

Pieter J. Swart

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RESEARCH INTERESTS

Multiscale analysis of dynamics on technological, social and biological networks; epidemiological modeling; wavelet-based multiresolution analysis; nonlinear principal component analysis of large datasets; mesoscopic structures associated with structural phase transformations; dynamics and hysteresis in martensites, perovskites, ferroelectrics and foams; applications of wavelets and homogenization to multiscale problems in solid-state and materials science; nonlinear partial differential equations; scientific computing with Python.

EMPLOYMENT

1995–Present	Staff Member, Mathematical Modeling and Analysis Group T-7, LANL.
June 2002–July 2003	Acting Deputy Director, Center for Nonlinear Studies, LANL.
2001–Present	Executive Committee, Center for Nonlinear Studies, LANL.
1999–2001	Project Leader: Computational Modeling of Complex Perovskites (with Motorola)
2000–2002	Project Leader: Multiscale Dimensional Reduction of Massive Bioinformatics Datasets (with Efecta Technologies)
1992–1995	Research Associate, Courant Institute of Mathematical Sciences, New York University, New York.
1991–1992	Post Doctoral Associate, Center for Nonlinear Analysis, Carnegie Mellon University, Pittsburgh.

EDUCATION

Ph.D.	Applied Mathematics, <i>The Dynamical Creation of Microstructure in Material Phase Transitions</i> , Advisor: Philip J. Holmes, Cornell University, 1991
M.S.	Applied Mathematics, California Institute of Technology, 1989
M.Sc.	Thesis, <i>Galerkin Methods for Parabolic Differential Equations</i> , University of Pretoria, South Africa, 1985
B.Sc. Hons.	Applied Mathematics, University of Pretoria, 1983
B.Sc.	Applied Mathematics, Mathematics & Physics University of Pretoria, 1982

HONORS AND AWARDS

Recipient of Mathematical Sciences Institute Fellowship, Cornell University, 1990–1999.
Recipient of Graduate Fellowship, California Institute of Technology, 1988–1989.

SELECTED PROFESSIONAL ACTIVITIES

Co-Organizer of:

- International Conference on “Networks: Structure, Dynamics, Function”, Santa Fe, May 2003.
- Mathematical and Theoretical Biology Institute Summer School, Los Alamos, June-July 2002.
- International Conference on “Image Analysis and Understanding Data From Scientific Experiments”, Los Alamos, Dec 2002.
- International Conference on “Complex Adaptive Matter”, Santa Fe, May 1999.
- International Conference on “Landscape Paradigms in Physics and Biology”, Los Alamos, 1995.

SELECTED PUBLICATIONS

- J.M. Ball, P.J. Holmes, R.D. James, R.L. Pego & P.J. Swart (1991) *On the Dynamics of Fine Structure*. J. Nonlinear Science 1 pp. 1–71.
- P.J. Swart & P.J. Holmes (1992) *Energy minimization and the formation of microstructure in dynamic anti-plane shear*. Arch. Rational Mech. Anal. 121 pp. 37–85.
- K. Bhattacharya, R.D. James & P.J. Swart (1997) *Relaxation in shape-memory alloys*. Acta Materialia 45:11 pp. 4547–4568.
- **Landscape Paradigms in Physics and Biology: Concepts, Structures and Dynamics**, editor with H. Frauenfelder et al., North-Holland (1997). Also published as a special issue of Physica D (1997).
- M. Avellaneda & P.J. Swart (1998) *Calculating the performance of piezoelectric composites for hydrophone applications: An effective medium approach*. The Journal of the Acoustical Society of America 103: 3 pp. 1449–1467.
- W.C. Kerr, M.G. Killough, A. Saxena, P.J. Swart & A.R. Bishop (1999) *Role of Elastic Compatibility in Martensitic Texture Evolution*. Phase Transitions 69 pp. 247–270.
- Y. Jiang, P.J. Swart, A. Saxena, M. Asipauskas & J.A. Glazier (1999) *Hysteresis and Avalanches in Foam Rheology Simulations*. Physical Review E, 59:2 pp. 5819–5832.
- T.J. Yang, U. Mohideen, V. Gopalan & P.J. Swart (1999) *Observation and mobility study of single 180 degrees domain wall using a near-field scanning optical microscope*. Ferroelectrics 222 p. 609.
- T.J. Yang, U. Mohideen, V. Gopalan & P.J. Swart (1999) *Direct Observation of Pinning and Bowing of a Single Ferroelectric Domain Wall*. Physical Review Letters, 82:20 pp. 4106–4109.
- D. Louca, H. Röder, J.L. Sarrao, D.A. Dimitrov, J.M. Wills, P.J. Swart & A.R. Bishop (2000) *The local atomic structure and phonons in $Ba_{0.5}Sr_{0.5}TiO_3$* . J. Phys. Chem. Solids, 61:2 pp. 239–242.
- D. Brandon, I. Fonseca & P.J. Swart (2001) *Oscillations in a dynamical model of phase transitions*. Proc. Royal Soc. Edinburgh A. 131:1 pp. 59–81.
- **NetworkX** (2005) *A software package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks*. <http://networkx.sourceforge.net>.