

RALPH E. SHOWALTER
BIOGRAPHICAL DATA

EDUCATION

Ph.D.	University of Illinois	1968
M.A.M.	North Carolina State University	1965
B.S.	North Carolina State University	1964

PROFESSIONAL EXPERIENCE

2003	Professor, Oregon State University
1995	Jane and Roland Blumberg Centennial Professor in Mathematics
12/94	Visiting Research Professor, Purdue University
1-5/93	Visiting Professor, Interdisciplinary Center for Applied Mathematics, VPI
7/90, 6/91	Visiting Professor, Institut für Mathematik, Universität Augsburg
1982-83	Visiting Professor, Brown University
1978	Professor, The University of Texas at Austin
1972	Associate Professor, University of Texas at Austin
1968	Assistant Professor, University of Texas at Austin

PROFESSIONAL SOCIETIES

American Mathematical Society
Society for Industrial and Applied Mathematics

INVITED LECTURES (previous 5 years)

Symposium on Computational Mechanics Advances in honor of Professor J. Tinsley Oden's 60th Birthday, January 13-15, 1997, Austin, Plasticity Models and Nonlinear Semigroups.

Invited Participant to Workshop on Issues in Plasticity, January 17-18, 1997, Austin.

Colloquium, Notre Dame, April 22, 1997.

Principal Speaker (4 lectures), Third Colloquium on Differential Equations, May 17-22, 1997, Maracaibo, Venezuela: Flow in Porous Media.

Plenary Speaker, New York Journal of Mathematics Conference, June 8 - 14, 1997, University at Albany, SUNY, Albany, NY: Partial Differential Equations with Hysteresis.

Colloquium, University of Southern California, Dec. 3, 1997. Elliptic-parabolic equations with hysteresis.

TICAM Seminar, April 14, 1998. Diffusion in Deformable Media.

Special Session, AMS Mtg #937, State College, PA, October 24-25, 1998. Biot Fissured Media.

Colloquium, University of Texas at San Antonio, January 22, 1999. Elliptic-parabolic equations with hysteresis.

Texas PDE, San Marcos, April 10, 1999. Diffusion in Poro-Elastic Media.

Colloquium, Mississippi State University, April 17, 1999. A transport model with adsorption hysteresis.

Special Session, Joint AMS # 944 -TexMex Meeting, May 19-22, 1999. Diffusion in Deformable Media.

- Colloquium, Warsaw, Interdisciplinary Centre for Mathematical and Computational Modeling, June, 1999. Diffusion in Deformable Media.
- Colloquium, Carnegie-Mellon University, November 5, 1999. Diffusion in Deformable Media.
- Invited Speaker, IMA Workshop on Resource Recovery, Feb. 9 -13, 2000, Minneapolis. Diffusion in Deformable Media.
- Plenary Speaker, Conference on Differential Equations & Computational Mathematics, April 1-2, 2000, Georgia Southern University. Diffusion in Deformable Media.
- Invited Speaker, Minisymposium on Mathematical Modeling and Numerical Simulation of Sub-surface and Surface Flow Problems, SIAM Annual Meeting 2000, July 10 - 14, 2000, Puerto Rico.
- Invited Speaker, International Conference on Homogenization and Materials Science, September 15 - 17, 2000, University of Akron.
- Colloquium, Vanderbilt University, March 19, 2001. Diffusion in Deformable Media.
- Invited Speaker, Minisymposium on 'Modeling, Analysis and Simulation of Hysteresis and Irreversible Phenomena in Porous Media', Sixth SIAM Conference on Mathematical and Computational Issues in the Geosciences , June 11 - 14, 2001, Boulder, CO. Analysis of Flow in Porous Media with Hysteresis.
- Invited Speaker, Minisymposium on 'Computational Modeling of Multi-Scale Processes in Deformable Porous Media', Sixth SIAM Conference on Mathematical and Computational Issues in the Geosciences , June 11 - 14, 2001, Boulder, CO. Deformable Composite Porous Media.
- Texas PDE, San Antonio, February 2, 2002. Partially saturated flow in deformable media.
- Plenary Speaker, Applied Partial Differential Equations and Applications, Pacific Northwest PDE seminar series, Washington State University, May 23 - 25, 2002.
- Invited Speaker, Second Biot Conference on PoroMechanics, August 26 - 28, 2002, Grenoble.
- Colorado State University Lecture Series, Fort Collins, January, 2003.
- Minisymposium on 'Deformable Porous Media', SIAM Conference on Mathematical and Computational Issues in the Geosciences, Austin, March 17 - 20, 2003.
- Colloquium, Oregon State University, April 3, 2003, Flow in Deformable Media.
- Invited Speaker, Conference on Control Theory for PDE, May 30-June 1, 2003, Georgetown University, Washington.
- Special Session on 'Nonlinear PDEs and Variational Problems', Annual AMS Meeting #110, Phoenix, January 7-10, 2004. Diffusion in Poro-Plastic Media.

