

CURRICULUM VITAE

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Personal Data

Birth: December 9, 1957, Minneapolis, Minnesota.
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Education

Ph.D. (Mathematics)	University of Chicago	1987
S.M. (Mathematics)	University of Chicago	1983
B.S. (Mathematics, with high distinction)	University of Minnesota	1981
B.S. (Physics, with high distinction)	University of Minnesota	1981

Professional Experience

Professor	The University of Texas at Austin	2001–
Associate Professor	The University of Texas at Austin	1995–2001
Assistant & Associate Professor	Rice University	1993–1995
Faculty Fellow	Rice University	1992–1993
Visiting Assistant Professor	Rice University	1990–1992
NSF Postdoctoral Research Fellow	University of Houston	1989–1990
Assistant Professor	Purdue University	1988–1991
Research Assistant Professor	Purdue University	1987–1988
Visitor	Institute for Mathematics and its Applications, University of Minnesota	1986–1987
Lecturer	University of Chicago	1983–1986

Professional Service

Associate Editor, *SIAM Journal on Numerical Analysis*, 1999–
Editorial Board, *Advances in Water Resources*, 2000–
Editorial Board, *Chapman & Hall/CRC Numerical Analysis and Scientific Computing Series*,
2006–

Research Interests

Algorithm development and numerical analysis of partial differential equations
Homogenization and multi-scale analysis
Mathematical modeling and simulation of subsurface flow phenomena
High performance, parallel, scientific computing

Professional Societies

American Mathematical Society
Society for Industrial and Applied Mathematics
Program Director, Activity Group on Geosciences, 2007–2008
Faculty co-advisor of the University of Texas Student Chapter, 2006–
Society of Petroleum Engineers
The International Society for Porous Media (InterPore)

Research Centers and Institutes

The University of Texas at Austin
Division of Statistics and Scientific Computing, associated faculty, 2007–
Institute for Computational Engineering & Sciences (ICES), core faculty 2003–
Texas Institute for Computational and Applied Mathematics (TICAM) 1995–2003
Center for Subsurface Modeling, TICAM/ICES 1995–
Associate Director 2008–
Center for Numerical Analysis, TICAM/ICES 1997–
Rice University
Center for Research on Parallel Computation, Technical Steering Committee 1997–1999

Honors and Awards

ICES Distinguished Research Award, 2011 (The University of Texas at Austin)
Moncrief Grand Challenge Faculty Award, 2012 (The University of Texas at Austin)
Frank Gerth III Faculty Fellowship, 2008–2011 (The University of Texas at Austin)
The President’s Associates Centennial Teaching Fellowship in Mathematics, 1997–1998 (The University of Texas at Austin)
National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship, 1989–1992 (University of Houston and Rice University)
Robert R. McCormick Fellowship, 1981–1984 (University of Chicago)
Sigma Pi Sigma (physics) and Tau Beta Pi (engineering) honor societies
Century Fund Scholarship, 1976–1977 (University of Minnesota)

Publications

Articles in progress

- [1] T. Arbogast, Ch.-S. Huang, and Ch.-H. Hung. A fully conservative Eulerian-Lagrangian stream-tube method for advection-diffusion problems. *Submitted*, 2011.
- [2] T. Arbogast and Hailong Xiao. A multiscale mortar mixed space based on homogenization for heterogeneous elliptic problems. *Submitted*, 2011.
- [3] T. Arbogast and Wenhao Wang. Convergence of a locally conservative streamline method for a model two-phase flow problem in a one-dimensional porous medium. *In preparation*, 2010.
- [4] T. Arbogast, J. L. Bona, and Juan-Ming Yuan. Studies in recurrence in nonlinear dispersive wave equations. *In preparation*, 2010.
- [5] T. Arbogast, Ch.-S. Huang, and T. F. Russell. A locally conservative streamline method for a model two-phase flow problem in a one-dimensional porous medium. *Submitted*, 2009.

