

# GEORGE FRANCIS PINDER

## Title

Director, Research Center for Groundwater Remediation Design  
Professor of Engineering  
Professor of Mathematics and Statistics  
Professor of Computer Science  
University of Vermont  
Burlington, Vermont, 05405

## Citizenship

United States  
Canada

## Degrees

Ph.D., University of Illinois, June 1968  
B.Sc. (Honors), University of Western Ontario, June 1965

## Professional Record

- March 2001-present Professor of Computer Science
- July 1993-present Director, Research Center for Groundwater Remediation Design
- July 1992-June 1996 Dean, Division of Engineering, Mathematics and Business Administration
- July 1989-June 1996 Dean, College of Engineering and Mathematics, University of Vermont, Burlington, Vermont 05405
- July 1989-present Professor of Civil and Environmental Engineering
- July 1990-present Professor of Mathematics and Statistics

- July 1980-June 1989 Chairman, Department of Civil Engineering, Princeton University, Princeton, New Jersey 08544
- Sept. 1977-July 1980 Professor of Civil Engineering, Princeton University, Director, Water Resources Program
- Sept. 1972-Sept.1977 Associate Professor of Civil Engineering, Princeton University, Director, Water Resources Program
- Dec. 1968-Sept. 1972 Research Hydrologist, U.S. Geological Survey, Water Resources Division, Atlantic Coast Region, Arlington, Virginia
- June 1968-Dec. 1968 Nova Scotia Department of Mines, Nova Scotia, Canada

## **Professional Societies<sup>1</sup>**

Society of Sigma Xi,  
 Phi Kappa Phi  
 American Society of Civil Engineers  
 Society of Petroleum Engineers of AIME  
 American Geophysical Union  
 Society for Industrial and Applied Mathematics  
 American Institute of Hydrology

## **Professional Activities**

### **Appointments to Editorial Boards**

- (1) Applied Mathematics Modelling
- (2) Applied Numerical Mathematics
- (3) Communications in Applied Analysis
- (4) International Journal of Computational and Numerical Analysis and Applications
- (5) International Journal of Pure and Applied Mathematics

### **Editor-in-Chief**

- (1) Numerical Methods for Partial Differential Equations

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<sup>1</sup>Societies in which membership has been awarded.

## **Founding Editor**

- (1) Advances in Water Resources
- (2) Numerical Methods for Partial Differential Equations

## **Professional Boards**

Board of Advisors, Wessex Institute of Technology, Ashurst, England  
External Advisory Committee, Water: Systems, Science and Society, Tufts University

## **Awards**

RCA Professor of Energy Resources, 1975-1989 (Princeton University)  
Horton Award, presented by the American Geophysical Union for an outstanding paper on hydrology (1969)  
O.E. Meinzer Award, presented by the Geological Society of America for an outstanding contribution to the field of hydrogeology (1975)  
The Eminent Scientists Award medal for 'Recognition for ...outstanding contributions in the field of water resources' (1992)  
University of Vermont University Scholar '...in recognition of contributions to research and scholarship' (1993).  
Fellow American Geophysical Union (1993)  
Julian Hinds Medal of the American Society of Civil Engineers for advancing '... engineering in the field of planning, development, and management of water resources '(2002).  
Fellow of Wessex Institute (2004)  
University of Vermont College Distinguished Professor (2005)  
Elected Member of Vermont Academy of Science and Engineering (2007)  
Hydrology Days Award (2009)  
Elected Member of National Academy of Engineering (2010)  
American Society of Civil Engineers Distinguished Member Medal (2012)  
Honorary Diplomat of American Society of Civil Engineers (2012).  
2016 EWRI Lifetime Achievement Award (2016)  
University of Vermont University Professor (2017)

## Leadership Positions

President, Hydrology Section of American Geophysical Union.

President, International Society for Computational Methods in Engineering.

Chairman, Groundwater Management Committee, American Society of Civil Engineers

Chairman, Groundwater Council, Environmental and Water Resources Institute, American Society of Civil Engineers.

Chairman, Peer Committee, National Academy, Section 11, Earth Resources Engineering.

Chairman, Section 11, Earth Resources Engineering, National Academy of Engineering.

