

April, 2014

**Thomas A. Manteuffel**

Department of Applied Mathematics  
University of Colorado at Boulder  
526 UCB  
Boulder, CO 80309-0526  
<http://grandmaster.colorado.edu/~tmanteuf/>  
[tmanteuf@colorado.edu](mailto:tmanteuf@colorado.edu)

**EDUCATION**

| <b>Educational Institution</b> | <b>Degree</b> | <b>Year</b> | <b>Address</b>     |
|--------------------------------|---------------|-------------|--------------------|
| University of Illinois         | PhD in Math   | 1975        | Urbana, Illinois   |
| University of Illinois         | MS in Math    | 1972        | Urbana, Illinois   |
| University of Wisconsin        | BS in Math    | 1970        | Madison, Wisconsin |

**PROFESSIONAL EXPERIENCE:**

- 1993–present. Professor of Applied Mathematics, Department of Applied Mathematics, University of Colorado at Boulder, Boulder, CO
- 1989–1993. Director, Computational Math Group, University of Colorado at Denver, Denver, CO
- 1985–1993. Professor of Mathematics, Mathematics Department, University of Colorado at Denver, Denver, CO
- 1982–1987. Section Leader: Research and Mathematical Software Libraries Section, Los Alamos National Laboratories, Los Alamos, NM
- 1981–1989. Member of Technical Staff, Los Alamos National Laboratories, Los Alamos, NM.
- 1979–1981. Member of Technical Staff, Sandia Laboratories, Albuquerque, NM.
- 1976–1979. Member of Technical Staff, Sandia Laboratories, Livermore, CA.
- 1975–1976. Assistant Professor at Emory University, Department of Mathematics
- 1975–1976. Mathematical Consultant for U.S. Geological Survey, Denver, CO.
- 1973–1975. Research Assistant to Professor Paul Saylor, University of Illinois, Dept. of Computer Science

**VISITING POSITIONS:**

- Visiting Professor, University of California at San Diego, Spring 1984.

- Ulam Scholar, Los Alamos National Laboratories, 1993–1994.
- Visiting Professor, University of Queensland, Brisbane, AU, Fall 1999.

**RESEARCH INTERESTS:** Numerical Linear Algebra  
 Iterative Solution of Large Sparse Linear Systems  
 Numerical Solution of Partial Differential Equations  
 Parallel Computing

**HONORS:**

- Golub Prize for work on Conjugate Gradient Methods, 1983
- Outstanding Researcher of the University, University of Colorado at Denver, 1990
- Ulam Scholar, Los Alamos National Laboratories, 1993–1994.
- Fellow of the Society of Industrial and Applied Mathematics, Class of 2009

**PROFESSIONAL SERVICE:**

- Member of Rheinboldt Committee, Future Directions in Computational Mathematics, Algorithms, and Scientific Software, 1985.
- Activities for The Society of Industrial and Applied Mathematics
  - President, 2001-2002.
  - President-elect, 2000.
  - Past-President, 2003.
  - Vice President-at-Large, 1996–1999.
  - Chair of Science Policy Committee, 1997 –2000, 2003-2004, member 1997 – present.
  - Master Program Committee, 1995–1996.
  - Council Representative to the Board of Trustees, 1991–1993.
  - Member of the Council, 1990–1995.
  - Publications Committee, 2004–2011.
- Chair, External Review Committee, Department of Mathematics, Iowa State University, November, 2001.
- External Review Committee, Department of Mathematics, Pennsylvania State University, September, 2003.
- Chair of the Review Panel of the Computational Sciences Program of the Helmholtz Association of National Research Centers, Germany, May 5, 2004.
- Member of the Review Panel, DOE ASCI Alliance Center, C-SAFE, University of Utah on October 5-6, 2004.