- [1] Ch.-S. Huang, T. Arbogast, and Jianxian Qiu. An Eulerian-Lagrangian WENO finite volume scheme for advection problems. *J. Comput. Phys.*, 2012, to appear.
- [2] T. Arbogast and Wen-Hao Wang. Stability, monotonicity, maximum and minimum principles, and implementation of the volume corrected characteristic method. *SIAM J. Sci. Comput.*, 33(4):1549–1573, 2011.
- [3] T. Arbogast. Homogenization-based mixed multiscale finite elements for problems with anisotropy. *Multiscale Model. Simul.*, 9(2):624–653, 2011.
- [4] T. Arbogast. Mixed multiscale methods for heterogeneous elliptic problems. In I. G. Graham, Th. Y. Hou, O. Lakkis, and R. Scheichl, editors, *Numerical Analysis of Multiscale Problems*, volume 83 of *Lecture Notes in Computational Science and Engineering*, pages 243–283. Springer, 2011.
- [5] T. Arbogast and Wenhao Wang. Convergence of a fully conservative volume corrected characteristic method for transport problems. *SIAM J. Numer. Anal.*, 48(3):797–823, 2010.
- [6] T. Arbogast and Ch.-S. Huang. A fully conservative Eulerian-Lagrangian method for a convection-diffusion problem in a solenoidal field. *J. Comput. Phys.*, 229(9):3415–3427, 2010. DOI 10.1016/j.jcp.2010.01.009.
- [7] Jichun Li, T. Arbogast, and Yunqing Huang. Mixed methods using standard conforming finite elements. *Comput. Methods Appl. Mech. Engrg.*, 198(5):680–692, 2009.
- [8] T. Arbogast and M. S. M. Gomez. A discretization and multigrid solver for a Darcy-Stokes system of three-dimensional vuggy porous media. *Comput. Geosci.*, 13(3):331–348, 2009. DOI 10.1007/s10596-008-9121-y.
- [9] T. Arbogast and D. S. Brunson. A computational method for approximating a Darcy-Stokes system governing a vuggy porous medium. *Comput. Geosci.*, 11(3):207–218, 2007.
- [10] R. Naimi-Tajdar, C. Han, K. Sepehrnoori, T. J. Arbogast, and M. A. Miller. A fully implicit, compositional, parallel simulator for IOR processes in fractured reservoirs. *SPE Journal*, 12(3), September 2007.
- [11] T. Arbogast, G. Pencheva, M. F. Wheeler, and I. Yotov. A multiscale mortar mixed finite element method. *Multiscale Model. Simul.*, 6(1):319–346, 2007.
- [12] T. Arbogast, Ch.-S. Huang, and S.-M. Yang. Improved accuracy for alternating-direction methods for parabolic equations based on regular and mixed finite elements. *Mathematical Models & Methods in Applied Sciences*, 17(8):1279–1305, 2007.
- [13] T. Arbogast and Ch.-S. Huang. A fully mass and volume conserving implementation of a characteristic method for transport problems. *SIAM J. Sci. Comput.*, 28(6):2001–2022, 2006.
- [14] T. Arbogast and K. J. Boyd. Subgrid upscaling and mixed multiscale finite elements. *SIAM J. Numer. Anal.*, 44(3):1150–1171, 2006.
- [15] T. Arbogast and H. L. Lehr. Homogenization of a Darcy-Stokes system modeling vuggy porous media. *Comput. Geosci.*, 10(3):291–302, 2006.
- [16] T. Arbogast and M. F. Wheeler. A family of rectangular mixed elements with a continuous flux for second order elliptic problems. *SIAM J. Numer. Anal.*, 42:1914–1931, 2005.
- [17] T. Arbogast. Analysis of a two-scale, locally conservative subgrid upscaling for elliptic problems. *SIAM J. Numer. Anal.*, 42:576–598, 2004.
- [18] T. Arbogast. An overview of subgrid upscaling for elliptic problems in mixed form. In Z. Chen, R. Glowinski, and Kaitai Li, editors, *Current Trends in Scientific Computing*, volume 329 of *Contemporary Mathematics*, pages 21–32. American Mathematical Society, 2003.
- [19] T. Arbogast and S. L. Bryant. A two-scale numerical subgrid technique for waterflood simulations. *SPE J.*, 7:446–457, Dec. 2002.
- [20] T. Arbogast. Implementation of a locally conservative numerical subgrid upscaling scheme for

