C. LARRABEE (LARRY) WINTER

Deputy Director and Senior Scientist
National Center for Atmospheric Research
Boulder, Colorado

Adjunct Professor
Department of Hydrology and Water Resources
University of Arizona
Tucson, Arizona

EDUCATION

1982 Ph.D., University of Arizona, Applied Mathematics
Advisors: Charles M. Newman, Director, Courant Institute of Mathematical Sciences, NYU
Shlomo P. Neuman, Regents Professor, Department of Hydrology and Water Resources, University of Arizona
Dissertation: Asymptotic Properties of Diffusion in Random Conductivity Fields
1980 M.S., University of Arizona, Applied Mathematics
1976 M.S., University of Arizona, Geoscience
1970 B.A., University of Arizona, Philosophy with honors.

AWARDS

1988 SAIC Publication Prize in Mathematics, Computer Science and Operations Research
1993 Los Alamos National Laboratory Distinguished Performance Award
1997 Bronze Award, Best Story of the Year, Arizona Highways Magazine

HONORS AND MEMBERSHIPS

Phi Kappa Phi, Sigma Xi, American Geophysical Union, Society for Industrial and Applied Mathematics, European Geophysical Society

BOARDS

Member, Editorial Board, Journal of Neural Network Computing (1989-1990)
Member, Executive Committee, SAHRA, NSF Science and Technology Center for Sustainable Hydrology, University of Arizona
Member, Executive Committee, Center for Non-Linear Studies, Los Alamos National Laboratory
Chair, New Mexico EPSCoR Committe
Member, New Mexico State Space Center Commission
Member, Advisory Board, SAHRA, NSF Science and Technology Center for Sustainable Hydrology, University of Arizona
Chair, Advisory Board, National Ecological Observatory Network, National Science Foundation
Member, Institute of Arctic and Alpine Research (INSTAAR) Scientific Advisory Committee (2006-2010)

EXPERIENCE

2003 – Present: NCAR
1990 - 2003: Los Alamos National Laboratory

	Governor's Science Advisor, Office of the Governor, State Capitol, Santa Fe, NM
	Leader, Computer Research and Applications Group, Computing and Computational Sciences Division
	Leader, Geoanalysis Group, Earth and Environmental Sciences Division
	Leader, Applied Mathematics and Statistics Team, Theoretical Division
1985 - 1990:	SAIC Advanced Computing Division, Tucson, AZ
	Chief Scientist
1983 - 1985:	Idaho State University, Pocatello, ID
	Assistant Professor of Mathematics and Computer Science
1980 - 1983	University of Arizona, Tucson, AZ
	Post-Doctoral Associate, Department of Hydrology and Water Resources

Publication List

Ph.D. Dissertation

Asymptotic Properties of Mass Transport in Random Porous Media, 1982, University of Arizona, Tucson.

Refereed journal articles

Sviercoski, R.F., C.L. Winter and A.W. Warrick, "An explicit form for an n-dimensional homogenized approximation of a linear elliptic equation," in prep..

Sviercoski, R.F., C.L. Winter and A.W. Warrick, "Analytical solutions to n-dimensional generalized Laplace's equation," submitted SIAM J. Appl. Math..

Winter, C.L., A.L. Guadagnini, D. Nychka, and D.M. Tartakovsky, "Statistical sensitivity of saturated flow through highly heterogeneous porous media," J. Comp. Phys, in press.

Winter, C.L., "Stochastic hydrology: practical alternatives exist ," Stochastic Environ. Res. and Risk Assessment, 18 (4), 2004.

Guadagnini A. and C.L., Winter, "Introduction: Stochastic models of flow and transport in multiple-scale heterogeneous porous media," J. Hydrology 294 (1-3).

Winter, C.L., E.S. Springer, K. Costigan, P. Fasel, S. Mniewski, G. Zyvoloski, "Virtual Watersheds: Simulating the Water Balance of the Rio Grande Basin", IEEE Computers in Science and Engineering, 6 (3), 2004.

Guadagnini, A., L. Guadagnini, D. M. Tartakovsky, and C. L. Winter, "Random domain decomposition for flow in heterogeneous stratified aquifers", Stochastic Environ. Res. and Risk Assessment 17(6), 2003.

Winter, C.L. and D.M. Tartakovsky, "Groundwater flow in heterogeneous composite aquifers", Water Resources Research, 38 (8), 2002.

Winter, C. L., D. M. Tartakovsky, and A. Guadagnini, Moment equations for flow in highly heterogeneous porous media, Surv. Geophys., 24(1), 81 - 106, 2003.

