

## Curriculum Vitae: Alex S. Mayer

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### Education

Brown University, Sc.B. Civil/Environmental Engineering, 1981

University of North Carolina at Chapel Hill, M.S. Environmental Engineering, 1987

Title: Development of a three-dimensional groundwater flow model

University of North Carolina at Chapel Hill, Ph.D. Environmental Engineering, 1992

Title: An investigation of residual nonaqueous phase liquid dissolution in saturated groundwater systems

### Professional Experience

September 2005-present

Director, Center for Water & Society

Michigan Technological University, Houghton, Michigan

September 2001-present

Full Professor

Dept. Geological Engineering and Sciences/Dept. Civil and Environmental Engineering (joint appointment)

Michigan Technological University, Houghton, Michigan

September 1998-present

Associate Professor

Dept. Geological Engineering and Sciences/Dept. Civil and Environmental Engineering (joint appointment)

Michigan Technological University, Houghton, Michigan

August 2000-May 2001

Visiting Scholar

Department of Civil Engineering

Technical University of Delft, Delft, The Netherlands

August 1995-November 1995

Visiting Professor

Department of Chemical Engineering/Department of Geology

University of Sonora, Hermosillo, Mexico

March 1992-August 1998

Assistant Professor

Dept. of Geological Engineering and Sciences/Dept. Civil and Environmental Engineering (joint appointment)  
Michigan Technological University, Houghton, Michigan

March 1992-present  
Professional Consultant in Hydrogeology  
Houghton, Michigan

1985-1991  
Research Assistant  
Department of Environmental Sciences and Engineering  
University of North Carolina, Chapel Hill, North Carolina

1981-1985  
Junior and Assistant Civil Engineer  
Water Resources Projects Section, Planning Division  
East Bay Municipal Utility District, Oakland, California

### **Professional Registration**

Registered Professional Engineer in State of California.

### **Awards**

Manierre Award, Huron Mountain Wildlife Foundation, 2010  
Distinguished Faculty Service Award, Michigan Technological University, 2009  
Rudolf Hering Medal, American Society of Civil Engineers, 2009  
Recognition Award for Rural Sustainable Development, Secretary of Social Development, Mexico, 2007  
Fulbright Fellowship (Netherlands), 2000-2001  
James M. Montgomery Consulting Engineers Southeast Region Scholarship, 1990-1991  
Board of Governors Fellowship for Doctoral Research, University of North Carolina, 1987-1990  
Daniel A. Okun Scholarship for Master's Research, University of North Carolina, 1985-1986

### **Publications**

Refereed Journal Articles (41 published or in press, 3 in review)

Miller, C.T. and A.S. Mayer, Groundwater, *Journal of the Water Pollution Control Federation*, 61(6), 954-984, 1989.  
Miller, C.T. and A.S. Mayer, Groundwater: A review of the 1989 literature, *Research Journal of the Water Pollution Control Federation*, 62(5), 700-737, 1990.  
Miller, C.T., M.M. Poirier-McNeill, and A.S. Mayer, Dissolution of trapped nonaqueous phase liquids: mass transfer characteristics, *Water Resources Research*, 26(11), 2783-2796, 1990.  
Miller, C.T., Rabideau, A.R., and A.S. Mayer, Groundwater, *Research Journal of the Water Pollution Control Federation*, 63(4), 552-593, 1991.  
Mayer, A.S., Rabideau, A.R., and C.T. Miller, Groundwater, *Water Environment Research*, 64(4), 535-570, 1992.

- Mayer, A.S. and C.T. Miller, The influence of porous media characteristics and measurement scale on pore-scale distributions of residual nonaqueous phase Liquids, *Journal of Contaminant Hydrology*, 11, 189-213, 1993.
- Mayer, A.S. and C.T. Miller, An Experimental investigation of pore-scale distributions of nonaqueous phase liquids at residual saturation, *Transport in Porous Media*, 10(1), 57-80, 1993.
- Mayer, A.S., Rabideau, A.R., Imhoff, P.T., Lowry, M.I., and C.T. Miller, Groundwater quality, *Water Environment Research*, 65(4), 486-534, 1993.
- Mayer, A.S., Imhoff, P.T., Mitchell, R.J., Rabideau, A.R., McBride, J.F., and C.T. Miller, Groundwater quality, *Water Environment Research*, 66(4), 532-585, 1994.
- Mayer, A.S., Mitchell, R.J., Carriere, P.P.E., Hein, G.L., Rabideau, A.R., and C.L. Wojick, Groundwater quality, *Water Environment Research*, 67(4), 629-685, 1995.
- Mayer, A.S. and C.T. Miller, The influence of mass transfer characteristics and porous media heterogeneity on nonaqueous phase liquid dissolution, *Water Resources Research*, 32(6), 1551-1567, 1996.
- Mayer, A.S., Carriere, P.P.E., Green, M.L., Mitchell, R.J., Pennell, K.D., Rabideau, A.R., Russell, K.T., Sandman, T.M. and T.M. Young, Groundwater quality, *Water Environment Research*, 68(4), 662-720, 1996.
- Huang, C. and A.S. Mayer, Pump-and-treat optimization using well locations and pumping rates as decision variables, *Water Resources Research*, 33(5), 1001-1012, 1997.
- Mayer, A.S., Carriere, P.P.E., Gallo, C., Pennell, K.D., Taylor, T.P., Williams, G.A., Zhong, L., Groundwater quality, *Water Environment Research*, 69(4), 777-844, 1997.
- Mayer, A.S. and R.J. Lenhard, Recent Advances in modeling the flow and transport of nonaqueous phase liquids in subsurface systems, co-editors, *Advances in Water Research*, 21(2), 75-181, 1998.
- Mitchell, R. J. and A. S. Mayer, A numerical model for transient-hysteretic flow and solute transport in unsaturated porous media, *Journal of Contaminant Hydrology*, 30(3-4) 243-264, 1998.
- Mitchell, R.J. and A.S. Mayer, Significance of transient and hysteretic flow in modeling transport in unsaturated porous media, *Soil Science Society of America Journal*, 62(6) 1506-1512, 1998.
- Gierke, J.S., A.S. Mayer, and D.R. Shonnard, Multidisciplinary subsurface remediation courses: fundamentals, experiments and design projects, *Journal of Engineering Education*, 87(5), 555-566, 1998.
- Huang, C. and A.S. Mayer, Development and application of a coupled-process parameter inversion model based on maximum likelihood estimation method, *Advances in Water Research*, 22(8), 841-853, 1999.
- Mayer, A.S., L. Zhong, and G. Pope, Measurement of mass transfer rates for surfactant-enhanced solubilization of nonaqueous phase liquids, *Environmental Science & Technology*, 33, 2965-2972, 1999.
- Zhong, L., Mayer, A.S., and R.J. Glass, Visualization of surfactant enhanced NAPL mobilization and solubilization in a two-dimensional micromodel, *Water Resources Research*, 37, 523-537, 2001.
- Erickson, M., Mayer A.S., and J. Horn, The niched Pareto genetic algorithm 2 applied to the design of groundwater remediation systems, *Evolutionary Multi-Criteria Optimization, Lecture Notes in Computer Science*, Springer-Verlag, Berlin, 681-695, 2001.
- Erickson, M., Mayer A.S., and J. Horn, Multi-objective optimal design of groundwater remediation systems: Application of the niched Pareto genetic algorithm (NPGA), *Advances in Water Resources*, 25, 51-65, 2002.
- Mayer, A.S., Kelley, T., Miller, C.T., Optimal Design for Problems Involving Flow and Transport Phenomena in Subsurface Systems, *Advances in Water Resources*, 25, 1233-1256, 2002.
- Zhong, L., Mayer, A.S., and G. Pope, The effects of surfactant formulation on nonequilibrium NAPL solubilization, *Journal of Contaminant Hydrology*, 60, 57-74, 2003.