- two-phase Darcy flow. *Comput. Geosci.*, 6:453–481, 2002.
- [21] T. Arbogast. Numerical subgrid upscaling of two-phase flow in porous media. In Z. Chen, R. E. Ewing, and Z.-C. Shi, editors, *Numerical treatment of multiphase flows in porous media*, volume 552 of *Lecture Notes in Physics*, pages 35–49. Springer, Berlin, 2000.
- [22] T. Arbogast, L. C. Cowsar, M. F. Wheeler, and I. Yotov. Mixed finite element methods on non-matching multiblock grids. *SIAM J. Numer. Anal.*, 37:1295–1315, 2000.
- [23] T. Arbogast, C. N. Dawson, P. T. Keenan, M. F. Wheeler, and I. Yotov. Enhanced cell-centered finite differences for elliptic equations on general geometry. *SIAM J. Sci. Comput.*, 19:404–425, 1998.
- [24] T. Arbogast and I. Yotov. A non-mortar mixed finite element method for elliptic problems on non-matching multiblock grids. *Comput. Methods Appl. Mech. Engrg.*, 149:225–265, 1997.
- [25] T. Arbogast, M. F. Wheeler, and I. Yotov. Mixed finite elements for elliptic problems with tensor coefficients as cell-centered finite differences. *SIAM J. Numer. Anal.*, 34:828–852, 1997.
- [26] T. Arbogast. Computational aspects of dual-porosity models. In U. Hornung, editor, *Homogenization and Porous Media*, Interdisciplinary Applied Math. Series, pages 203–223. Springer, New York, 1997.
- [27] T. Arbogast, S. Bryant, C. Dawson, F. Saaf, Chong Wang, and M. Wheeler. Computational methods for multiphase flow and reactive transport problems arising in subsurface contaminant remediation. *J. Comput. Appl. Math.*, 74:19–32, 1996.
- [28] T. Arbogast, M. F. Wheeler, and Nai-Ying Zhang. A nonlinear mixed finite element method for a degenerate parabolic equation arising in flow in porous media. *SIAM J. Numer. Anal.*, 33:1669–1687, 1996.
- [29] T. Arbogast, C. N. Dawson, and M. F. Wheeler. A parallel algorithm for two phase multi-component contaminant transport. *Applications of Math.*, 40:163–174, 1995.
- [30] T. Arbogast and Zhangxin Chen. On the implementation of mixed methods as nonconforming methods for second order elliptic problems. *Math. Comp.*, 64:943–972, 1995.
- [31] T. Arbogast and M. F. Wheeler. A characteristics-mixed finite element method for advection dominated transport problems. *SIAM J. Numer. Anal.*, 32:404–424, 1995.
- [32] T. Arbogast. Gravitational forces in dual-porosity systems. II. Computational validation of the homogenized model. *Transport in Porous Media*, 13:205–220, 1993.
- [33] T. Arbogast. Gravitational forces in dual-porosity systems. I. Model derivation by homogenization. *Transport in Porous Media*, 13:179–203, 1993.
- [34] T. Arbogast, M. Obeyesekere, and M. F. Wheeler. Numerical methods for the simulation of flow in root-soil systems. *SIAM J. Numer. Anal.*, 30:1677–1702, 1993.
- [35] J. Douglas, Jr., T. Arbogast, P. J. Paes Leme, J. L. Hensley, and N. P. Nunes. Immiscible displacement in vertically fractured reservoirs. *Transport in Porous Media*, 12:73–106, 1993.
- [36] T. Arbogast. The existence of weak solutions to single-porosity and simple dual-porosity models of two-phase incompressible flow. *Journal of Nonlinear Analysis: Theory, Methods, and Applications*, 19:1009–1031, 1992.
- [37] J. Douglas, Jr., J. L. Hensley, and T. Arbogast. A dual-porosity model for waterflooding in naturally fractured reservoirs. *Comput. Methods Appl. Mech. Engrg.*, 87:157–174, 1991.
- [38] J. Douglas, Jr. and T. Arbogast. Dual-porosity models for flow in naturally fractured reservoirs. In J. H. Cushman, editor, *Dynamics of Fluids in Hierarchical Porous Media*, pages 177–221. Academic Press, London, 1990.
- [39] T. Arbogast, J. Douglas, Jr., and U. Hornung. Derivation of the double porosity model of single phase flow via homogenization theory. *SIAM J. Math. Anal.*, 21:823–836, 1990.
- [40] T. Arbogast and F. A. Milner. A finite difference method for a two-sex model of population dynamics. *SIAM J. Numer. Anal.*, 26:1474–1486, 1989.