- Chair of the Review Panel, DOE ASCI Alliance Center, C-SAFE, University of Utah on October 3-4, 2005.
- Advisory Committee, DOE Office of Science, Advanced Scientific Computing Research, 2003-2011.
- Advisory Board, Bravarian Graduate School of Computational Engineering.
- Governing Board, Institute for Statistical and Mathematical Sciences (SAMSI), University of North Carolina, 2006–2008.
- Review Committee, Pacific Northwest National Laboratory, Fundamental and Computational Sciences Directorate, (2008 – ).
- Chair External review Committee, Department of Scientific Computing, Florida State University, (2012).
- Journal Editorships
  - Editor-in-Chief, SIAM Journal of Numerical Analysis, 1996-2000, 2007–2009.
  - Editor, SIAM Journal of Numerical Analysis, 1996–present.
  - Associate Editor, SIAM Journal of Multiscale Modelling, 2005-2010.
  - Associate Editor, Electronic Transactions in Numerical Analysis, 1994-present.
  - Associate Editor, Journal Numerical Linear Algebra, 1990 - present.
  - Guest Editor, SIAM Journal of Numerical Analysis, 1992-1994.
  - Associate Editor, SIAM Journal of Scientific Computing, 1991 - 1995, current guest editor.
  - Associate Editor, SIAM Journal of Matrix Analysis, 1990 – 1993.

#### **CONFERENCE ORGANIZATION:**

- Co-Chairman, Copper Mountain Conference Series on Iterative and Multigrid Methods, 1989 - 2002.
- Program Committee, Copper Mountain Conference Series on Iterative and Multigrid Methods, 2003-present.
- Organizing Committee, SIAM Annual Meeting, Los Angeles, CA, July 20-24, 1992.
- Chair, Workshop on First-order Systems Least-squares Functionals, Center for Non-linear Studies, Los Alamos National Laboratories, May 25-27, 1994.
- Organizing Committee, Workshop on Least-squares Finite Element Methods, Ohio Aerospace Institute, October 13-14, 1994.
- Organizer, Workshop on Least-squares Finite-element Methods, Oberwolfach, Germany, June 14, 2002.

- Organizer, Workshop on Multigrid Methods for Transport, Boulder, CO, October 1-2, 2009
- Co-Chair, Annual Workshop on Algebraic Multigrid Methods, Boulder, CO 2001–present

#### Ph. D. STUDENTS

1. Jim Otto, *Multi-level methods for the solution of advection-dominated elliptic problems on composite grids*, 1992
2. Suely Oliveira, *Parallel multigrid methods for transport equations*, 1993.
3. Gaoming Yang, *Multigrid methods for the Boltzmann transport equation*, 1993.
4. Klaus J. Ressel, *Least-squares finite element solution of the neutron transport equation in diffusive regimes*, 1994.
5. Teri L. Barth, *Implementation of the conjugate gradient method using short multiple recursions*, 1996.
6. Barry. Lee, (co-advisor with S. McCormick) *Multilevel methods for first-order system least squares*, May 1996.
7. Markus Berndt, (co-advisor with S. McCormick) *Parallel multilevel adaptive methods*, May 1999.
8. Andrea. Codd, (co-advisor with S. McCormick) *First-order system least squares (FOSLS) for elliptic grid generation (EGG)*, May 2001.
9. Timothy Chartier, (co-advisor with S. McCormick) *Algebraic multigrid based on element interpolation (AMGe) and spectral AMGe*, May 2001.
10. B. Philip, (co-advisor with S. McCormick) *Asynchronous fast adaptive composite grid methods for elliptic problems on adaptively-refined curvilinear grids*, May 2001.
11. Hugh MacMillan, *First-order least-squares and electrical impedance tomography*, May 2001.
12. Ken Jarman, (Co-advisor with J. Oliveira) *Stochastic Immiscible Flow With Moment Equations.*, May 2001.
13. Brian Bloechle, (Co-Advisor with H. Rajaram) *On the Taylor Dispersion of Reactive Solutes in a Parallel-Plate Fracture-Matrix System*, May 2001.
14. Travis Austin, *Advances on least-squares methods for 3-d linear Boltzmann transport equation*, August 2001.
15. Luke Olson, *Multilevel least-squares finite elements methods for hyperbolic partial differential equations*, May 2003.