- Bau, D. and A.S. Mayer, Stochastic management of pump-and-treat strategies using surrogate functions, *Advances in Water Resources*, 29, 1901–1917, 2006.
- Mayer, A.S., May, W., Lukkarila, C. and J. Diehl. Estimation of fault zone conductance by calibration of a regional groundwater flow model – Desert Hot Springs, California, *Hydrogeology Journal*, DOI 10.1007/s10040-007-0158-0, 2007.
- Mayer, A.S. and K.L. Endres, Simultaneous Optimization of Contaminant Source and Plume Remediation, *Journal of Contaminant Hydrology*, 91, 288-311, DOI 10.1016/j.jconhyd.2006.11.009, 2007.
- Mayer, A.S., Endres, K.L. and D.W. Hand, Groundwater treatment modeling in the optimal design of pump-and-treat groundwater remediation systems, *Journal of Environmental Engineering*, 133, 809-818, 2007.
- Bau, D. and A.S. Mayer, Data-worth analysis for multi-objective optimal design of pump-and-treat remediation systems, *Advances in Water Resources*, 30, 1815-1830, DOI 10.1016/j.advwatres.2007.02.008, 2007.
- Ilija, M., Mayer, A.S., and B.D. Solomon, Economic valuation of environmental services sustained by water flows in the Yaqui River delta, *Ecological Economics*, DOI 10.1016/j.ecolecon.2007.06.006, 2007.
- Robles, A., Mayer, A.S., and M.H. Durfee, Community partnered projects: a case study of a collaborative effort to improve sanitation in a marginalized community in northwest Mexico, *Environment, Development and Sustainability*, 11, 197-213, DOI 10.1007/s10668-007-9104-5, 2007.
- Mayer, A.S., Sandman, T., and M. Breidenbach, The Effect of Flow Regime on Physical Non-Equilibrium Transport in Unsaturated Porous Media, *Vadose Zone Journal*, 7, 981–991, 2008.
- Bau, D. and A.S. Mayer, Optimal design of pump-and-treat systems under uncertain hydraulic conductivity and plume distribution, *Journal of Contaminant Hydrology*, 100, 30-46, 2008.
- Mayer, A.S. and A. Muñoz Hernandez, Integrated water resources optimization models: An assessment of a multidisciplinary tool for sustainable water resources management strategies, *Geography Compass*, 3, 1176–1195, DOI 10.1111/j.1749-8198.2009.00239.x.2009.
- Kolka, R.K., Giardina, C.P., McClure, J.D., Mayer, A.S., and Jurgensen, M.F., Partitioning hydrologic contributions to an ‘old-growth’ riparian area in the Huron Mountains of Michigan, USA, *Ecohydrology*, DOI: 10.1002/eco.112, 2010.
- Eckman, B., Feblowitz, M., Mayer, A., and Riabov, A., Toward an integrative software infrastructure for water management in the Smarter Planet, *IBM Journal of Research and Development*, 54, 1-20, DOI: 10.1147/JRD.2010.2048972, 2010.
- Nesbit, S. and Mayer, A. Shifting attitudes: The influence of field trip experiences on student beliefs, *Transformative Dialogues: Teaching & Learning Journal*, 4(2), 1-22, 2010.
- Muñoz Hernandez, A. and Mayer, A.S., Integrated hydrologic-economic-institutional water resources management model for the Rio Yaqui basin, Sonora, Mexico, *Journal of Water Resources Planning and Management*, 137, 227–237, 2011.
- Robles, A., Halvorsen, K.E., and Mayer, A.S., Waterborne disease-related risk perceptions in the Sonora River Basin, Mexico, *Risk Analysis*, 31(5), 866-878, 2011.
- Van Grinsven, M., Mayer, A.S., and Huckins, C., Estimation of streambed groundwater fluxes associated with coaster brook trout spawning habitat, *Ground Water*, doi: 10.1111/j.1745-6584.2011.00856.x, 2011.
- Robles, A., Mayer, A.S., Auer, M.T., and Vivoni, E., Modeling riverine pathogen fate and transport in Mexican rural communities and its public health implications, *Journal of Environmental Management*, in review, 2011.
- Robles, A., Halvorsen, K.E., Mayer, A.S., and Vivoni, E., Can hydrologic models Change Water-related Risk Perceptions? Results of a Participatory Modeling Workshop in the Sonora River Basin, Mexico, *Environmental Modelling and Software*, in review, 2011.