- [41] T. Arbogast. On the simulation of incompressible, miscible displacement in a naturally fractured petroleum reservoir. *R.A.I.R.O. Modél. Math. Anal. Numér.*, 23:5–51, 1989.
- [42] T. Arbogast. Analysis of the simulation of single phase flow through a naturally fractured reservoir. *SIAM J. Numer. Anal.*, 26:12–29, 1989.

Articles in Unrefereed Works

- [1] T. Arbogast. The mixed variational multiscale method and aspects of convergence for heterogeneous porous media. In *Oberwolfach Reports*, volume 6, chapter Mini-Workshop on Numerical Upscaling for Flow Problems: Theory and Applications, organized by Achi Brandt, Yalchin Efendiev, and Oleg Iliev. The Mathematisches Forschungsinstitut Oberwolfach (MFO), European Mathematical Society, 2009.
- [2] T. Arbogast and Kirsten J. Boyd. Mixed variational multiscale methods and multiscale finite elements. In *Oberwolfach Reports*, Vol. 2, Issue 1, Gemischte und nicht-standard Finite-Elemente-Methoden mit Anwendungen, organized by K. Hackl, C. Carstensen, and D. Braess. The Mathematisches Forschungsinstitut Oberwolfach (MFO), European Mathematical Society, 2005.
- [3] L. Zhang, S. L. Bryant, J. W. Jennings, T. J. Arbogast, and R. Paruchuri. Multiscale flow and transport in highly heterogeneous carbonates. In *Proceedings of the 2004 SPE Annual Technical Conference and Exhibition held in Houston, Texas*, September 26–29, 2004. SPE 90336.
- [4] T. Arbogast, D. S. Brunson, S. L. Bryant, and J. W. Jennings. A preliminary computational investigation of a macro-model for vuggy porous media. In C. T. Miller et al., editors, *Computational Methods in Water Resources XV*, New York, 2004. Elsevier.
- [5] T. Arbogast and S. L. Bryant. Numerical subgrid upscaling for waterflood simulations. In *Proceedings of the 16th SPE Symposium on Reservoir Simulation held in Houston, Texas*, February 11–14, 2001. SPE 66375.
- [6] T. Arbogast and S. Bryant. Efficient forward modeling for DNAPL site evaluation and remediation. In L. R. Bentley et al., editors, *Computational Methods in Water Resources XIII*, pages 161–166, Rotterdam, 2000. Balkema.
- [7] M. Wheeler, T. Arbogast, S. Bryant, J. Eaton, Qin Lu, M. Peszynska, and I. Yotov. A parallel multiblock/multidomain approach for reservoir simulation. In *Proceedings of the 15th SPE Symposium on Reservoir Simulation held in Houston, Texas*, February 14–17, 1999. SPE 51884.
- [8] M. F. Wheeler, T. Arbogast, S. Bryant, and J. Eaton. Efficient parallel computation of spatially heterogeneous geochemical reactive transport. In V. N. Burganos et al., editors, *Computational Methods in Water Resources XII, Vol. 1: Computational Methods in Contamination and Remediation of Water Resources*, pages 453–460, Southampton, U.K., 1998. Computational Mechanics Publications.
- [9] T. Arbogast, S. E. Minkoff, and P. T. Keenan. An operator-based approach to upscaling the pressure equation. In V. N. Burganos et al., editors, *Computational Methods in Water Resources XII, Vol. 1: Computational Methods in Contamination and Remediation of Water Resources*, pages 405–412, Southampton, U.K., 1998. Computational Mechanics Publications.
- [10] Peng Wang, I. Yotov, M. Wheeler, T. Arbogast, C. Dawson, M. Parashar, and K. Sepehrnoori. A new generation EOS compositional reservoir simulator: Part I—Formulation and discretization. In *Proceedings of the 14th SPE Symposium on Reservoir Simulation held in Dallas, Texas*, June 8–11, 1997. SPE 37979.