16. Allison Baker, (Co-advisor with E. Jessup) *A technique for accelerating the convergence of GMRES*, August 2003.
17. Scott MacLachlan, (co-advisor with S. McCormick) *Adaptive algebraic multigrid methods and homogenization*, May 2004.
18. Chad Westphal, *First-order system least squares for geometrically-nonlinear elasticity in nonsmooth domains*, August, 2004.
19. Oliver Röhrle, (co-advisor with S. McCormick) *Multilevel first-order system least squares for nonlinear PDEs*, December 2004.
20. Eunjung Lee, *FOSLL\* for eddy current problems with three-dimensional edge singularities*, August 2005
21. James Brannick, (co-advisor with S. McCormick) *Adaptive algebraic multigrid methods*, December 2005.
22. Brendan Sheehan, *Multigrid methods for isotropic neutron transport*, May, 2007.
23. Joshua Nolting *Efficiency-based local adaptive refinement for FOSLS finite elements*, May 2008.
24. Geoff Sanders, *Two extensions to adaptive smooth aggregation (aSA) multigrid: eigensolver initialization and nonsymmetric problems*, August 2008.
25. James Adler, *Nested Iteration and First Order Systems Least Squares on Incompressible Resistive Magnetohydrodynamics*, May 2009.
26. Christian Ketelsen, *Least-Squares Finite Element Methods for Quantum Electrodynamics*, August 2009.
27. Lei Tang, *Parallel Efficiency-based Adaptive Local Refinement*, December 2010.
28. Min Ho Park, (co-advisor with S. McCormick) *Relaxation-corrected Bootstrap Algebraic Multigrid (rBAMG)*, December 2010.
29. Kuo Liu, *Hybrid First-Order System Least-Squares Finite Element Methods With The Application To Stokes And Navier-Stokes Equations* , December 2012.
30. Toby Jones, (co-advisor with S. McCormick), *Algebraic Multigrid Methods for Parallel Computing, Systems, and Graphs*, December 2013
31. Jose Garcia, *Fluid Dynamics of Large Scale Circulation in the Ocean using First Order System Least Square (FOSLS) Finite Element Method*, May 2014

#### RECENT INVITED LECTURES:

- Plenary Speaker, South African Numerical Analysis Meeting, Stellenbosch University, Stellenbosch, SA, March 26-28, 2008.

- Invited Speaker, DOE Conference on Computational Methods in Transport, Granlibakini Lodge, Tahoe City, CA, September 6-10, 2008.
- Plenary Speaker, Seventh International Conference on Large Scale Scientific Computations, Sozopol, Bulgaria, June 3-8, 2009.
- Invited Speaker, Center for Applied Scientific Computing, Livermore National Laboratory, Livermore CA, July 29, 2009.
- Invited Speaker, Workshop on Multigrid Methods for Transport, Boulder Colorado, October 3, 2009
- Invited Speaker, Computer Science and Mathematics Division Lecture Series, Oak Ridge National Laboratory, Oak Ridge, TN, November 4, 2009.
- Invited Speaker, DOE Applied Mathematics PI Meeting, Berkeley, CA, May 3, 2010.
- Invited Speaker, IMA Workshop on Numerical Solutions of Partial Differential Equations, University of Minnesota, December 2, 2010
- Minisymposium Speaker, Numerical Discretization Error Estimation for Uncertainty Quantification, SIAM CS&E Conference, Reno, NV, March 2, 2011.
- Colloquium Speaker, Purdue University, April 13, 2011
- Plenary Speaker, Ninth International Conference of Numerical Analysis and Applied Mathematics 2011, ICNAAM 2011, Halkidiki, Greece, September 19, 2011
- Seminar Speaker, Lawrence Livermore National Laboratory, February 21, 2012
- Colloquium Speaker, National Renewable Energy Laboratory, Golden, CO, August 24, 2012.
- Minisymposium Speaker, SIAM Conference on Computational Science and Engineering, February 26, 2013.
- Invited Speaker, Eleventh International Conference of Numerical Analysis and Applied Mathematics 2013, ICNAAM 2013, Rhodes, Greece, September 2, 2013.
- Plenary Speaker, ICES/USACM Workshop on Minimum Residual and Least Squares Finite Element Methods, Nov. 4, 2013, Austin, Texas.