Robles, A., Vivoni, E., and Mayer, A.S., Distributed hydrologic forecasting in northwest Mexico reveals the links between runoff mechanisms and land-atmosphere interactions, Mexico, *Journal of Hydrometeorology*, in review, 2011.

#### Co-Edited Book

Mayer, A.S. and S.M. Hassanizadeh, *Soil and Groundwater Contamination: Nonaqueous Phase Liquids*, American Geophysical Union, Washington, CD, 2005.

#### Refereed Book Chapters

Pinder, G.F., Mayer, A.S., and others, "Optimization and modeling for remediation and Monitoring," *Environmental Modeling for the Future*, Dupont Co., Dover, Delaware, 111-186, 2001.

Mayer, A.S. "Laboratory Study of Plug Flow Reactors," *Environmental Engineering Processes Laboratory Manual*, (Eds: SE Powers, J Bisogni, J Burken, K Pagilla), Association of Environmental Engineering and Science Professors, Champaign IL, 2001.

Illangasekare, T.H., Jensen, K. H., Javandel, I. and A. S. Mayer, "Migration and distribution," *Soil and Groundwater Contamination: Nonaqueous Phase Liquids*, American Geophysical Union, Washington, DC, 2005.

Mayer, A. S. and M. Oostrom, "Site Characterization and Monitoring," *Soil and Groundwater Contamination: Nonaqueous Phase Liquids*, American Geophysical Union, Washington, DC, 2005.

Oostrom, M., Falta, R. W., Mayer, A. S., and I. Javandel, and S. M. Hassanizadeh, "Remediation," *Soil and Groundwater Contamination: Nonaqueous Phase Liquids*, American Geophysical Union, Washington, DC, 2005.

Honrath, Jr., R.E. , Mihelcic, J.R., Zimmerman, J.B. and Mayer, A.S., "Physical Processes," *Environmental Engineering: Fundamentals Sustainability, Design*, John Wiley & Sons, Hoboken, New Jersey, 2009.

Auer, M.T. , Mihelcic, J.R., Urban, N.R., Mayer, A.S., and Penn, M.R., "Water Quality," *Environmental Engineering: Fundamentals Sustainability, Design*, John Wiley & Sons, Hoboken, New Jersey, 2009.

Whitman, B.E. , Mihelcic, J.R., and Mayer, A.S., "Water Supply, Distribution, and Wastewater Collection," *Environmental Engineering: Fundamentals Sustainability, Design*, John Wiley & Sons, Hoboken, New Jersey, 2009.

#### Refereed Proceedings

Mayer, A.S. and C.T. Miller, "A Three-Dimensional Flow Model for Analysis of Remediation Efforts at a Polluted Coastal Aquifer," *Proceedings of the American Water Resources Association Symposium on Coastal Water Resources*, Wilmington, NC, May 1988, 531-541, 1988.

Mayer, A.S. and C.T. Miller, "A Three-Dimensional Finite Element-Finite Difference Model for Simulating Confined and Unconfined Groundwater Flow," *Proceedings of the VIIIth International Conference on Computational Methods in Water Resources*, Vol. 1, Boston, MA, June 1988, 89-94, 1988.

Mayer, A.S. and C.T. Miller, "A Compositional Model for Simulating Multiphase Flow, Transport, and Mass Transfer in Groundwater Systems," *Proceedings of the VIIIth International Conference on Computational Methods in Water Resources, Subsurface Hydrology*, Venice, Italy, June 1990, 217-222, 1990.

Mayer, A.S. and C.T. Miller, "Equilibrium and Mass-Transfer Limited Approaches to Modeling Multiphase Groundwater Systems," *Environmental Engineering, Proceedings of the 1990 Specialty Conference*, American Society of Civil Engineers, Arlington, VA, July 1990, 314-321, 1990.

- Mayer, A. S. and C. T. Miller, "Simulating Nonaqueous Phase Dissolution in Heterogeneous Porous Media," *Proceedings of the Ninth International Conference on Computational Methods in Water Resources, Vol. 2*, Computational Mechanics Publications, Southampton, UK, 247-254, 1992.
- Mayer, A. S., "Application of Domain Decomposition Techniques for Multiphase Groundwater Problems," *Proceedings of the Xth International Conference on Computational Methods in Water Resources*, Kluwer Academic Publ., Dordrecht, Germany, 951-958, 1994.
- Mitchell, R. J. and A. S. Mayer, "A Modified Method of Characteristics Technique for Simulating Contaminant Transport in Variably Saturated Porous Media," *Proceedings of the Xth International Conference on Computational Methods in Water Resources*, Kluwer Academic Publ., Dordrecht, Germany, 505-512, 1994.
- Mayer, A. S., V. J. Wildfong, and R. A. Voigt, "Modeling the Fate of Hazardous Compounds in Conventional Wastewater Treatment within a Waste Minimization Framework," *Computer Techniques in Environmental Studies V, Vol. I*, Computational Mechanics Publications, Southampton, UK, 191-198, 1994.
- Johnson, J., A. S. Mayer, and S. Sorby, "Development of an Efficient Pre- and Post-processing Framework for Groundwater Flow and Transport Models," *Computer Techniques in Environmental Studies V, Vol. II*, Computational Mechanics Publications, Southampton, UK, 77-84, 1994.
- Huang, C. and A. S. Mayer, "Development of Dynamic Groundwater Remediation Strategies for Variable Aquifer Configurations," *Water Resources Planning for the 21st Century, Proceedings of the 22nd Annual Conference*, American Society of Civil Engineers, 840-843, 1995.
- Huang, C. and A. S. Mayer, "Dynamic Optimal Control for Groundwater Remediation Management Using Genetic Algorithms," *Models for Assessing and Monitoring Groundwater Quality*, IAHS Publication No. 227, International Association of Hydrologic Sciences, 149-155, 1995.
- Mitchell, R. J. and A. S. Mayer, "Effects of Transient-Hysteretic Flow on Nonreactive Solute Transport in the Vadose Zone," *Vadose Zone Hydrology: Cutting Across the Disciplines*, Hydrologic Science, University of California, Davis, 74(43), 95-6, 1995.
- Sorby, S. A., A. S. Mayer, and J. G. Johnson, "Development of a Pre- and Post-Processing Framework for Groundwater Flow Modeling," *Computers and Their Applications, Proceedings of the ISCA 11th International Conference*, International Society for Computers and Their Applications, Raleigh, North Carolina, 118-121, 1996.
- Huang, C. and A. S. Mayer, "The Role of Uncertainty in the Optimization of Groundwater Remediation Systems," *Proceedings of the XIth International Conference on Computational Methods in Water Resources*, Computational Mechanics Publ., Southampton, UK, 359-366, 1996.
- Huang, C. and A. S. Mayer, "Computational Challenges Associated with Mathematical Optimization of Soil and Groundwater Remediation Systems," *Next Generation Environmental Models and Computational Methods*, Society of Industrial and Applied Mathematics, 287-291, 1997.
- Mitchell, R.J. and A.S. Mayer, "The Impacts of Source Size and Horizontal Correlation Scale on Solute Transport during Unsaturated Hysteretic Flow," *Proceedings of the International Workshop, Characterization and Measurement of the Hydraulic Properties of Unsaturated Porous Media*, U.S. Salinity Laboratory, Riverside, California, pp. 677-686, 2000.
- Mayer, A.S., "Development of multi-objective optimization algorithms for assessing tradeoffs between cost, reliability, and cleanup goals for subsurface remediation," *Computational Methods in Water Resources XII*, 1395-1402, 2002.
- Endres, K.L., Mayer, A.S., and C. Enfield, "Optimization of Source and Plume Remediation," *Proceedings of the World Water and Environmental Resources Congress*, May 2001, Orlando, Florida, American Society of Civil Engineers, 2001.
- Endres, K. and A.S. Mayer, "Using Remediation Time as an Optimization Variable in Groundwater Remediation Systems," *Proceedings of the 15th International Conference on Computational Methods*

