

Jan Karbowski

SHORT FACTS

Work address:

Sloan-Swartz Center for Theoretical Neurobiology,
Division of Biology 216-76,
California Institute of Technology, Pasadena, CA 91125, USA.
E-mail: jkarb@cns.caltech.edu

Nationality: Polish.

Sex: Male.

EDUCATION

- Ph.D. in Condensed Matter Physics; Warsaw University, 1996.
- M.Sc. in Theoretical Physics; Warsaw University, 1992.
- B.Sc. in Physics, Mathematics; Nicholas Copernicus University, Poland, 1991.

OBJECTIVE

- To participate in activities where my interdisciplinary background and experience in mathematical modeling of biological systems can be best utilized.

EMPLOYMENT

- California Institute of Technology, Division of Biology: Sloan-Swartz Postdoctoral Scholar, 2003-present.
- University of Pittsburgh, Department of Mathematics: Research Assistant Professor (non tenure-track), 2000-2002.
- Boston University, Center for BioDynamics, Department of Mathematics: Research Associate, 1998-2000.

- Boston University, Center for Polymer Studies, Department of Physics: Fulbright Postdoctoral Fellow, 1997-1998.
- Polish Academy of Sciences, Center for Theoretical Physics: Research Associate, 1996-2000.

INTERESTS

- Computational Neuroscience, Systems Biology, Biological Physics, Dynamical Systems.

FELLOWSHIPS, AWARDS AND HONORS

- The Sloan-Swartz Fellowship at Caltech, 2003-present.
- Fellowship of the Marine Biological Laboratory in Woods Hole, MA, to participate in the course: “Methods in Computational Neuroscience”, 2-28 August, 1999.
- The Fulbright Fellowship, 1997-1998.
- The Fellowship/Award of the Foundation for Polish Science (Fundacja na Rzecz Nauki Polskiej) for young scientists of all disciplines, 1995.
- One of the winners of the Polish National Physics Olympics for High School Students, 1987.

GRANTS

- Individual research grant in condensed matter physics from the Polish Science Foundation (KBN) in 1994.

EXTENDED VISITS

- Kavli Institute for Theoretical Physics, University of California Santa Barbara, CA. Visiting Scholar in the program: “Understanding the Brain”, 16 Aug - 4 Sep, 2004.

- International Center for Theoretical Physics, Trieste, Italy. Visiting graduate student in the program: “Spring College in Condensed Matter Physics”, 2 May - 30 May, 1994.

MAJOR TALKS

- California Institute of Technology, “Animal Behavior Interest Group”, 8 November 2004. Invited Talk: “Robust sinusoidal locomotion of *Caenorhabditis* worms: Integrating theory with genetics”.
- “Understanding the brain” program organized by the Kavli Institute for Theoretical Physics, University of California Santa Barbara, 1 Sep 2004. Invited talk: “Conserved relationships and trade-offs in the brain design”.
- West Coast *C. elegans* Worm Meeting, University of California Santa Barbara, CA, 20-23 Aug 2004. Platform talk: “Nematode locomotion: Integrating theory with genetic perturbations and comparative analysis”.
- Society for Industrial and Applied Mathematics, 50th Anniversary Meeting, Minisymposium on “The role of synaptic plasticity in the dynamics of neuronal networks”, Philadelphia, PA, 8-12 July 2002. Invited talk: “Synchrony and balanced synaptic plasticity”.
- The Neurosciences Institute, San Diego, CA, 30 May 2002. Invited talk: “Optimal wiring in the cerebral cortex”.
- American Physical Society Annual Meeting, Division of Biological Physics, Focus Session on “Dynamics of Evolution/Neurobiological Physics”, Indianapolis, IN, 18-22 March 2002. Contributed talk: “Optimal wiring principle and neuronal degree of separation”.
- University of Pittsburgh, Department of Mathematics, Computational Neuro-Group Seminar Series, Pittsburgh, PA, January 2001. Contributed talk: “Basic concepts in information theory and their application in neuroscience”.

- Princeton University, Department of Molecular Biology, Princeton, NJ, 6 Apr 2000. Invited talk: “Population coding accuracy and temporal correlations in neural networks”.
- Salk Institute for Biological Studies, Computational Neurobiology Laboratory, La Jolla, CA, 22 Feb 2000. Invited talk: “Population coding accuracy and temporal correlations in neural networks”.
- California Institute of Technology, Computation and Neural Systems Program, Pasadena, CA, 18 Feb 2000. Invited talk: “Population coding accuracy and temporal correlations in neural networks”.
- Brown University, Department of Applied Mathematics, Providence, RI, 11 Feb 2000. Invited talk: “Population coding accuracy and temporal correlations in neural networks”.
- Marine Biological Laboratory in Woods Hole, MA, August 2 - August 28, 1999. Course Title: “Methods in Computational Neuroscience”: contributed talk.
- Boston University, Center for BioDynamics Seminar Series, Department of Mathematics, Boston, MA, March 1999. Contributed talk: “Multispikes and synchronization in hippocampus”.
- Boston University, Center for Polymer Studies Seminars, Department of Physics, Boston, MA, April 1998. Contributed talk: “Master equation approach to protein folding”.
- Annual Meeting on Statistical Physics, Rutgers University, NJ, 12-15 December, 1997. Contributed talk: “Generalized solution model and its application to supercooled water”.
- Technical University of Warsaw, Department of Applied Physics, Warsaw, Poland, July 1996: invited talk.
- Polish Academy of Sciences, Center for Theoretical Physics Seminar Series, Warsaw, Poland, January 1996: invited talk.
- International Center for Theoretical Physics in Trieste, Italy, August 4 - August 22, 1994. Workshop Title: “Miniworkshop on Strong Correlations and Quantum Critical Phenomena”: contributed talk.