## Doctoral Theses Supervised

1. James W. Mercer “Finite element approach to the modeling of hydrothermal systems” 1973.
2. Kevin O’Neill “The transient three-dimensional transport of liquid and heat in fractured porous media” October, 1977.
3. Nader M. Safai “Simulation of saturated and unsaturated deformable porous media” October, 1977.
4. Clifford I. Voss “Finite element simulation of multiphase geothermal reservoirs” May 1978.
5. Allen M. Shapiro “Fractured porous media: equation development and parameter identification” 1981.
6. Linda M. Abriola “Mathematical modeling of the multiphase migration of organic compounds in a porous medium” September, 1983.
7. Myron, B. Allen III “Collocation techniques for modelling compositional flows in porous media” June, 1983.
8. Michael A. Celia “Collocation on deformed finite elements and alternating direction methods” September, 1983.

9. Roger H. Page “Solving differential and numerical models of systems with uncertain material parameters: Applications to convection-dispersion equations” 1983.
10. David E. Dougherty “On equivalent porous medium modeling of transport in fractured porous reservoirs” June 1985.
11. Mary C. Hill “An investigation of hydraulic conductivity estimation in a ground-water flow study of northern Long Valley, New Jersey” 1985.
12. Bernard Joos “The least squares collocation method for solving partial differential equations” June 1986.
13. David P. Ahlfeld “Designing contaminated groundwater remediation systems using numerical simulation and nonlinear optimization” January, 1987.
14. Lin A. Ferrand “An experimental investigation of the capillary pressure-saturation relation in two- and three- fluid porous media” June, 1988.
15. Lawrence Bentley “The Eulerian-Lagrangian least squares collocation method for solving the transport equation” October, 1990.
16. Stuart A. Stothoff “A boundary integral technique for modeling two-phase flow in porous media” June, 1991.
17. Joseph Guarnaccia “A collocation-based parallel algorithm to solve multiphase flow and multicomponent transport problems” February, 1992.
18. George P. Karatzas “Globally optimal groundwater management combining the outer approximation method with numerical simulation” June, 1993
19. Tullio Tucciarelli “Solving the groundwater quality management problem: a global approach” November, 1993
20. William A. McGrath “Sampling network design to delineate groundwater contaminant plumes” October, 1997
21. Graciela Herrera de Olivares “Cost effective groundwater quality sampling network design” May, 1998

22. Stephen H. Brill “The solution of two dimensional partial differential equations via Hermite collocation with block red-black Gauss Seidel preconditioner”, May 1998
23. Alexander A. Spiliotopoulos “Solution of groundwater management problems using concave and biconcave minimization techniques”, July, 1999
24. Metin M. Ozbek “Risk-based remedial design: utilizing expert opinion on groundwater-driven health risk”, May 2000
25. Karen L. Ricciardi, “Optimal groundwater remediation design subject to uncertainty,” May, 2002
26. Maria P. Papadopoulou, “Enhanced methodology for the solution of groundwater management problems,” October, 2002
27. Yingqi Zhang, “Optimal design of groundwater-quality monitoring networks,” May 2002.
28. Melissa M. McKay, “Computationally Based Investigation of Alcohol Assisted Bioremediation,” May 2004.
29. Xinyu Wei, “Long-term Monitoring Network Design Evaluation Using and Intermediate-Scale Groundwater Facility,” May, 2006
30. Zoi Dokou, “Optimal Search Strategy for the Definition of a DNAPL Source,” February, 2008.
31. James L. Ross, “Approximate Reasoning in Hydrogeological Modeling,” May, 2008.
32. Hua Chen, “Investigation of Contaminant Transport in Tidally-Influenced Aquifers: Experiment and Analysis,” May 2010.
33. Christina Syrrakou, “Numerical Modeling and Experimental Investigations of the Local Hydrology of a Pervious Concrete Site,” May 2014
34. Ganesh Oka, “A Cellular Automata Based Model of Upscaling the Impact of Bacterial Growth Attached to Soil Particles on the Intrinsic Permeability of the Soil: Theory and Simulations” 2014

## **Masters Dissertations Supervised**

1. Noemi de la Puente “An analysis of the removal of trichloroethylene from soils using surfactants” October, 1986.
2. J. Mark Nielson “A study of the spatial variability of microscopic solute transport in dispersive flows using fiber optic sensors, 1988.
3. J. Christopher Bianchi “Velocity measurements of low Reynolds number tube flow using fiber-optic technology” May, 1993.
4. David T. Piccirilli “Using the collocation method with splines under tension and upstream weighting to solve the one-dimensional convection-diffusion equation. May, 1994
5. Aaron H. Mandell “Development of a three-dimensional aquifer flow and transport model for the identification of well pollution sources” May 2000
6. Lester, George. “Evaluation of Pulsed Pumping in Porous Media Containing Sharp Material Interfaces, Using Laboratory Experiments and Modeling, ” October, 2013