*in Water Resources* (CMWR XV), June 13-17, 2004 Chapel Hill, NC, USA, C.T. Miller et al., editors, Elsevier, Amsterdam, pp. 535-543, 2004.

Bau, D. and A.S. Mayer, "Analysis of the Impact of Layered Soil Heterogeneity on Optimal Policies for Groundwater Remediation," *Proceedings of the 15th International Conference on Computational Methods in Water Resources* (CMWR XV), June 13-17, 2004 Chapel Hill, NC, USA, C.T. Miller et al., editors, Elsevier, Amsterdam, pp. 312-320, 2004.

Bau, D. and A.S. Mayer, "Geostatistical Solution To The Inverse Problem Using Surrogate Functions For Remediation Of Shallow Aquifers," *Proceedings of the 16th International Conference on Computational Methods in Water Resources* (CMWR XVI), June 18-22, 2006, Copenhagen, Denmark, P. Binning et al., editors, Technical University of Denmark, <http://proceedings.cmwr-xvi.org>, 2006.

Kemppainen, A.J., Mayer, A.S., Huntoon, J.E., "Introducing Sustainable Design into First Year Engineering Education," 2007 ASEE North Midwest Section Conference, Houghton, Michigan, September 20-22, 2007, <http://www.ndsu.nodak.edu/asee/conferences/2007/proceedings/>.

#### Other Publications

Miller, C.T., D.J. Crawford-Brown, and A.S. Mayer, "Development of a Variable, Dual-Energy Attenuation Method for Measuring Fluid Saturations in Multiphase Systems," Final Report for University of North Carolina Biomedical Research Support Grant, Chapel Hill, NC, 1989.

Miller, C.T., F.K. Pfaender, A.S. Mayer and D.C. Dobbins, "Investigation of Aquifer Response to Purge-Well Rehabilitation," Final Report for Robert S. Kerr Environmental Research Laboratory, U.S. Environmental Protection Agency, Project CR-814625, Ada, OK, 1990.

Mayer, A.S., "Supercomputer Modeling of Groundwater Contamination by Nonaqueous Phase Liquids," *Cray Channels*, 17(2), 18-21, Cray Research, Inc., Eagan, Minnesota, 1995.

Miller, C.T. and A.S. Mayer, "NAPL Dissolution in Heterogeneous Porous Media," *Center for Multiphase Research News* 2(2), 1-5, University of North Carolina at Chapel Hill, 1996.

Mayer, A.S. and W.L. May, "Mathematical Modeling of Proposed Artificial Recharge for the Mission Creek Subbasin," Report for the Mission Springs Water District, Desert Hot Springs, CA, 1998.

Kersten., L. and Mayer, A.S., Watersshed Management Plan for Huron Creek, Michigan, Michigan Department of Environmental Quality, Lansing, Michigan, 2009.

#### **Presentations (1997-2010)**

##### Conferences and Workshops

"Well Location Optimization for Heterogeneous Aquifer Remediation," American Society of Civil Engineering Water Resources Planning and Management Conference, Houston, Texas, April 1997.

"Coupling Risk and Cost in a Multi-Objective Framework for Optimizing Remediation Design," Society of Industrial and Applied Mathematics Geosciences Conference, Albuquerque, New Mexico, June 1997.

"Development of a Multidisciplinary Curriculum to Address Subsurface Remediation Education," International Conference on Engineering Education, Chicago, Illinois, August 1997.

"The Influence of the San Andreas Fault on Groundwater Flow in the Upper Coachella Valley, California: A Mathematical Modeling Investigation, poster presented at Penrose Conference on Fluid Flow and Faults, Taos, New Mexico, September 1997. *invited*

"Using Surfactants to Enhance Solubilization of Organic Liquid Contaminants in Groundwater Systems," ECODES '98, University of Matanzas, Cuba, June 1998. *invited*

"Nonequilibrium Behavior in Surfactant-Enhanced Solubilization of Nonaqueous Phase Liquids," Gordon Research Conference, Proctor, New Hampshire, August 1998.