#### **REFEREED PUBLICATIONS:**

1. T.A. Manteuffel, "The Tchebychev Iteration for Nonsymmetric Linear Systems," *Numer. Math.*, 28, 307–327 (1977).
2. T.A. Manteuffel, "Adaptive Procedures for Estimating Parameters for the Nonsymmetric Tchebychev Iteration," *Numer. Math.*, 31, 183–208 (1978).

3. T.A. Manteuffel, "An Incomplete Factorization Technique for Positive Definite Linear Systems," *Math. Comp.*, Vol. 34, No. 150, 473–497 (1980).
4. T.A. Manteuffel, "An Interval Analysis Approach to Rank Determination in Linear Least Squares Problems," *SISSC*, Vol. 2, No. 3, 335–348 (1981).
5. T.A. Manteuffel, "Optimal Parameters for Linear Second-Degree Stationary Iterative Methods," *SIAM J. Numer. Analysis*, Vol. 19, No. 4, 833–839 (1982).
6. D.B. Grove, L.F. Konikow and T.A. Manteuffel, "Application of the Conjugate Gradient Method to Ground-Water Models," *Journal of Ground Water Resources* (1982).
7. V. Faber and T.A. Manteuffel, "Necessary and Sufficient Conditions for the Existence of a Conjugate Gradient Method," *SIAM J. Numer. Analysis*, Vol. 21, No. 2, 352–362 (1984).
8. R.C.Y. Chin, J. dePillis and T.A. Manteuffel, "ADI as a Preconditioning for Solving the Convection-Diffusion Equation," *SISSC*, Vol. 5, No. 2, 281–299 (1984).
9. J.M. Hyman and T.A. Manteuffel, "Dynamic Acceleration of Nonlinear Iterations," *Elliptic Problem Solvers II*, G. Birkhoff and A. Schoenstadt, eds., Academic Press, 1984.
10. T.A. Manteuffel and A.B. White, "Numerical Solution of Second-Order Boundary Value Problems on Nonuniform Meshes," *Math. Comp.*, Vol. 47, No. 176, 511–535 (1986).
11. H.O. Kreiss, T.A. Manteuffel, B. Schwartz, B. Wendroff and A.B. White, "Supraconvergent Schemes on Irregular Grids," *Math. Comp.*, Vol. 47, No. 176, 537–554 (1986).
12. V. Faber, T.A. Manteuffel, A.B. White and G.M. Wing, "Asymptotic Behavior of Singular Values and Singular Functions of Certain Convolution Operators," *Comp. and Maths. with Appls.*, Vol. 12A, No. 6, 733–747 (1986).
13. T.A. Manteuffel and A.B. White, "On the Efficient Numerical Solution of Systems of Second-Order Boundary-Value Problems," *SIAM J. Numer. Analysis*, Vol. 23, No. 5, 996–1006 (1986).
14. V. Faber and T.A. Manteuffel, "Orthogonal Error Methods," *SIAM J. Numer. Analysis*, Vol. 24, No. 1, 170–187 (1987).
15. R.C.Y. Chin and T.A. Manteuffel, "An Analysis of Block SOR for a Class of Matrices with Complex Spectrum," *SIAM J. of Numer. Analysis*, Vol 25, No. 3 (1988).
16. V. Faber and T.A. Manteuffel, "A Look at Transport Theory from the Viewpoint of Linear Algebra," *Transport Theory, Invariant Embedding and Integral Equations, Lecture Notes in Pure and Applied Mathematics* Vol. 115 (Nelson, Faber, Manteuffel, Seth and White, eds.) Marcel-Dekker, April 1989.