Winter, C.L., D.M. Tartakovsky and A. Guadagnini, "A numerical solution of moment equations for flow in heterogeneous composite aquifers", Water Resources Research, 38(5), 2002.

Guadagnini, A., L. Guadagnini, D.M. Tartakovsky, and C.L. Winter, Moments of groundwater flow in heterogeneous composite layered media, Proceedings of *the 4th International Conference ``Calibration and Reliability in Groundwater Modeling'' (ModelCARE'02)*, Prague, Czech Republic, June 17 - 20, 2002.

Tartakovsky, D.M. and C.L. Winter, Radial flow in heterogeneous aquifers with uncertain hydraulic parameters, Proceedings of *the 4th International Conference ``Calibration and Reliability in Groundwater Modeling'' (ModelCARE'02),* Prague, Czech Republic, June 17 - 20, 2002.

Winter, C.L. and D.M. Tartakovsky, "A theoretical foundation for conductivity scaling", Geophysical Research Letters, 28(23), 2001.

Tartakovsky, D.M. and C.L. Winter, "Moving fronts in random media", SIAM J. Appl. Math, 2001.

Winter, C.L. and D.M. Tartakovsky, "Mean flow in composite porous media", Geophysical Research Letters, 27 (12), 2000.

Zhang, D. and C.L. Winter, "Moment-equation approach to single phase fluid flow in heterogeneous reservoirs", Society of Petroleum Engineers Journal, 4 (2), 1999.

Tartakovsky, D. M. and C. L. Winter, Groundwater flow in composite aquifers under uncertainty, Proceedings of *the International Conference ``Calibration and Reliability in Groundwater Modeling'' (ModelCARE'99),* Zürich, Switzerland, September 20-23, 1999.

Tartakovsky, D. M., and C. L. Winter, Scale-dependent Darcy flows in fractured media, Proceedings of the International Symposium in Honor of Paul A. Witherspoon: ``Dynamics of Fluids in Fractured Rocks: Concepts and Recent Advances", Berkeley, California, February 10-12, 224-225, 1999.

Mitkov, I., D. Tartakovsky, C.L. Winter, "Dynamics of wetting fronts in porous media,", Physical Review E, 58 (5), 1998.

Zhang, D. and C.L. Winter, "Nonstationary stochastic analysis of steady-state flow through variably saturated, heterogeneous media," Water Resources Research34 (5), 1998.

Zhang, D., T.C. Wallstrom and C.L. Winter, "Stochastic analysis of steady-state unsaturated flow in heterogeneous media: Comparison of the Brooks-Corey and Gardner Russo models," Water Resources Research, 34 (6), 1998.

Hagelberg, C.R., D.I. Cooper, C.L. Winter and W.E. Eichinger, "Spatial patterns in marine surface layer water vapor observations," J. Geophysical Rsrch, 103 (D14), 1998.

Neuman, S.P., D. M.Tartakovsky, T.C. Wallstrom and C.L. Winter, "Correction to prediction of steady-state flow in nonuniform geologic media by conditional moments," Water Resources Research, 32, 1996.

Carter, K.E. and C. L. Winter, "Fractal nature and scaling of normal faults in the Espanola Basin: implications for growth and strain," J. of Structural Geology, 17(6), 1995.

Stein, Michael C. and C. L. Winter, "Recursive Bayesian fusion for force estimation," Proc. 8th National Symposium on Sensor Fusion, Dallas, TX, March 15-17, 1995.

Winter, C. L. and Michael C. Stein, "Image Exploitation System overview," Proc. 8th National Symposium on Sensor Fusion, Dallas, TX, March 15-17, 1995.

Levitt, T. S., C. L. Winter, C. J. Turner, R. A. Chestek, G. J. Ettinger, S. C. Sayre, "Bayesian inference-based fusion of radar imagery, military intelligence and terrain models in the Image Exploitation System," International Journal of Human Computer Systems, Int. J. Human-Computer Studies, 42, 1995.

Cooke, B.J.. K.S. Lackner, D.H. Sharp and C.L. Winter, "Efficient data transmission from silicon wafer strip detectors," IEEE Trans. on Nuc. Sci., 39 (5), 1992.

Cooke, B.J.. K.S. Lackner, D.H. Sharp and C.L. Winter, "Superconducting super collider data compressions and driver/modulator architecture", IEEE Trans. on Nuc. Sci., 39 (5), 1992.

Winter, C. L., "BUGS: an adaptive critter," J. Neural Network Comp., 1(1), 1989.

Winter, C.L. "An adaptive network that learns state transitions," Advances in Neural Information Processing Systems, Morgan Kaufman, 1989.