- "Interphase Mass Transfer in NAPL-Contaminated Groundwater Systems," special session co-chair, Fall Meeting of the American Geophysical Union, San Francisco, California, December 1998.
- "Nonequilibrium Mass Exchange in Surfactant-Enhanced Solubilization of a Nonaqueous Phase Liquid," Fall Meeting of the American Geophysical Union, San Francisco, California, December 1998.
- "Visualization of Surfactant-Enhanced Nonaqueous Phase Liquid Mobilization and Solubilization Phenomena at the Micro-Scale," 24th General Assembly of the European Geophysical Society, The Hague, Netherlands, April 1999.
- "Modeling Nonequilibrium Solute Transport Under Transient Flow Conditions with Steady State Flow and Transport Parameters," 24th General Assembly of the European Geophysical Society, The Hague, Netherlands, April 1999.
- "Applications of Saltwater Intrusion Modeling to the Guaymas Valley Aquifer, Sonora, Mexico," University of Sonora, Sonora, Mexico, October, 1999. *workshop presenter.*
- "Saltwater Intrusion into a Northwest Mexico Coastal Aquifer," Conference on Ecology and Sustainable Development (ECODES 2000), Matanzas, Cuba, June 2000, *invited*
- "Uncertainty- The Most Significant Technological Limitation" Environmental Modeling Expert Workshop, Pennsylvania State University, August 2000. *invited panel member and speaker*
- "Multi-Scale Mass Transfer Limitations in Nonaqueous Phase Dissolution," Workshop on Subsurface Flow and Transport Phenomena, Delft Technical University, Netherlands, October, 2000. *invited*
- "Optimization Methods for Subsurface Remediation Design," Workshop on Subsurface Flow and Transport Phenomena, Delft Technical University, Netherlands, October 2000. *short course teacher*
- "Pore scale analysis of nonaqueous phase liquid dissolution and surfactant-enhanced solubilization," Society of Industrial and Applied Mathematics Geosciences Conference, Boulder, Colorado, June 2001. *invited*
- "Using multi-objective optimization to construct tradeoff curves for subsurface remediation," Society of Industrial and Applied Mathematics Geosciences Conference, Boulder, Colorado, June 2001. *invited*
- "Development of multi-objective optimization algorithms for assessing tradeoffs between cost, reliability, and cleanup goals for subsurface remediation," XIIIth International Conference on Computational Methods in Water Resources, Delft, Netherlands, July 2002.
- "Contamination of Soil and Groundwater by Nonaqueous Phase Liquids," Delft Technical University, Netherlands, July 2002. *short course organizer and teacher*
- "Development of Multi-Objective Optimization Algorithms for Assessing Tradeoffs Between Cost, Reliability, And Cleanup Goals for Subsurface Remediation," XII Conference on Computational Methods in Water Resources, Delft, Netherlands, July 2002.
- "Incorporation of uncertainty in hydraulic conductivity and source strength into a multi-objective optimization algorithm for designing subsurface remediation systems," IX Mexican American Exchange in Mathematics and its Applications (MAXIMA), Morelos, Mexico, August 2002. *invited*
- "Optimization of Engineering Design of Subsurface Environmental Remediation Systems- Development & Testing of Community Benchmark Problems," Large-Scale Computer Models for Environmental Systems- Simulation and Optimization Workshop, Research Triangle Park, North Carolina, April 2003. *invited*
- "Optimization of Engineering Design of Subsurface Environmental Remediation Systems- Development and Testing of Community Benchmark Problems," American Geophysical Union, Fall Meeting, San Francisco, December 2003.
- "Sustainability Analysis in Water Resources Management and Potential Application to Sonora, Mexico," Third Forum on Water, University of Sonora, Hermosillo, Mexico, May 2004. *invited*
- "NAPL Dissolution: Field Scale Modeling," DNAPL Source Zone workshop, Tucson, Arizona, February, 2005. *invited*



- "Building Human Capacity to Improve Water and Sanitation in Rural Sonora," TIES Workshop 2006, Guadalajara, Mexico, February 2006. *invited*
- "Modeling the Rio Yaqui basin, Mexico- Optimization of water resource allocation," GeoCuenca 2006, Havana, Cuba, June 2006. *invited*
- "Training A New Generation of Water Resource Experts," Higher Education in Development/USAID Meeting, Washington DC, August 2006. *invited*
- "Crecimiento de Ciudades: la Población, el Agua y su Infraestructura," North American Mobility Program Conference, Guanajuato, Mexico, October, 2006. *invited*
- "Sustaining the Project: "Training a Core of Water Resource Experts," TIES Workshop 2007, Querétaro, Mexico, June 2007. *invited*
- Workshop on "Complex Interacting Systems for a Sustainable Future," National Science Foundation, Tampa, Florida, June 2007. *invited panelist*
- "Modeling and analyzing the use, efficiency, value, and governance of water in the Great Lakes region through an integrated approach: 2009 Update," International Association of Great Lakes Research, Toledo, Ohio, May, 2009. *invited*.
- "Spatial variability of constraints on groundwater usage due to potential adverse resource impacts in the Great Lakes Basin." National Groundwater Association 2010 Ground Water Summit, April, 2010. (presented by student).
- "Modeling and analyzing the use, efficiency, value, and governance of water in the Great Lakes region through an integrated approach: 2010 Update," International Association of Great Lakes Research, Toronto, Canada, May, 2010. *invited*.

#### Invited Lectures:

- "Nonequilibrium Dissolution of Nonaqueous Phase Liquid (NAPL) Contaminants," Department of Petroleum and Geosystems Engineering, University of Texas, Austin, Texas, January 1997.
- "Apparent Nonequilibrium Dissolution of NAPLs: Explanations and Implications," Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts, March 1997.
- "Coupling Risk and Cost in a Multi-Objective Framework for Optimizing Remediation Design," Sandia National Laboratory, Albuquerque, New Mexico, June 1997.
- "Rate-Limited Solubilization of Organic Liquid Contaminants: Measurements and Implications," Department of Earth Sciences, Stanford University, California, October 1998.
- "Surfactant-Enhanced Aquifer Remediation: A Multi-Scale Investigation of Rate Limitations," University of Colorado, Boulder, Colorado, March 1999.
- "Using Multi-Objective Optimization to Design Subsurface Remediation Systems," Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, The Netherlands, April 1999.
- "Visualization of Surfactant-Enhanced NAPL Mobilization and Solubilization," ISVA, Danish Technological University, Lyngby, Denmark, April 1999.
- "Applications of Saltwater Intrusion Modeling to the Guaymas Valley Aquifer, Sonora, Mexico: Four-Day Workshop," University of Sonora, Sonora, Mexico, October, 1999.
- "Surfactant-Enhanced Aquifer Remediation," Mexican Institute for Water Technology, Cuernavaca, Mexico, May 2000.
- "Multiobjective Optimization for Groundwater Remediation," Mexican Institute for Water Technology, Cuernavaca, Mexico, May 2000.
- "Groundwater Remediation and Risk Assessment" Tampere University, Finland, December 2000.
- "Optimization Methods for Groundwater and Soil Remediation," Tampere University, Finland, December 2000.