17. S.F. Ashby, T.A. Manteuffel and P.E. Saylor, "Adaptive Polynomial Preconditioning for Hermitian Indefinite Linear Systems," *BIT*, 29(4), pp. 583–609, 1989.
18. V. Faber, T.A. Manteuffel and S.V. Parter, "On the Theory of Equivalent Operators and Application to the Numerical Solution of Uniformly Elliptic Partial Differential Operators," *Advances in Applied Mathematics*, 11, pp. 109–163, 1989.
19. T.A. Manteuffel and S.V. Parter, "Preconditioning and Boundary Conditions," *SIAM J. of Numer. Anal.*, Vol. 27, No. 31, pp. 656–694, June 1990.
20. S. Ashby, T.A. Manteuffel and P. Saylor, "A Taxonomy of Conjugate Gradient Methods," *SIAM J. Numer. Analysis*, Vol. 27, No. 6, pp 1547-1568, Dec. 1990.
21. J. E. Morel and T.A. Manteuffel, "An Angular Multigrid Acceleration Technique for  $S_n$  Equations with Highly Forward-Peaked Scattering," *Nucl. Sci. Eng.*, Vol. 107, pg 330, 1990.
22. T.A. Manteuffel and A.B. White, "A Calculus of Difference Schemes for the Solution of Boundary Value Problems on Irregular Meshes," *SIAM J. of Numer. Anal.*, Vol. 29, No. 5, pp 1321-1346 1992.
23. C.I. Goldstein, T.A. Manteuffel and S.V. Parter, "Preconditioning and Boundary Conditions without  $H_2$  Estimates:  $L_2$  Condition Numbers and the Distribution of the Singular Values," *SIAM J. of Numer. Anal.*, Vol. 30, No. 2, pp 343–376, 1993.
24. S.F. Ashby, T.A. Manteuffel and J.S. Otto, "A Comparison of Chebychev and Least Squares Adaptive Polynomial Preconditioning for Hermitian Positive Definite Linear Systems," *SIAM J. Sci. and Stat. Comp.*, Vol. 13, No. 1, pp 1–29, (1992).
25. W.D. Joubert, T.A. Manteuffel, S.V. Parter and S.P. Wong, "Preconditioning Second-order Elliptic Operators: Experiment and Theory," Los Alamos National Laboratory Reports LA-UR-90-1615, April, 1990., *SIAM J. Sci. and Stat. Comp.*, Vol. 13, No. 1, pp 259-288, (1992).
26. T.A. Manteuffel and J.S. Otto, "Optimal Equivalent Preconditionings," *SIAM J. of Numer. Anal.* , Vol. 30, No. 3, pp. 790-812, June 1993.
27. V. Faber, F. Chung and T.A. Manteuffel, "An Upper Bound on the Diameter of a Graph from Eigenvalues Associated with its Laplacian," *SIAM J. of Dis. Math.*, Vol. 7, No. 3, pp443, (1994).
28. T.A. Manteuffel and J.S. Otto, "On the Roots of the Orthogonal Polynomials and Residual Polynomials Associated with a Conjugate Gradient Method," *Journal of Numerical Linear Algebra*, Vol. 1 (5), pp 449-475, (1994)
29. T.A. Manteuffel, S.F. McCormick, J.E. Morel, S. Oliveira and G. Yang, "A Parallel Version of a Multigrid Algorithm for Isotropic Transport Equations," *SIAM J. Sci. and Stat. Comp.*, Vol 15. No. 2, pp 474-493, (1994).