Guarino, D. R., R. P. Kruger, S. Sayre, T. Sos, C. J. Turner and C. L. Winter, "DARPA sensor national testbed: hardware and software architecture," Proc. 2nd IEEE Symposium on Frontiers of Massively Parallel Computing, Fairfax, VA, 1988.

Winter, C.L. "An adaptive network that flees pursuit," Neural Networks, 1, Supp. 1, 1988.
Neuman, S. P., C. L. Winter and C. M. Newman, "Stochastic theory of field-scale Fickian dispersion in anisotropic porous media," Water Resources Research, 23 (3), 1987.
Ryan, T.W., C.L. Winter and C.J. Turner, "Dynamic control of an artificial neural system: the property inheritance network," Applied Optics, 26(3), 1987
Reynolds, T. D., R.B. Shepard and C. L. Winter, "Calibration of resistance-type soil moisture units in a high clay-content soil," Soil Science, 144(4), 1987.
Ryan, T. W. and C. L. Winter, "Variations on adaptive resonance," Proc Intl. Joint Conf. Neural Net, San Diego, CA, 1987.
Ryan, T.W., C. L. Winter and C. J. Turner, "TIN: a trainable inference network," Proc Intl. Joint Conf. Neural Net, San Diego, CA, 1987.
Winter, C. L., S. Dreyfuss, B. R. Hunt and T. Levitt, "Is there a future for expert systems?," Proc IEEE 6th Phoenix Conf. on Computers and Comm., Phoenix, AZ, 1987.
Winter, C. L., T. W. Ryan and B. R. Hunt, "Inference and data structures for image identification," Proc IEEE 5th Phoenix Conf. on Computers and Comm., Phoenix, AZ, 1986.
Winter, C. L. and W. L. Cook, "Interval estimates for yield modeling," IEEE J. Solid-State Circuits, 21(4), 1986.
Neuman, S. P., E.S. Simpson, P.A. Hsieh, J.W. Jones and C. L. Winter, "Statistical analysis of hydraulic tests from fractured rock near Oracle Arizona," Proc. 17th IAH Congress on Hydrogeology of Rocks of Low Permeability, Tucson, AZ, 1985.
Winter, C. L. and R.D. Girse, "Evolution and modification of probability in knowledge bases," Proc. IEEE 2nd Conf. on AI Applications, Miami Beach, FL, 1985.
Winter, C. L., C.M. Newman and S. P. Neuman, "A perturbation expansion for diffusion in a random velocity field," SIAM J. Appl. Math., 44(2), 1984.
Winter, C.L. and S. P. Neuman, "Asymptotic coefficients for random dispersions," NATO Advanced Study Institute on Mechanics of Fluids in Porous Media, Newark, DE, 1982.
Winter, C.L. and S. P. Neuman, "Evaluation of coefficients in the megascopic convection-dispersion equation," 3rd Annual Waste Management Symposium, ASCHE, Tucson, AZ, 1981.

Selected Reports

"Analysis of LAM patient tomograms: stereology and modeling," V. Faber, C.M. Wing, C. L. Winter, and J. D. Zahrt, Los Alamos Unclassified Report, LA-UR-95-371, 1995.
"Experiments with quadtree data structures," Kristi M. Carlson and C. L. Winter. Los Alamos Unclassified Report LA-UR-94-0359, Los Alamos National Laboratory, 1994.
"Efficient data transmission from silicon wafer strip detectors," B. J. Cooke, Klaus S. Lackner, David H. Sharp, Larry Winter, Los Alamos National Laboratory, LAUR-91-3903, 1991.
"Prediction of far-field subsurface radionuclide dispersion coefficients from hydraulic conductivity measurements, C. L. Winter, S. P. Neuman and C.M. Newman, US Nuclear Regulatory Commission Tech. Rpt., NUREG/CR-3612, 1984.

Edited Volumes

Winter, C.L. and A. Guadagnini, Flow and transport through highly heterogeneous porous media, special edition of the Journal of Hydrology, in press.

Zhang, D. and C. L. Winter, Theory, modeling and field investigation in hydrogeology: A special volume in honor of Shlomo P. Neuman's 60th birthday, Special Paper 348, Geol. Soc. Am., 2000.

Invited Talks

Winter, C.L., A. Guadagnini, D. Nychka, and D.M. Tartakovsky, "Multivariate Sensitivity Analysis of Saturated Flow Through Simulated Highly Heterogeneous Groundwater Aquifers," AGU Fall Meeting, San Francisco, CA, December 8, 2005.

Winter, C.L., "Stochastic PDEs in groundwater hydrology," IX Wkshp on PDEs, Instituto Nacional de Matematica Pura e Aplicada (IMPA), Rio de Janeiro, Brazil, plenary lecture, July 18-22, 2005.