## **Papers in Refereed Publications**

1. with J.D. Bredehoeft (1968) “Application of the digital computer for aquifer evaluation,” *Water Resources Research*, 4 (5), 1060-1193.
2. with J.F. Jones (1969) “Determination of the groundwater component of peak discharge from the chemistry of total runoff,” *Water Resources Research*, 5 (2), 438-445.
3. with J.D. Bredehoeft and H.H. Cooper, Jr. (1969) “Determination of aquifer diffusivity from aquifer response to fluctuations in river stage,” *Water Resources Research*, 5 (4), 850-855.
4. with P. Trescott (1970) “Air pump for small diameter piezometers,” *Ground Water*, 8 (3), 10-15.
5. with P. Trescott and J.F. Jones (1970) “Digital model of alluvial aquifer,” *Journal Hydraul. Div., American Society of Civil Engineers*, HY5, 1115-1128.

6. with J.D. Bredehoeft (1970) "Digital analysis of areal flow in multiaquifer groundwater systems: a quasi three-dimensional model," *Water Resources Research*, 6 (3), 883-888.
7. with H.H. Cooper, Jr. (1970) "A numerical technique for calculating the transient position of the saltwater front," *Water Resources Research*, 6 (3), 875-882.
8. with S.P. Sauer (1971) "Numerical simulation of flood-wave modification due to bank-storage effects," *Water Resources Research*, 7 (1), 63-70.
9. with J.D. Bredehoeft (1971) "Application of transport equations to flowing groundwater systems," *Proceedings of the Symposium of Underground Waste Management and Environmental Implications*, AAPG Memoir, (18), 191-201.
10. with E.O. Frind (1972) "Application of Galerkin's procedure to aquifer analysis," *Water Resources Research*, 8 (1), 108-120.
11. with J.D. Bredehoeft (1973) "Mass transport in flowing groundwater," *Water Resources Research*, 9 (1), 194-209.
12. with E.O. Frind and S.S. Papadopoulos (1973) "Functional coefficients in the analysis of groundwater flow," *Water Resources Research*, 9 (1), 222-226.
13. with E.O. Frind (1973) "Galerkin solution of the inverse problem for aquifer transmissivity," *Water Resources Research*, 9 (5), 1397-1410.
14. (1973) "A Galerkin-finite element simulation of groundwater contamination on Long Island, New York," *Water Resources Research*, 9 (6), 1657-1669.
15. (1974) "Progress in simulation of contaminant transport in porous media," *American Water Resources Association*, 19, 223-239.
16. with W.G. Gray (1974) "Galerkin approximation of the time derivative in the finite element analysis of groundwater flow," *Water Resources Research*, 10 (4), 821-828.
17. with J. W. Mercer, Jr. (1975) "Galerkin finite-element simulation of a geothermal reservoir," *Geothermics*, 2 (3-4), 81-89.



18. with G. Segol and W.G. Gray (1975) "A Galerkin finite-element technique for calculating the transient position of the saltwater front," *Water Resources Research*, 11 (2), 343-354
19. with J.W. Mercer and T.G. Donaldson (1975) "A Galerkin finite-element analysis of the hydrothermal system at Wairakei, New Zealand," *Journal of Geophysical Research*, 80 (17), 2608-2621.
20. with W.G. Gray (1976) "An analysis of the numerical solution of the transport equation," *Water Resources Research*, 12 (3), 547-555.
21. with G. Segol (1976) "Transient simulation of salt-water intrusion in Southeastern Florida," *Water Resources Research*, 12 (1), 65-70.
22. with W.G. Gray (1976) "Is there a difference in the finite element method?," *Water Resources Research*, 12 (1), 105-107.
23. with W.G. Gray (1976) "On the relationship between the finite element and finite difference methods," *Int. J. Numerical Methods in Engineering*, 10, 893-923.
24. with M. van Genuchten and E.O. Frind (1977) "Simulation of two-dimensional contaminant transport with isoparametric Hermitean finite elements," *Water Resources Research*, 13 (2), 451-456.
25. with D.H. Tang (1977) "Simulation of groundwater flow and mass transport under uncertainty," *Advances in Water Resources*, 1 (1), 25-30.
26. with H. Rubin (1977) "Approximate analysis of upconing," *Advances in Water Resources*, 1 (2), 97-101.
27. with P.S. Huyakorn (1978) "A new finite element technique for the solution of two-phase flow through porous media," *Advances in Water Resources*, 1 (5), 285-298.
28. with P.S. Huyakorn, C.R. Faust, and J.W. Mercer (1978) "Finite element simulation of two-phase flows in porous media," In K.C. Park and D.K. Garling (Eds.), *Computational Techniques for Interface Problems*, ASME publication AMD, 30, 19-44.