- [11] T. Arbogast, C. N. Dawson, P. T. Keenan, M. F. Wheeler, and I. Yotov. The application of mixed methods to subsurface simulation. In R. Helmig et al., editors, *Modeling and Computation in Environmental Sciences*, volume 59 of *Notes on Numerical Fluid Mechanics*, pages 1–13, Braunschweig, 1997. Vieweg Publ.
- [12] M. F. Wheeler, T. Arbogast, S. Bryant, C. N. Dawson, F. Saaf, and Chong Wang. New computational approaches for chemically reactive transport in porous media. In G. Delic and M.F. Wheeler, editors, *Next Generation Environmental Models and Computational Methods (NGEMCOM)*, pages 217–226, Philadelphia, 1997. Proceedings of the U.S. Environmental Protection Agency Workshop (NGEMCOM), SIAM.
- [13] T. Arbogast, M. F. Wheeler, and I. Yotov. Logically rectangular mixed methods for flow in irregular, heterogeneous domains. In Á. A. Aldama et al., editors, *Computational Methods in Water Resources XI*, volume 1, pages 621–628, Southampton, 1996. Computational Mechanics Publications.
- [14] T. Arbogast. Mixed methods for flow and transport problems on general geometry. In G. F. Carey, editor, *Finite Element Modeling of Environmental Problems*, pages 275–286, Cichester, England, 1995. Wiley.
- [15] T. Arbogast, P. T. Keenan, M. F. Wheeler, and I. Yotov. Logically rectangular mixed methods for Darcy flow on general geometry. In *Proceedings of the 13th SPE Symposium on Reservoir Simulation held in San Antonio, Texas*, pages 51–59, February 12–15, 1995. SPE 29099.
- [16] T. Arbogast, M. F. Wheeler, and I. Yotov. Logically rectangular mixed methods for groundwater flow and transport on general geometry. In A. Peters et al., editors, *Computational Methods in Water Resources X, Vol. 1*, pages 149–156, Dordrecht, The Netherlands, 1994. Kluwer Academic Publishers.
- [17] T. Arbogast, C. N. Dawson, and M. F. Wheeler. A parallel multiphase numerical model for subsurface contaminant transport with biodegradation kinetics. In A. Peters et al., editors, *Computational Methods in Water Resources X, Vol. 2*, pages 1499–1506, Dordrecht, The Netherlands, 1994. Kluwer Academic Publishers.
- [18] T. Arbogast, C. N. Dawson, and P. T. Keenan. Efficient mixed methods for groundwater flow on triangular or tetrahedral meshes. In A. Peters et al., editors, *Computational Methods in Water Resources X, Vol. 1*, pages 3–10, Dordrecht, The Netherlands, 1994. Kluwer Academic Publishers.
- [19] T. Arbogast and M. F. Wheeler. A parallel numerical model for subsurface contaminant transport with biodegradation kinetics. In J. R. Whiteman, editor, *The Mathematics of Finite Elements and Applications VIII (MAFELAP 1993)*, pages 199–213, New York, 1994. Wiley.
- [20] T. Arbogast. A simplified dual-porosity model for two-phase flow. In T. F. Russell et al., editors, *Computational Methods in Water Resources IX, Vol. 2: Mathematical Modeling in Water Resources*, pages 419–426, Southampton, U.K., 1992. Computational Mechanics Publications.
- [21] T. Arbogast, M. Obeyesekere, and M. F. Wheeler. Simulation of flow in root-soil systems. In T. F. Russell et al., editors, *Computational Methods in Water Resources IX, Vol. 2: Mathematical Modeling in Water Resources*, pages 195–202, Southampton, U.K., 1992. Computational Mechanics Publications.
- [22] T. Arbogast, A. Chilakapati, and M. F. Wheeler. A characteristic-mixed method for contaminant transport and miscible displacement. In T. F. Russell et al., editors, *Computational Methods in Water Resources IX, Vol. 1: Numerical Methods in Water Resources*, pages 77–84, Southampton, U.K., 1992. Computational Mechanics Publications.
- [23] T. Arbogast. Gravitational forces in dual-porosity models of single phase flow. In *Proceedings, Thirteenth IMACS World Congress on Computation and Applied Mathematics*, pages 607–608, Dublin, Ireland, July 22-26, 1991. Trinity College.