30. Z. Cai, R. Lazarov, T.A. Manteuffel and S. McCormick, “First-order System Least Squares for Second-Order Partial Differential Equations: Part I ”, *SIAM J. Numer. Anal.*, Vol 31, No 6 (1994)
31. X. C. Hu, T.A. Manteuffel, S. F. McCormick and T. F. Russell, “Accurate Discretization for Singular Perturbations: The One-Dimensional Case”, *SIAM J. Numer. Anal.*, Vol. 32, No. 1, pp 83-109, (1995)
32. T.A. Manteuffel, S.F. McCormick, J.E. Morel, S. Oliveira and G. Yang, “A Fast Multigrid Algorithm for Isotropic Transport Problems I: Pure Scattering,” *SIAM J. Sci. and Stat. Comp.*, Vol. 16, NO. 3, pp. 601-635, May 1995.
33. T.A. Manteuffel, G. Starke and R. S. Varga, “Adaptive  $K$ -step Iterative Methods for Nonsymmetric Systems of Linear Equations”, *Electr. Trans. Numer. Anal.*, Vol. 3, pp 50-65, (1995).
34. Z. Cai, T.A. Manteuffel and S. F. McCormick, “First-Order System Least Squares for Velocity-Vorticity-Pressure Form of the Stokes Equations, with Application to Linear Elasticity”, *Electronic Transactions in Numerical Analysis*, Vol. 3, pp150-159, (1995).
35. T.A. Manteuffel, S.F. McCormick, J.E. Morel and G. Yang, “ A Fast Multigrid Algorithm for Isotropic Transport Problems II: with Absorption,” *SIAM J. Sci. and Stat. Comp.*, Vol. 17, No. 6, pp. 1449 - 1474, (1996).
36. V. Faber, W. Joubert and E. Knill and T.A. Manteuffel, “Minimal Residual Method Stronger Than Polynomial Preconditioning”, *SIAM J. Mat. Anal.*, Vol. 17, No. 4 (1996).
37. T.A. Manteuffel and G. Starke, “On Hybrid Iterative Methods for Nonsymmetric Systems of Linear Equations”, *Numerische Math.*, Vol. 73, No. 4, pp. 489 - 506, (1996).
38. Z. Cai, T.A. Manteuffel and S. McCormick, “First-order System Least Squares for Second-Order Partial Differential Equations: Part II”, *SIAM J. Numer. Anal.*, Vol. 34, No. 2, (1997).
39. Z. Cai, T.A. Manteuffel and S. McCormick, “First-order System Least Squares for Stokes Equations with Application to Linear Elasticity”, *SIAM J. Numer. Anal.*, Vol. 34, No. 5, pp. 1727-1741 (1997)
40. M. Berndt, T. A. Manteuffel, and S. F. McCormick “Local error estimates and adaptive refinement for first-order system least squares (FOSLS) *E.T.N.A.*, Vol. 6, pp. 35–43 (1998).
41. Z. Cai, T.A. Manteuffel, S.F. McCormick and S. V. Parter, “First-order System Least-squares for the Pure Traction Problem in Planar Linear Elasticity”, *SIAM J. Numer. Anal.*, Vol. 35, No. 1, pp. 320-335 (1998).