29. with C.I. Voss (1978) "Block iterative finite element preprocessed scheme for simulation of large non-linear problems," *Int. J. Numerical Methods in Engineering*, 12, 1543-1558.
30. with J. Bear (1978) "On the equations describing porous medium deformation in multiphase flow," *American Society of Civil Engineers, Mechanics Division, EM4*, 881-894.
31. with N.M. Safai (1979) "Vertical and horizontal land deformation in a desaturating porous medium," *Advances in Water Resources*, 2 (1), 19-25.
32. with E.O. Frind (1979) "A collocation finite element method for potential problems in irregular domains," *Int. J. Numerical Methods in Engineering*, 14, 681-701.
33. with D.H. Tang (1979) "A direct solution to the inverse problem in groundwater flow," *Advances in Water Resources*, 2 (2), 97-101.
34. with D.H. Tang (1979) "Analysis of mass transport with uncertain physical parameters," *Water Resources Research*, 15 (5), 1147-1155.
35. with A. Shapiro (1979) "A new collocation method for the solution of the convection-dominated transport equation," *Water Resources Research*, 15 (5), 1177-1182.
36. with R.H. Page (1979) "Groundwater utilization, South Fork of Long Island," *Clearwaters*, 9(4), 11-14.
37. with N.M. Safai (1980) "Vertical and horizontal land deformation due to fluid withdrawal," *Int. J. Numerical and Analytical Methods in Geomechanics*, 4, 131-142.
38. with A. Shapiro (1981) "Analysis of an upstream weighted collocation approximation to the transport equation," *Jour. Comp. Phys.*, 39, 46-71.
39. with L. Hayes and M. Celia (1981) "Alternating-direction collocation for rectangular regions," *Computer Methods in Applied Mechanics and Engineering*, 27, 265-277.
40. with M. Celia and W.G. Gray (1981) "Velocity calculation from randomly located hydraulic heads," *Groundwater*, 19,(3), 262-264.

41. with K. O'Neill (1981) "A derivation of the equations for transport of liquid and heat in three dimensions in a fractured porous medium," *Advances in Water Resources*, 4 (4), 150-164.
42. with V.V. Nguyen and J.F. Botha (1981) "Phenomenological interpretation of the thermo-dynamics of stream-water systems using catastrophe theory," *J. Non-Equilibrium Thermodynamics*, 6, 285-294.
43. with A. Shapiro (1982) "Physics of flow in geothermal systems," *Geological Society of America, Special paper 189*, 25-30.
44. with O.L. Franke and E.P. Patten (1982) "An electric-analog simulation of elliptic partial differential equations using finite element theory," *Mathematics and Computers in Simulation XXIV*. 65-71.
45. with V.V. Nguyen, W.G. Gray, J.F. Botha, and D.A. Crerar (1982) "A theoretical investigation on the transport of chemicals in reactive porous media," *Water Resources Research* 18 (4), 1149-1156.
46. with M.B. Allen (1983) "Collocation simulation of multiphase porous-medium flow," *Soc. Petrol. Eng. Jour.*, 23 (1), 135-142.
47. with D.E. Dougherty (1983) "A brief note on upwind collocation," *Int. J. Numerical Methods Fluids*, 3 (3), 307-313.
48. with V.V. Nguyen (1983) "Geothermal reservoir simulation using nonequilibrium thermodynamics," *Soc. Petrol. Eng. Jour.*, 23 (4), 602-612.
49. with V.V. Nguyen, W.G. Gray, and J.F. Botha (1983) "Numerical simulation of uranium insitu mining," *Chem. Engrg. Sci.*, 38 (11), 1855-1862.
50. (1984) "Groundwater contaminant transport modeling" *Environ. Sci. Technol.*, 18 (4) 108-114.
51. with D.K. Babu (1984) "Analytical integration formulae, isoparametric finite elements" *Int. J. Numerical Methods in Engineering*, 20, 1153-1166.
52. with M.F.N. Mohsen (1984) "Analytical solution of the transport equation using a polynomial initial condition for verification of numerical simulators," *Int. J. Numerical Methods Fluids*, 4, 701-707.