- “Multi-Scale Nonequilibrium in Surfactant Enhanced Aquifer Remediation” University of Vermont, January 2001.
- “Chemical and Physical Nonequilibrium in Groundwater Remediation with Surfactants,” Leuven University, Belgium, February 2001.
- “Surfactant-Enhanced Aquifer Remediation-Kinetic Effects,” University of Padua, Italy, March 2002.
- “Broad survey of water problems and approaches for solving problems in Sonora,” Instituto Mexicano de Tecnologia del Agua, Morelos, Mexico, August 2002.
- “A Challenging Optimization Problem: Engineering Design of Subsurface Environmental Remediation Systems,” Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, North Carolina, March 2003.
- “US Perspectives on Watershed Management,” Watershed Management Certificate Lecture Series, College of Sonora, Mexico, October 2006.
- “US Perspectives on Watershed Management,” Watershed Management Certificate Lecture Series, College of Sonora, Mexico, April 2007.
- “Integrated Economic-Environmental-Hydrologic Modeling of the Rio Yaqui Basin, Sonora, Mexico,” University of Illinois, May 2007.
- “US Perspectives on Watershed Management,” Watershed Management Certificate Lecture Series, College of Sonora, Mexico, October 2007.

### Research Projects

Total Funding, 1993-present

Federal Sources: as PI, \$8,517,000; as co-PI, \$2,651,000

Other Sources: as PI, \$1,314,000; as co-PI, \$204,000

### Current Funded Projects

- A Research Coordination Network on Pan American Biofuels and Bioenergy Sustainability, Senior Personnel, National Science Foundation, \$750,000, 1/12 to 12/16.
- Environmental CyberCitizens: Engaging Citizen Scientists in Global Environmental Change through Crowdsensing and Visualization, PI, National Science Foundation, \$250,000, 9/11 to 8/13.
- Virtual Water Accounting: A New Paradigm for the Adaptive Management of Great Lakes Water, PI, Great Lakes Protection Fund, \$400,000, 1/11 to 12/13.
- Sustainable Water Resources for Communities under Climate Change: Can State-of-the-Art Forecasting Inform Decision-Making in Data Sparse Regions? , PI, National Science Foundation, \$324,000, 9/10 to 8/13.
- Humans, Hydrology, Climate Change, and Ecosystems- An Integrated Analysis of Water Resources and Ecosystem Services in the Great Lakes Basin (Planning Grant), PI, National Science Foundation, \$150,000, 9/10 to 8/11.
- Biocomplexity of Hydrological Service Payments and Watershed Sustainability in Mexico (planning grant), co-PI, NSF, \$38,500, 9/09 to 3/12.
- GK12: GlobalWatershed: Integrating Rural and Global Perspectives with Research and Technological Advances, PI, National Science Foundation, \$2,500,000, 9/09 to 8/14.
- Enhancing the Capacity for Sustainable Forest Management and Ecosystem Service Provisioning in Chiapas and Oaxaca, PI, US Agency for International Development, \$290,000, 09/08 to 08/11.
- SustR: Sustainable Development for Rural Communities- Social, Health, Economic, and Environmental Advances, PI, US Department of Education, \$180,000, 09/08 to 08/12.

Graduate Student Scholarships to Advance a Global Outlook of Economic and Social Prosperity that Protects the Environment, acting PI, National Science Foundation, Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) \$599,978, 6/08 to 5/12.

Modeling and Analyzing the Use, Efficiency, Value and Governance of Water as a Material in the Great Lakes Region through an Integrated Approach, PI, National Science Foundation, \$1,078,000, 09/07 to 08/12.

#### Selected, Past Funded Projects

Sustainable Wastewater Management in the Rio Sonora Basin, Mexico, PI, Consejo Nacional de Ciencia y Tecnologia (Mexico), \$80,000, 01/04 to 12/10.

Biocomplexity of Hydrological Service Payments and Watershed Sustainability in Mexico (Planning Grant), co-PI, National Science Foundation, \$38,500, 9/09 to 8/10.

ExCit: Expanding Cities- People, Water and Infrastructure, PI, US Department of Education, \$228,000, 08/03 to 07/08.

Watershed Management Plan for Huron Creek Watershed, PI, Michigan Department of Environmental Quality, \$74,000, 09/07 to 06/09.

Engaging Social Scientists in the WATERS Initiative: Special Sessions at the 2008 International Symposium on Society and Resource Management, PI, National Science Foundation, \$18,000, 05/08 to 04/09.

Center for Water and Society, PI, MTU, \$45,000, 09/05 to 08/06

Vietnam: Water Resources Management Planning Grant, PI, National Science Foundation, \$2,000, 03/05 to 09/05.

Michigan Tech-UNISON Linkage: Training a Core of Water Resources Experts, PI, U.S. Agency for International Development, \$787,000, 03/03 to 08/06.

Multi-Objective Decision-Making for Environmental Remediation, PI, Environmental Protection Agency, \$292,000, 09/98 to 05/03.

AQUA3: North American Alliance for Sustainable Water Resources Management, PI, Department of Education, \$214,000, 03/01 to 02/05.

Ph.D. Fellowships in Computational Engineering and Sciences, PI, Department of Education, \$453,000, 03/01 to 02/04.

Computational Facilities for MTU's CS&E Program, co-PI, National Science Foundation, \$260,000, 09/98 to 08/01.

Metrics for Optimization of Environmental Remediation Problems, PI, National Science Foundation, \$111,000, 06/01 to 05/03.

Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation, PI, Environmental Protection Agency, \$474,000, 11/96 to 10/01.

A Mathematical Modeling Approach to Determine the Advance of Saline Intrusion in the Guaymas Valley, Sonora, Mexico, co-PI, Consejo Nacional de Ciencia y Tecnologia (Mexico), \$38,000, 05/97 to 12/99.

Monitoring and Assessment of Northern Hardwoods Groundwater Remediation Efforts, Mead Paper Company, PI, Mead Paper, \$84,000, 05/96 to 08/00.

Capillary Desaturation of Nonaqueous Phase Liquids in Porous Media, PI, Michigan Research Excellence Fund, \$32,000, 12/97 to 12/98.

In Situ Subsurface Remediation Technologies: Integration into an Interdisciplinary Engineering Curriculum, co-PI, National Science Foundation, \$465,000, 09/94 to 09/98.

Mechanistic Relationships for Physical Nonequilibrium Phenomena in Vadose Zone Solute Transport, PI, National Science Foundation, \$142,000, 09/93 to 01/97.

Environmental Treatment Design Options Tool (ETDOT), co-PI, MTU/EPA Center of Excellence, \$184,000, 04/93 to 06/96.

Environmental Fate and Risk Assessment Tool (EFRAT), co-PI, MTU/EPA Center of Excellence, \$126,000, 04/95 to 06/96.

In Situ Containment of Heavy Metals in Soils and Groundwater through Chemical Precipitation, co-PI, Michigan Research Excellence Fund, \$36,000, 12/94 to 03/96.

A Pore-Scale Investigation of Immiscible Fluid Displacement at Porous Media Interfaces (Travel Grant), PI, National Academy of Science/National Research Council, \$2,000, 12/94 to 11/95.

Enhanced Visualization for Analysis of Groundwater Modeling Efforts, co-PI, Michigan Research Excellence Fund, \$130,000, 11/92 to 10/94.

Application of Domain Decomposition and Parallelization Techniques for a Multiphase Flow and Transport Model, PI, Cray Research Corporation, \$170,000, 09/93 to 04/94.

Characterization of a Large Fault Zone as a Barrier to Fluid Flow: The San Andreas Fault near Desert Hot Springs, CA, PI, Petroleum Research Fund, \$29,000, 09/94 to 08/97.

## Service

Recent University Service, 2005-present, listed roughly in order of effort

2005-present	<i>Director</i> and co-founder, Michigan Technological University Center for Water & Society
2009-2010	Search Committee for Provost and Academic Vice President, <i>Chair</i>
2006-7	Search Committee for College of Engineering Dean, <i>Chair</i>
2007	Research Misconduct Investigation Committee, <i>Chair</i>
2004-present	GMES Departmental Graduate Committee, <i>Chair</i>
2007	Presidential Task Force on Commitment to International Education, Research, and Service
2006-present	College of Engineering Promotion & Tenure Committee
2005-present	several Degree Program Curriculum Committees
2007	Search Committee for SFRES Faculty
2006	Committee to Evaluate SFRES Dean
2005-6	Search Committee for SFRES Faculty

## Editing

*Advances in Water Resources*: Member, Editorial Board 1997-2005

*Journal of Contaminant Hydrology*: Member, Editorial Board 1999-2005

*Water Resources Research*: Associate Editor 1999-2003

## Current Membership in Professional Organizations

American Geophysical Union  
 American Society of Civil Engineers  
 American Water Works Association  
 National Ground Water Association

## Manuscript, Proposal, and Panel Reviews

*Advances in Water Resources*  
American Society of Civil Engineering (ASCE) Books  
*Biotechnology Progress*  
*Environmental Science & Technology*  
*European Journal for Operations Research*  
*Ground Water*  
*Ground Water Monitoring & Remediation*  
*Journal of Colloid and Interface Science*  
*Journal of Contaminant Hydrology*  
*Journal of Environmental Engineering, ASCE*  
*Journal of Hydraulic Engineering, ASCE*  
*Journal of Hydrogeology*  
*Journal of Hydrologic Engineering, ASCE*  
*Journal of Hydrology*  
*Journal of Water Resources Planning & Management, ASCE*  
*Soil Science Society of America Journal*  
Soil Science Society of America Books  
*Water Resources Research*

Alabama Agricultural Experiment Station  
Canadian Universities Community Development  
Fulbright Scholar Program  
National Science Foundation (IGERT, Environmental Engineering, Hydrology, GK-12, Environmental Sustainability, S-STEM)  
National Research Council/U.S.-Mexico Foundation for Science  
Petroleum Research Fund  
U.S. Army Research Office  
U.S. Department of Defense EPSCoR  
U.S. Department of Energy EMS  
U.S. Geological Survey

## **Teaching, Curriculum Development and Graduate Advising Experience**

### Courses Taught

Civil Engineering Senior Design (undergraduate)  
Drinking Water Treatment (undergraduate)  
Earth Mechanics (undergraduate)  
Environmental Engineering Senior Design (undergraduate)  
Flow and Transport in Porous Media (graduate)  
Geological Engineering Senior Design (undergraduate)  
Groundwater Site Investigations (undergraduate)  
Hydrogeology/Geohydrology (undergraduate)  
Introduction to Environmental Engineering (undergraduate)  
Mathematical Modeling of Earth Systems (graduate)  
North American Water Resources Field Experience (undergraduate/graduate)  
Remediation Engineering (undergraduate/graduate)  
Water & Society (undergraduate/graduate)

Teaching and Curriculum Development Highlights

1. *Average course rating* (combined undergraduate and graduate) over last five years: 4.5/5.0
2. *Course and Curriculum Development*: Of the thirteen courses in the "Courses Taught" list, ten were developed exclusively by Mayer and three were developed by Mayer and others.
3. *Publications Related to Curriculum Developments*:

Gierke, J.S., A.S. Mayer, and D.R. Shonnard, "Multidisciplinary Subsurface Remediation Courses: Fundamentals, Experiments and Design Projects," *Journal of Engineering Education*, 87(5), 555-566, 1998.

Mayer, A.S. "Laboratory Study of Plug Flow Reactors," *Environmental Engineering Processes Laboratory Manual*, (Eds: SE Powers, J Bisogni, J Burken, K Pagilla), Association of Environmental Engineering and Science Professors, Champaign IL, 2001.