Editorial Board:

Applicable Analysis
 Advances in Mathematical Sciences and Applications
 Communications in Applied Analysis
 Electronic Journal of Differential Equations
 Electronic Journal of Mathematical and Physical Sciences
 International Journal of Differential Equations and Applications
 International Journal of Mathematics and Mathematical Sciences
 International Journal of Pure and Applied Mathematics
 Journal of Mathematical Analysis and Applications
 Mathematical Methods in the Applied Sciences

Ph.D. Degrees Supervised

Robert L. Dawes, May 1977, A degenerate evolution equation for fluid flow in multi-porous media
 Martin M. Rooney, December 1977, Numerical analysis of nonlinear wave equations
 E. DiBenedetto, August 1979, Implicit degenerate evolution equations
 Kenneth L. Kuttler, December 1980, Degenerate evolution inequalities.
 J. Rulla, September, 1985, A Stefan Problem with prescribed convection, (awarded Best Dissertation Award by Graduate School).
 M. P. Bosse, August, 1987, Homogenization of the layered medium equation.
 S. Oppenheimer, December, 1987, Dynamics of gas absorption.
 N. Walkington, May, 1988, Resolution of a diffusion problem arising in the flow of fluids.
 Xingsheng Xu, August, 1988, The continuous dependence of solutions to a Cauchy problem
 Gordon Clark, August 1992, Micro-structure modeling of fluid flow in layered media.
 John Cook, August 1992, Diffusion models with microstructure and secondary flux.
 Lindsay Packer, August 1992, The regularized layered medium equation.
 Thomas Little, August 1993, Semilinear parabolic equations with Preisach Hysteresis.
 Brook Hagood, August, 1994, Semilinear degenerate parabolic systems and distributed capacitance models.
 Laura Lochhead, December, 1996, A coupled system of semilinear parabolic equations with hysteresis.
 Hee Chul Pak, December, 1999, Two Distributed Capacitance Models.
 Bahareh Momken, December, 2000, Fluid flow and Deformation in Composite Porous Media.
 Darrin Visarraga, December, 2001, Heat Transport Models with Distributed Microstructure.

Master's Degrees Supervised

John R. McNeely, August 1969
 Lonnie Brauner, Jr., June 1970
 Yii-Ming Chen, June 1970
 Steven R. Brooks, 1975
 Kevin Holley, 1981
 Cam Snyder, 1984
 Carl Baribault, 1989
 Christina Grieg, 1993
 R-Sya Chen, 1995
 Tim Povich, 2002.

RESEARCH

Singular or degenerate nonlinear evolution equations and systems of variational inequalities; related partial differential equations; initial-boundary-value problems of coupled mechanics and diffusion in heterogeneous media. Design and analysis of models, homogenization, approximation of solutions.

RESEARCH SUPPORT

1972-73	National Science Foundation
1975-77	National Science Foundation, MPS 75-07870, \$15,600
1977-79	National Science Foundation, MCS 75-07870, \$20,200
1980-82	National Science Foundation, MCS 80-02687, \$25,496
1985-88	National Science Foundation, DMS 85-10660, \$22,600
1988-90	Texas Advanced Research Program, #1886, \$46,303
1990-91	Deutsche Forschungsgemeinschaft
1988-91	National Science Foundation, DMS 88-012664, \$80,200

1988-91	Department of the Navy (with G. Carey, ASE/EM, N00014-89-J-1002), \$168,676
1991-92	National Science Foundation, DMS-9103984, \$17,567
1992-93	DOE Computational Science Graduate Science Fellowship Proposal
1992-94	National Science Foundation, DMS-9121743, \$107,988
1993	University Research Institute Faculty Research Assignment
1995-00	National Science Foundation, DMS-9500920, \$104,053
2002-2004	Texas Advanced Research Program, \$50,000 Design and Analysis of Mathematical Models for Deformable Porous Media.