53. with D.K. Babu (1984) "A finite element-finite difference alternating direction algorithm for three-dimensional groundwater transport," *Advances in Water Resources*, 7 (3), 116-119.
54. with M.F.N. Mohsen (1984) "Orthogonal collocation with 'adaptive' finite elements," *Int. J. Numerical Methods in Engineering*, 20, 1901-1910.
55. with S.K. Gupta and C.R. Cole (1984) "A finite-element three-dimensional groundwater (FE3DGW) model for a multiaquifer system," *Water Resources Research*, 20 (5), 553-564.
56. with V. Nguyen (1984) "Direct calculation of aquifer parameters in slug test analysis," *Groundwater Hydraulics*, American Geophysical Union, *Water Resources Monograph* 9, 222-239.
57. with M.A. Celia (1985) "An analysis of alternating-direction methods for parabolic equations," *Numerical Methods for Partial Differential Equations*, 1 (1), 57-70.
58. with L.M. Abriola (1985) "A multiphase approach to the modeling of porous media contamination by organic compounds, 1, equations development," *Water Resources Research*, 21 (1), 11-18.
59. with L.M. Abriola (1985) "A multiphase approach to the modeling of porous media contamination by organic compounds, 2, numerical simulation," *Water Resources Research*, 21, (1), 19-26.
60. with I. Kinnmark (1985) "On the diffuse and dispersive effect of displaced integration points in finite element analysis," *Int. J. Numerical Methods in Engineering*, 21, 361-365.
61. with M.B. Allen (1985) "The convergence of upstream collocation in the Buckley-Leverett Problem," *Soc. Petrol Eng. Journal*, June Vol. 279, 363-370.
62. with Z.J. Kabala and P.C.D. Milly (1985) "Analysis of well-aquifer response to a slug test," *Water Resources Research*, 22 (9), 1433-1436.
63. with M.F.N. Mohsen (1986) "Collocation with 'adaptive' finite elements in Buckley-Leverett Problem," *International Journal for Numerical Methods in Engineering*, 23, 121-131.

64. with L.M. Abriola (1986) "On the simulation of non-aqueous phase organic compounds in the subsurface," *Water Resources Research*, 22 (9), 1095-1195.
65. with L.A. Ferrand and P.C.D. Milly (1986) "Dual-gamma attenuation for the determination of porous medium saturation with respect to three fluids," *Water Resource Research*, 22 (12), 1657-1664.
66. with D. Ahlfeld and J.M. Mulvey (1986) "Designing optimal strategies for contaminated groundwater remediation," *Advances in Water Resources*, 9 (2), 77-84.
67. with T. V. Hromadka and B. Joos (1987) "Approximating a linear operator equation using a generalized Fourier series: development," *Engineering Analysis*, 4 (4), 82.
68. with T. V. Hromadka and C.C. Yen (1987) "Approximating a linear operator equation using a generalized Fourier series: applications," *Engineering Analysis*, 4 (4), 214-220.
69. with D. Ahlfeld and J.M. Mulvey (1987) "Combining physical containment with optimal withdrawal for contaminated groundwater remediation," *Advances in Water Resources*, 10, (4), 200-204.
70. with M.A. Celia and L.R. Ahuja (1987) "Orthogonal collocation and alternating-direction procedures for unsaturated flow problems," *Adv. Water Resources*, 10, 178-187
71. with D.P. Ahlfeld, J.M. Mulvey, and E.F. Wood (1988) "Contaminated groundwater remediation design using simulation, optimization, and sensitivity theory: 1. Model. development," *Water Resources Research*, 24(3), 431-441.
72. with D.P. Ahlfeld, and J.M. Mulvey (1988) "Contaminated groundwater remediation design using simulation, optimization, and sensitivity theory: 2. Analysis of field site," *Water Resources Research*, 24(3), 443-452.
73. with J.P. Laible (1989) "Least squares collocation solution of differential equations on irregularly shaped domains using orthogonal meshes," *Numerical Methods for Partial Differential Equations*, 5 (4), 347-361.