Mayer, A.S. and S.M. Hassanizadeh, *Soil and Groundwater Contamination: Nonaqueous Phase Liquids*, American Geophysical Union, Washington, CD, 2005.

Auer, M.T., Mayer, A.S., Mihelcic, J.R., and N.R. Urban, "Water Quality," *Fundamentals of Environmental Engineering*, Second Edition, (Ed: Mihelcic, J.), John Wiley & Sons, in review, 2007.

4. *Funding*: Curriculum development, graduate fellowship programs, and other educational projects have been funded by the following grants (\$2,221,000 as PI or co-PI since 1994)

Watershed Management Plan for Huron Creek Watershed, PI, Michigan Department of Environmental Quality, \$74,000, 09/07 to 12/08.

ExCit: Expanding Cities- People, Water and Infrastructure, PI, Department of Education, \$228,000, 08/03 to 07/08.

Michigan Tech-UNISON Linkage: Training a Core of Water Resources Experts, PI, U.S. Agency for International Development, \$787,000, 03/03 to 08/06.

AQUA3: North American Alliance for Sustainable Water Resources Management, PI, Department of Education, \$214,000, 03/01 to 02/05.

Ph.D. Fellowships in Computational Engineering and Sciences, PI, Department of Education, \$453,000, 03/01 to 02/04.

In Situ Subsurface Remediation Technologies: Integration into an Interdisciplinary Engineering Curriculum, co-PI, National Science Foundation, \$465,000, 09/94 to 09/98.

Graduate Students Advised Since 1992*MS Student- Principal Advisor*

Vaughn Wildfong, "A Comprehensive Model to Predict Fate of Volatile Organic Compounds in a Wastewater Treatment Facility," *Environmental Engineering*, 1994

Richard Voigt, "Modeling Metals Fate in Conventional Wastewater Treatment Plants," *Environmental Engineering*, 1995

Michael Breidenbach, "Development of a Laboratory Column for Investigating Solute Transport in the Vadose Zone," *Civil Engineering*, 1996,

Todd Sandman, "An Experimental Study of Relationships between Transport Parameters and

- Flow Conditions for Transient and Steady-State Flows in an Unsaturated Sand," Civil Engineering, 1996
- Darren Dusenbery, "An I-DEAS Based Three-Dimensional Graphical Pre- and Post-Processor for Groundwater Models," Geological Engineering, 1996 (co-advisor)
- Joel Johnson, "A Complete Pre- and Post-Processing Framework for Groundwater Flow and Transport Modeling in Three Dimensions," Civil Engineering, 1995 (co-advisor)
- Wesley May, "Characterization of a Large Fault Zone as a Barrier to Fluid Flow: The San Andreas Fault near Desert Hot Springs, California," Geological Engineering, 1997
- Chad Lukkarila, "Modeling the San Andreas Fault near Desert Hot Springs, California as a Barrier to Groundwater Flow:," Geological Engineering, 1998
- Mark Erickson, "Multiobjective Optimization of a Groundwater Quality Management Problem Using the Niche Pareto Genetic Algorithm," Geological Engineering, 2000
- Eileen Ostrowski, "Prediction of Hydraulic Conductivity from Bench-, Meso-, and Full-Scale Experiments," Environmental Engineering, 2000 (co-advisor)
- Jeff Ahrens, "Creation of Amorphous Ferric Hydroxides with Oxygenated Water for In-Situ Immobilization of Arsenic from Groundwater," Environmental Engineering, 2003
- Wanda Rodriguez, "Arsenic Removal by Creating an In Situ Fe(OH)<sub>3</sub> Filter: Effects on Fe(OH)<sub>3</sub> Adsorption to Sand Due to Variations in Fe Concentration, Pore Grain Size and Residence Time," Environmental Engineering, 2005
- Kristen Betz, "Preliminary Study to Determine the Affects of Air Sparging on Source Zone Dense Nonaqueous Phase Liquids Using Mass Flux," Environmental Engineering, 2006
- Monica Ilija Ojeda, "Economic Valuation of Environmental Services Sustained by Water Flows in the Yaqui River Delta, Mexico," Environmental Engineering, 2006
- Linda Kersten, "Huron Creek Watershed Management Plan," Environmental Engineering, 2008
- Matthew Van Grinsven, "Groundwater Fluxes in Coaster Brook Trout Spawning Areas," Geology, expected 2009
- Katelyn Fitzgerald, "Metrics for Groundwater Sustainability in the Great Lakes Basin," Geological Engineering, expected 2010
- Ryan Biehl, Environmental Engineering Master's International, expected 2012.
- Steven Wright, Environmental Engineering Master's International, expected 2012.

*PhD Students- Principal Advisor*

- Robert Mitchell, "Nonideal Flow and Solute Transport in Unsaturated Porous Media: A Modeling Study," Environmental Engineering, 1996
- Changlin Huang, "Improving the Performance of Pump-and-Treat Groundwater Remediation Using Mathematical Optimization," Environmental Engineering, 1996
- John Uhrie, "Immobilization of Sulfide Metals in Porous Media," Metallurgy, 1998 (co-advisor)
- Lirong Zhong, "Surfactant-Enhanced Nonaqueous Phase Liquid Contaminant Removal from Liquid Saturated Media," Environmental Engineering, 1999
- Karen Endres, "Optimization of Complex Groundwater Remediation Systems," Environmental Engineering, 2004
- Domenico Bau, "Stochastic analysis for optimal management strategies applied to the remediation of contaminated groundwater/aquifer systems," Environmental Engineering, 2006
- Andrea Munoz Hernandez, "Integrated Modeling of Water Resources in the Rio Yaqui Basin," Environmental Engineering, 2009
- Agustin Robles Morua, "Sustainable Wastewater Management in the Rio Sonora Basin, Mexico," Environmental Engineering, 2010

Meredith Ballard, Environmental Engineering, expected 2011

*MS Students- Committee Member:* 94 students in 12 degree programs (as of 9/1/10)

*PhD Students- Committee Member :* 23 students in 8 degree programs (as of 9/1/10)