42. T.A. Manteuffel and Klaus Ressel, “Least-squares finite-element solution of the neutron transport equation in diffusive regimes”, *SIAM J. Numer. Anal.*, Vol. 35, No. 2, (1998).
43. J.-M. Fiard, T.A. Manteuffel and S. McCormick, “First-order system least squares (FOSLS) for convection-diffusion problems: numerical results”, *SIAM J. Sci. Comp.*, Vol. 19 (1998), pp. 1958-1979.
44. P. Bochev, Z. Cai, T.A. Manteuffel and S. McCormick, “Analysis of velocity-flux least-squares principles for the Navier-Stokes equations: Part I”, *SIAM J. Numer. Anal.*, Vol. 35, No. 3, pp 990 - 1009 (1998).
45. P. Bochev, Z. Cai, T.A. Manteuffel and S. McCormick, “Analysis of velocity-flux least-squares principles for the Navier-Stokes equations: Part II”, *SIAM J. Numer. Anal.*, Vol. 36, No. 4, pp 1125-1144 (1999).
46. T. A. Manteuffel, K. J. Ressel and G. Starke, “A boundary functional for the least-squares finite element solution of the neutron transport equation”, *SIAM J. Numer. Anal.*, Vol. 37, No. 2, pp. 556–586 (2000).
47. T. A. Barth and T. A. Manteuffel, “Multiple recursion conjugate gradient methods, part I: sufficient conditions”, *SIAM J. Matrix Anal. and Apps.*, Vol. 21, No. 3, pp. 768–796 (2000).
48. Z. Cai, C.-O. Lee, T. A. Manteuffel, and S. F. McCormick, “First-order system least squares for the Stokes and elasticity equations: further results”, *SIAM J. Sci. Comp.*, Vol. 21, pp. 1728-1739 (2000).
49. B. Lee, T. A. Manteuffel, S. F. McCormick, and J. Ruge, “First-order system least-squares (FOSLS) for the Helmholtz equation”, *SIAM J. Sci. Comp.*, Vol. 20, pp. 1927–1949, April 2000.
50. Z. Cai, C.-O. Lee, and T. Manteuffel, and S. F. McCormick, “First-order system least squares for planar linear elasticity: numerical results”, *SIAM J. Sci. Comp.*, Vol. 21, p. 1706-1727 (2000).
51. A. Cleary, R. Falgout, V. Henson, J. Jones, T. Manteuffel, S. F. McCormick, G. Miranda, and J. Ruge, “Robustness and scalability of algebraic multigrid (AMG)”, *SIAM J. Sci. Comp.* Vol. 21, No. 5, pp. 1886 - 1908, (2000)
52. S.-D. Kim, T.A. Manteuffel and S. McCormick, First-order system least squares (FOSLS) for spatial linear elasticity: pure traction, *SIAM J. Numer. Anal.*, Vol. 38, No. 5, pp. 1454-1482 (2000).
53. M. Brezina, A. Cleary, R. Falgout, V. Henson, J. Jones, J. Ruge, T. Manteuffel, S. F. McCormick, “Algebraic multigrid based on element interpolation (AMGe)”, *SIAM J. Sci. Comp.* Vol. 22, No. 5, pp. 1570-1592, (2001).

54. S. F. Ashby, M. J. Holst, T.A. Manteuffel and P. E. Saylor, “The Role of the Inner Product in Stopping Criteria for Conjugate Gradient Iterations”, *B.I.T.*, Vol 41, No. 1, (2001).
55. Z. Cai, T. A. Manteuffel, S. F. McCormick, “First-order system  $\mathcal{LL}^*$  (FOSLL\*): scalar elliptic partial differential equations”, *SIAM J. Numer. Anal.* Vol. 39, No. 4, pp. 1418 - 1445 (2001).
56. E. Chow, T. A. Manteuffel, C. Tong, B. K. Wallin, “Algebraic elimination of slide surface constraints in implicit structural analysis”, *Inter. J. for Numer. Meth. in Eng.*, 01, 1-21 (2002)
57. J. J. Heys, C. G. DeGroff, W. W. Orlando, T. A. Manteuffel, S. F. McCormick, “First-order system least squares for elasto-hydrodynamics with application to flow in compliant blood vessels”, *Biomed. Sci. Instr.* 38 (2002), pp. 277-282.
58. T. Chartier, R. Falgout, J. Jones, V. E. Henson, T. Manteuffel, S. F. McCormick, J. Ruge, and P. Vassilevski, “Spectral element AMG $\epsilon$ ”, *SIAM J. Sci. Comp.*, Vol. 25, No. 1, pp. 1-26, (2003).
59. P. N. Brown, B. Lee, T. A. Manteuffel, “A moment-parity multigrid preconditioner for the first-order least-squares formulation of the Blotzmann transport equations”, *SIAM J. Sci. Comp.*, Vol. 25, No. 2, pp. 513-533, (2003).
60. T. A. Manteuffel, S. F. McCormick and C. Pflaum, “Improved discretization error estimates for first-order system least-squares (FOSLS)”, *J. of Numer. Math.*, Vol. 11, pp. 163-177,(2003).
61. A. Codd and T. A. Manteuffel, and S. F. McCormick, “Multilevel first-order system least squares for nonlinear partial differential equations, with application to elliptic grid generation”, *SIAM J. Numer. Anal.*, Vol. 41, pp. 2197–2209,(2003).
62. A. Codd, T. A. Manteuffel, S. F. McCormick, and J. Ruge, “Multilevel first-order system least squares for elliptic grid generation: ellipticity and computational results”, *SIAM J. Numer. Anal.*, Vol. 41, pp. 2210–2232, (2003).
63. J. Heys, T. A. Manteuffel, S. F. McCormick and J. Ruge, “First-order system least-squares (FOSLS) for coupled fluid-elastic problems”, *J. Comp. Phys.*, 195(2): 560-575, (2004).
64. H. R. MacMillan, T. A. Manteuffel, and S. F. McCormick, “First-order system least squares and electrical impedance tomography: part I”, *SIAM J. Numer. Anal.*, Vol. 42, No. 2, pp. 461–483, (2004).
65. H. de Sterck, T. A. Manteuffel, S. F. McCormick, and L. Olson, “Least-Squares finite element methods for linear hyperbolic PDEs”, *SIAM J. Sci. Comp.*, Vol. 26, No. 1, pp. 31–54, (2004).