PUBLICATIONS (previous 5 years)

- (with J. Douglas, Jr. and M. Pezysnska) Single phase flow in partially fissured media, *Transport in Porous Media* 28 (1997), 285–306.
- (with P. Shi) Dynamic Plasticity Models, *Computational Methods in Applied Mechanics and Engrg.* 151 (1998), 501-511.
- (with Peter Shi) Plasticity models and nonlinear semigroups, *Jour. Math. Anal. Appl.* 216 (1997), 218-245.
- (with M. Pezysnska) A transport model with adsorption hysteresis, *Differential and Integral Equations* 11 (1998), 327-340.
- Lectures on Flow in Porous Media, III Coloquio sobre Ecuaciones Diferenciales y Aplicaciones, Maracaibo, Venezuela, Angel Domingo Rueda and Jorge Guíñez (editors), Universidad del Zulia, 1998, pp. 53–97.
- (with Gordon Clark) Two-scale convergence of a model for flow in a partially fissured medium, *Electronic Journal of Differential Equations* Vol. 1999 (1999), No. 02, pp. 1-20.
- Diffusion in Poro-Elastic Media, TICAM Report 00-05, and *Jour. Math. Anal. Appl.* 251 (2000), 310-340.
- (with K.-H. Hoffmann) Vibration of a shape-memory alloy wire, TICAM Report 00-09, and *Communications in Applied Analysis*, 7 (2003), 53-66.
- Diffusion in Deformable Media, TICAM Report 00-18, and *IMA Volumes in Mathematics and its Applications*, vol. 131 (2002): Resource Recovery, Confinement, and Remediation of Environmental Hazards, John Chadam, Al Cunningham, Richard E. Ewing, Peter Ortoleva, and Mary Fanett Wheeler (editors), pp. 115-129.
- (with Hee Chul Pak) Thin-Film Capacitance Models, TICAM Report 00-19, and *Applicable Analysis* 78 (2001), 415–451.
- (with Bahareh Momken) Single-phase Flow in Composite Poro-elastic Media, TICAM Report 00-31, and *Math. Methods in the Applied Sciences* 25 (2002), 115-139.
- (with Ning Su) Partially Saturated Flow in a Poroelastic Medium, TICAM Report 01-01, and *Discrete and Continuous Dynamical Systems - Series B* 1 (2001), pp. 403-420.
- (with D.B. Visarraga) Absorption-Delay Models of Heat Transport, TICAM Report 02-01, and *Mathematical Models and Methods in Applied Sciences* 13 (2003), 645-660.
- (with Ning Su) Partially Saturated Flow in a Composite Poroelastic Medium, TICAM Report 02-15, and in *Poromechanics II*, (Grenoble, 2002), J.-L. Auriault et al (editors), pp.549–554, Balkema, Lisse, 2002.
- (with D.B. Visarraga) Double-Diffusion Models from a Highly-Heterogeneous Medium, TICAM Report 02-23. and *Jour. Math. Anal. Appl.*, to appear.
- Diffusion in Deforming Porous Media, TICAM Report 02-37, and *Dynamics of Continuous, Discrete and Impulsive Systems*, [Series A: Mathematical Analysis] 10 (2003), 661–678.
- (with Ulisse Stefanelli) Diffusion in Poro-Plastic Media, TICAM Report 03-22, and *Math. Methods in the Applied Sciences*, to appear.

Work in Progress

(with M. Murad) Biot-Stokes Consolidation system

(with Ning Su) Nonlinear Evolution Equations and Applications

Vector hysteresis in parabolic systems.

Hyperbolic - Sobolev System with Hysteresis.

Maxwell's Equations with Hysteresis.

Dual Poro-elastic Models of Fissured Deformable Media

Books

(with R. W. Carroll) Singular and Degenerate Cauchy Problems, Academic Press, 1976.

Hilbert Space Methods in Partial Differential Equations, Monographs & Studies in Mathematics, Pitman Publishing, 1977, and

Electronic Monographs in Differential Equations, <http://ejde.math.swt.edu//mono-toc.html>.

(edited, with J. T. Oden) Workshop on Existence Theory in Nonlinear Elasticity, National Technical Information Service, 1977.

Chapter in Book: Micro-structure models of porous Media, in 'Homogenization and Porous Media', Edited by Ulrich HORNUNG, Interdisciplinary Applied Mathematics Series, vol. 6, Springer, New York, 1996.

Monotone Operators in Banach Space and Nonlinear Partial Differential Equations, Mathematical Surveys and Monographs #49, American Mathematical Society, Providence, 1997.