74. with L.A. Ferrand, P.C.D. Milly (1989) "Experimental determination of three-fluid saturation profiles in porous media," *Journal of Contaminant Hydrology*, 4, 373-395.
75. with L.R. Bentley and I. Herrera (1989) "Solution of the advective-dispersive transport equation using a least squares collocation, Eulerian-Lagrangian method," *Numerical Methods for Partial Differential Equations*, 5, 227-240.
76. with K. Sato, T. Fukuhara (1990) "An approach to fully coupled heat and moisture transfer analysis in saturated-unsaturated porous media during surface evaporation," *Proc. of Japan Society of Civil Engineering*, No. 423, Vol. II-14, November 111-120.
77. with M.A. Celia (1990) "Generalized alternating-direction collocation methods for parabolic equations II. Transport equations with application to seawater intrusion problems," *Numerical Methods for Partial Differential Equations*, 6, No.3, 215-230.
78. with M.A. Celia (1990) "Generalized alternating-direction collocation methods for parabolic equations III. Nonrectangular Domains," *Numerical Methods for Partial Differential Equations*, 6, No.3, 231-244..
79. with L.A. Ferrand, P.C.D. Milly and R.P. Turrin (1990) "A comparison of capillary pressure-saturation relations for drainage in two- and three-fluid porous media," *Adv. Water Resources*, 1990, 13, No. 2, 54-63.
80. with M.A. Celia (1990) "Generalized alternating-direction collocation methods for parabolic equations I. Spatially varying coefficients," *Numerical Methods for Partial Differential Equations*, 6, No.3, 193-214.
81. with L.R. Bentley and A. Aldama (1990) "Fourier analysis of the Eulerian-Lagrangian least squares collocation method," *Int. J. Numerical Methods in Fluids*, 11, 427-444.
82. with M.A. Celia (1990) "Generalized alternating-direction collocation methods for parabolic equations III. Nonrectangular Domains," *Numerical Methods for Partial Differential Equations*, 6, No.3, 231-244.
83. with D.P. Ahlfeld, (1992) "A Fast and accurate method for solving subsurface contaminant transport problems with a single uncertain parameter," *Advances in Water Resources*, 15, No. 2, , 143-149.

84. with T. Tucciarelli (1991) "Optimal data acquisition strategy for the development of a transport model for groundwater remediation" *Water Resources Research*, 27, No. 4, 577-588.
85. with L. R. Bentley (1992) "A least squares method for solving the mixed form of the groundwater flow equations," *Numerical Methods in Fluids*, 14, 729-751.
86. with J. M. Nielsen, T.J. Kulp, and S.M. Angel (1991) "Investigation of dispersion in porous media using fiber-optic technology," *Water Resources Research*, 27, No. 10, 2743-2749.
87. with S.A. Stothoff (1992) "A boundary integral technique for multiple-front simulation of incompressible, immiscible flow in porous media," *Water Resources Research*, 28, No. 8, 2067-2076.
88. with L.R. Bentley (1992) "Eulerian-Lagrangian solution of the vertically averaged groundwater transport equation," *Water Resources Research*, 28, No. 11, 3011-3020.
89. with D. G. Zeitoun (1993) "An optimal control least squares method for solving coupled flow-transport systems," *Water Resources Research*, 29, No. 2, 217-228.
90. with J. P. Laible (1993) "Solution of the shallow water equations by least squares collocation," *Water Resources Research*, 29, No. 2, 445-456.
91. with G. P. Karatzas (1993) "Groundwater management using numerical simulation and the outer approximation method for global optimization," *Water Resources Research*, 29, No. 10, 3371-3378.
92. with P.T. Imhoff and P.R. Jaffe (1994) "An experimental study of complete dissolution of a nonaqueous phase liquid in saturated porous media," *Water Resources Research*, 30, No 2, 307-320.
93. with D.G. Zeitoun and J.P. Laible (1995) "A weighted least squares method for first-order hyperbolic system," *International Journal for Numerical Methods in Fluids*, 20, 191-212.