Winter, C.L., "Uncertainty in natural systems," Joint Conf. On Prob. Mech. and Structural Reliability, ASCE, Albuquerque, N.M., plenary lecture, July 26-28, 2004.

Winter, C.L., "Darcy-type flows in random domains", Applied Math. Seminar, University of North Carolina, January 30, 2004.

Winter, C.L., "Diffusion in random domains", Applied Math Seminar, Brown University, December 5, 2003.

Winter, C.L., "Quantifying uncertainty in groundwater flow and transport: It's really dark down there", Center for Experimental Study of Subsurface Environmental Processes, Colorado School of Mines, October 16, 2003

Winter, C.L., "Stochastic modeling in composite multi-scale porous media", American Geophysical Union Fall Meeting, San Francisco, CA, December 2002.

Winter, C.L., "Conductivity scaling in porous media", Appl. Math. Colloq., University of Arizona, October 2002.

Winter, C.L., "Integrated basin-scale modeling", Dept of Hydrology and Water Resources Seminar, University of Arizona, October, 2002.

Winter, C.L., "Spectral analysis of random flows in heterogeneous porous media," Universite de Paris VI, April, 2002.

Winter, C.L. and D.M. Tartakovsky, "Karhunen-Loeve decomposition of a random diffusion operator", Institute for Mathematics and Its Applications, University of Minnesota, January, 2002.

Winter, C.L., "Non-stationary flow in porous media", 3 lectures, Politecnico di Milano, Milan, IT, July, 2000.

Winter, C.L., "Flow in composite porous media," European Geophys. Soc. Annual Meeting, Nice, France, March, 2000.

Winter, C.L., "Flow in highly heterogeneous porous media," Workshop on Stochastic Processes and Predictability in Multi-Scale Porous Media, Center for Non-Linear Studies, Los Alamos National Laboratory, July, 1999.

Winter, C.L., "Random flows in porous media," Appl. Math. Colloq., University of Arizona, March, 1998.

Winter, C. L., "Engineering applications of neural nets," Conf. on Neural Network Technology for Solving Engineering Problems, Center for AI Applications, University of Dayton OH, July, 1988.

Winter, C. L., "Image processing with neural nets," Proc. Conf. on Commercial Assessment of Neural Nets, Institute for International Research, Los Angeles, CA, January 1988

Granrath, D.R., T.W. Ryan and C.L. Winter, "Stochastic image analysis", IEEE Sys. Man and Cybernetics Annual Conf., Tucson, AZ, 1985.

Workshops and Sessions Organized

Rio Grande Basin Modeling, J. Hogan, F. Phillips, and C.L. Winter, NSF Science and Technology Center for Sustainable Hydrology, Taos, NM, May 2002.

Flow and Transport in Highly Heterogeneous Random Porous Media, C.L. Winter and A. Guadagnini, European Geophysical Society, Annual Meeting, Nice, FR, April 2002.

Quantifying Uncertainty and Multiscale Phenomena in Subsurface Processes, J. Glimm, L. Durlofsky, M. Wheeler, L. Dulofsky and C.L. Winter, Institute for Mathematics and Its Applications, University of Minnesota, January 2002.

Basin-Scale Hydrology, L. Bastidas, E. Springer and C.L. Winter, NSF Science and Technology Center for Sustainable Hydrology, Albuquerque, NM, May 2001.

Modeling Requirements for the Rio Grande, L. Bastidas and C.L. Winter, NSF Science and Technology Center for Sustainable Hydrology, New Mexico Institute of Mining and Technology, Socorro, NM, May 2001.

Stochastic Differential Equations in Geophysics, S. Habib, L. Margolin, D.M. Tartakovsky, C.L. Winter, Center for Nonlinear Studies, Los Alamos National Laboratory, September 1999.

Multiscale Processes in Random Porous Media, D. Moulton, C.L. Winter, and D. Zhang, Center for Nonlinear Studies, Los Alamos, National Laboratory, July 1999.

Computational Models of River Basins, J. Roads and C.L. Winter, NSF Science and Technology Center for Sustainable Hydrology, Scripps Institute of Oceanography, La Jolla, CA, September 1998.

Science of the Rio Grande, E. Springer and C.L. Winter, Coupled Environmental Modeling, Los Alamos National Laboratory, Albuquerque, NM, August 1997.

Image Understanding Workshop, D. Granrath, T. W. Ryan and C. L. Winter, IEEE Sys. Man and Cybernetics Annual Conf., Tucson, AZ, October 1985.