TEACHING EXPERIENCE

- Courses in: Stochastic Methods in Science and Engineering, Statistical Physics, Quantum Mechanics, General Physics, Analytic Geometry and Calculus, Introduction to Linear Algebra.

PROGRAMMING AND COMPUTER SKILLS

- Experience with UNIX (Linux), Windows, and DOS environments.
- Experience with mathematical packages such as Matlab and Mathematica.
- Expert programming in Fortran (F90, F77).

OTHER PROFESSIONAL ACTIVITIES

- Reviewer for scientific journals: Physical Review E, European Physical Journal B, Current Anthropology, Journal of Integrative Neuroscience.

REFERENCES

- Prof. Paul W. Sternberg, Division of Biology 156-29, California Institute of Technology, Pasadena, CA 91125. Email: pws@caltech.edu
- Prof. Bard G. Ermentrout, Department of Mathematics, University of Pittsburgh, Pittsburgh, PA 15260. Email: bard@math.pitt.edu
- Prof. Nancy Kopell, Department of Mathematics, Boston University, Boston, MA 02215. Email: nk@math.bu.edu
- Prof. Larry Abbott, Department of Biology, Brandeis University, Waltham, MA, 02454. Email: abbot@brandeis.edu

LIST OF PUBLICATIONS

- J. Karbowski, C.J. Cronin, G. Schindelman, A. Seah, J.E. Mendel, P.W. Sternberg - “Neuro-muscular feedback control of *C. elegans* sinusoidal locomotion revealed by genetic and modeling study”, in preparation.
- J. Karbowski, C.J. Cronin, A. Seah, J.E. Mendel, P.W. Sternberg - “Conservation rules and their breakdown in *Caenorhabditis* sinusoidal locomotion”, submitted for publication.
- J. Karbowski and G.B. Ermentrout - “Model of the early development of thalamo-cortical connections and area patterning via signaling molecules”, *Journal of Computational Neuroscience* **17**, 347-363 (2004).
- J. Karbowski - “Towards comparative theoretical neuroanatomy of the cerebral cortex”, submitted for publication.
- J. Karbowski - “How does connectivity between cortical areas depend on brain size? Implications for efficient computation”, *Journal of Computational Neuroscience* **15**, 347-356 (2003).
- J. Karbowski - “Optimal wiring in the cortex and neuronal degree of separation”, *Neurocomputing* **44**, 875-879 (2002).
- J. Karbowski and G.B. Ermentrout - “Synchrony arising from a balanced synaptic plasticity in a network of heterogeneous neural oscillators”, *Physical Review E* **65**, art. no. 031902 (2002).
- J. Karbowski - “Optimal wiring principle and plateaus in the degree of separation for cortical neurons”, *Physical Review Letters* **86**, 3674-3677 (2001).
- J. Karbowski and N. Kopell - “Multispikes and synchronization in a large neural network with temporal delays”, *Neural Computation* **12**, 1573-1606 (2000).
- J. Karbowski - “Fisher information and temporal correlations for spiking neurons with stochastic dynamics”, *Physical Review E* **61**, 4235-4252 (2000).

- J. Karbowski and L.A. Turski - “The Bose-Einstein condensation in random box”, *Physica A* **276**, 489-494 (2000).
- M. Cieplak, M. Henkel, J. Karbowski and J.R. Banavar - “Master equation approach to protein folding and kinetic traps”, *Physical Review Letters* **80**, 3654-3657 (1998).
- J. Karbowski - “Quantum fluctuations in the Kondo insulators: Slave boson approach”, *Physical Review B* **54**, R728-R731 (1996).
- J. Karbowski and J. Spalek - “Superconducting instabilities in the finite U Anderson lattice model”, *Physica B* **206-207**, 716 (1995).
- J. Karbowski and J. Spalek - “ Interorbital pairing for heavy fermions and universal scaling of their basic characteristics”, *Physical Review B* **49**, 1454-1457 (1994).
- J. Karbowski and J. Spalek - “Universal scaling of basic properties of the heavy fermion superconductors”, *Acta Physica Polonica A* **85**, 341-345 (1994).
- J. Spalek, K. Byczuk, J. Karbowski, and W. Wojcik - “Strongly correlated fermions at low temperatures”, *Physica Scripta T.49A*, 206-214 (1993).

Book chapters

- J. Karbowski - “Optimal wiring in the cortex and neuronal degree of separation”, in *Computational Neuroscience: Trends in Research*, (Plenum Press, New York), (2002).
- K. Byczuk, J. Karbowski, J. Spalek, and W. Wojcik - “Electronic Structure and pairing of strongly correlated fermions: Fermi liquid versus spin liquid”, in *Strong Correlations and Superconductivity*, (World Scientific, Singapore), pp. 159-184 (1994).