
- G. Adkins and Y. Shiferaw, ”Two-loop corrections to the orthopositronium and parapositronium decay rates due to vacuum polarization”, Phys. Rev. A **52**, 2442 (1995).

Computer Skills

- Numerical methods: Partial differential equations in two and three dimensions. Many variable ordinary differential equations. Nonlinear iterated maps. Numerical linear algebra. Monte Carlo methods.
- Programming language: Fortran, C, C++.
- Operating systems: Unix, Windows
- Symbolic computation packages: Mathematica, Matlab, Latex typesetting.

References

- Professor Alain Karma, Department of Physics and Center of Interdisciplinary Research on Complex Systems, Northeastern University, Boston, MA 02115.
  a.karma@neu.edu
- Professor James N. Weiss (MD), Department of Cardiology, David Geffen School of Medicine, University of California at Los Angeles, Los Angeles, CA 90095.
  jweiss@mednet.ucla.edu
- Professor Yadin Y. Goldschmidt, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260.
  yadin+@pitt.edu
- Professor Alan Garfinkel, David Geffen School of Medicine, University of California at Los Angeles, Los Angeles, CA 90095,
  agarfinkel@mednet.ucla.edu