- [24] T. Arbogast, M. Obeyesekere, and M. F. Wheeler. Convergence analysis for simulating flow in root-soil systems. In J. R. Whiteman, editor, *The Mathematics of Finite Elements and Applications VII (MAFELAP 1990)*, pages 361–383, London, 1991. Academic Press.
- [25] T. Arbogast, J. Douglas, Jr., and U. Hornung. Modeling of naturally fractured reservoirs by formal homogenization techniques. In R. Dautray, editor, *Frontiers in Pure and Applied Mathematics*, pages 1–19. Elsevier, Amsterdam, 1991.
- [26] P. J. Paes Leme, J. Douglas, Jr., T. Arbogast, and N. P. Nunes. A tall block model for immiscible displacement in naturally fractured reservoirs. In *Proceedings, Society of Petroleum Engineers Latin American Petroleum Engineering Conference, Rio de Janeiro, Brazil, October 15–19, 1990*. SPE 21104.
- [27] J. Douglas, Jr., T. Arbogast, and P. J. Paes Leme. Two models for the waterflooding of naturally fractured reservoirs. In *Proceedings, Tenth SPE Symposium on Reservoir Simulation*, pages 219–225, 1989. Paper SPE 18425.
- [28] T. Arbogast, J. Douglas, Jr., and J. E. Santos. Two-phase immiscible flow in naturally fractured reservoirs. In M. F. Wheeler, editor, *Numerical Simulation in Oil Recovery*, number 11 in The IMA Volumes in Mathematics and its Applications, pages 47–66. Springer-Verlag, 1988.
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- [30] J. Douglas, Jr., P. J. Paes Leme, T. Arbogast, and T. Schmitt. Simulation of flow in naturally fractured reservoirs. In *Proceedings, Ninth SPE Symposium on Reservoir Simulation*, pages 271–279, 1987. Paper SPE 16019.

Technical Reports

- [1] T. Arbogast. User’s guide to Parssim1: The parallel subsurface simulator, single phase. Technical Report TICAM Report 98–13, The Center for Subsurface Modeling, Texas Institute for Computational and Applied Mathematics, The University of Texas at Austin, Austin, Texas, May 1998.
- [2] T. Arbogast, C. N. Dawson, D. Moore, F. Saaf, C. San Soucie, M. F. Wheeler, and I. Yotov. Validation of the PICS transport code. Technical report, Department of Computational and Applied Mathematics, Rice University, Houston, Texas, 1993.

Other Manuscripts

- [1] T. Arbogast and J. L. Bona. Methods of Applied Mathematics. World wide web address <http://www.ma.utexas.edu/users/arbogast/appMath08c.pdf>, Department of Mathematics, The University of Texas at Austin, Austin, Texas, 1999–2008.