94. with D.P. Ahlfeld and R.H. Page (1995) "Optimal ground-water remediation methods applied to a superfund site: From formulation to implementation," *Ground Water*, 33, No. 1.
95. with D.P. Ahlfeld and R.H. Page (1995) "Cleanup solution-conflict resolution," *Civil Engineering*, 59-61.
96. with G.P. Karatzas (1996) "The solution of groundwater quality management problems with a nonconvex feasible region using a cutting plane optimization technique," *Water Resources Research*, 32, 4, 1091-1100.
97. with D.G. Zeitoun and J.P. Laible (1997) "An iterative penalty method for the least squares solution of boundary value problems," *Numerical Methods for Partial Differential Equations*, 257-282.
98. with J.G. Guarnaccia, (1997) "NAPL: Simulator Documentation," National Risk Management Research Laboratory, U. S. Environmental Protection Agency, EPA/600/SR-97/102, pp8.
99. with T. Tucciarelli and G.P. Karatzas (1998) "A primal method for the solution of the groundwater quality management problem," *Journal of Operations Research*,. 46, No. 4, 463-473.
100. with G.P. Karatzas and D. P. Ahlfeld (1999) "Computer facilitated ground-water remediation design," *Technology*, 6, No. 4-6, 453-475.
101. with D. P. Ahlfeld, G.P. Sabadell, R.A. Marryott, and R.H. Harris (2000) "Allocating remedial costs at Superfund sites with co-mingled ground water contaminant plumes," *International Journal of Environmental Forensics*, 1, No. 1, 87-105.
102. with S.H. Brill (2001) "Eigenvalue analysis of a block red-black Gauss-Seidel preconditioner applied to the Hermite collocation discretization of Poisson's equation," *Numerical Methods for Partial Differential Equations*, 17(3), 204-228.
103. with S.H. Brill (2001) "Analysis of a block red-black preconditioner applied to the Hermite collocation discretization of a model parabolic equation," *Numerical Methods for Partial Differential Equations*, 17(6), pp 584-606.



104. with S.H. Brill (2002) "Parallel implementation of the bi-CGSTAB method with block red-black Gauss-Seidel preconditioner applied to the Hermite collocation discretization of partial differential equations" *Parallel Computing*, Vol. 28, pp 399-414.
105. with L. Wu and H. Wang (2003) "A nonconventional Eulerian-Lagrangian single-node collocation method with Hermite polynomials for unsteady-state advection-diffusion equations," *Numerical Methods for Partial Differential Equations*, Vol. 19, No. 3, pp 271-283.
106. with W.A. McGrath, (2003) "Search strategy for groundwater contaminant plume delineation," *Water Resour. Res.*, Vol. 39, No. 10.
107. with M. P. Papadopoulou and G.P. Karatzas, (2003) "Enhancement of the outer approximation method for the solution of concentration-constrained optimal-design groundwater-remediation problems" *Water Resour. Res.*, Vol. 39, No. 7, p. SBH 5-1 to 5-8.
108. with Yingqi Zhang, (2003) "Latin-hypercube sample-selection strategies for correlated random hydraulic-conductivity fields," *Water Resour. Res.* Vol. 39, No. 8, p. SBH 11-1 to SBH 11-11.
109. with A.A. Spiliotopoulos and G.P. Karatzas, (2004) "A multiperiod approach to the solution of groundwater management problems using an outer approximation method," *Journal of European Operations Research*, Vol. 157, pp 514-525.
110. with F. Fedele, M. McKay, (2004) "A single-degree of freedom Hermite collocation for advection-diffusion equations" *Int. J. for Numerical Methods in Fluids*, Vol. 44, pp 1337-1354.
111. with K. Ricciardi, (2005) "Comparison of the lognormal and beta-distribution functions to describe the uncertainty in permeability," *Journal of Hydrology*, V 313, pp. 248-256.
112. with Y.Zhang and G.S. Herrera, (2005) "Least-cost design of groundwater-quality monitoring networks," *Water Resources Research*, Vol. 41, W08412, doi:10.1029/2005WR003936.
113. with Herrera, G. S. (2005) "Space-time optimization of groundwater quality sampling networks", *Water Resour. Res.*, 41, W12407.1-W12407.15.

114. with M. M. Ozbek, (2006) “Non-probabilistic Uncertainty in Subsurface Hydrology and its Applications: an Overview,” *Water, Air and Soil Pollution: Focus* (2006), 6, pp. 35-46.
115. with M.P. Papadopoulou and G.P. Karatzas, (2007) “Flexible time-varying optimization methodology for the solution of groundwater management problems” *European Journal of Operational Research*, 180/2, pp 770-785.
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