66. M. Brezina, R. Falgout, S. MacLachlan, T. A. Manteuffel, S. F. McCormick, and J. Ruge, “Adaptive smoothed aggregation (aSA)”, *SIAM J. Sci. Comp.*, Vol. 25, No. 6, pp. 1896–1920, (2004).
67. J. J. Heys, C. G. DeGroot, T. A. Manteuffel, S. F. McCormick, and H. Tufo, Modeling 3-d compliant blood flow with FOSLS, *Biomed Sci Instrum.* 40, pp. 193–199, (2004).
68. T. M. Austin, T. A. Manteuffel and S. F. McCormick, “A robust multilevel approach to minimizing  $H(\text{div})$  dominated functionals in an  $H^1$ -conforming finite element space”, *J. Numer. Lin. Alg. Appl.*, vol. 11, pp. 115-140, (2004).
69. J. Heys, T. A. Manteuffel, S. F. McCormick, and L. Olson, Algebraic multigrid (AMG) for high-order finite element, *J. Comp. Phys.* Vol. 204, pp. 520–532, (2005).
70. A. H. Baker, E. R. Jessup, and T. A. Manteuffel, “A technique for accelerating the convergence of GMRES”, *SIAM J. Mat. Anal. & App.*, Vol 26, No. 4, pp. 962–984 (2005). (Also available as Technical Report #CU-CS-945-03, University of Colorado, Department of Computer Science, January, 2003.)
71. M. Berndt, T. A. Manteuffel, S. F. McCormick and G. Starke, “Analysis of first-order system least-squares (FOSLS) for elliptic problems with discontinuous coefficients: part I”, *SIAM J. Numer. Anal.*, Vol. 42, pp. 386-408 (2005).
72. M. Berndt, T. A. Manteuffel and S. F. McCormick, “Analysis of first-order system least-squares (FOSLS) for elliptic problems with discontinuous coefficients: part II”, *SIAM J. Numer. Anal.*, Vol. 42, pp. 409-436 (2005).
73. H. De Sterck, T. A. Manteuffel, S. F. McCormick, and L. Olson, “Numerical Conservation Properties of  $H(\text{div})$ -Conforming Least-Squares Finite Element Methods for Scalar Conservation Laws”, *SIAM J. Sci. Comput.*, Vol. 26, No. 5, pp. 1573–1597, (2005).
74. M. Brezina, R. Falgout, S. MacLachlan, T. A. Manteuffel, S. F. McCormick, and J. Ruge “Adaptive Smoothed Aggregation (aSA)”, *SIAM review SIGEST*, Vol. 47, pp. 317-346 (2005).
75. J. Brannick, M. Brezina, S. MacLachlan, T. Manteuffel, S. McCormick, and J. Ruge, “An energy based coarsening strategy”, *Numer. Lin. Alg. Appl.*, Vol. 13, pp. 133–148, (2005).
76. M. Brezina, R. Falgout, S. MacLachlan, T. Manteuffel, S. McCormick, and J. Ruge, “Adaptive algebraic multigrid ( $\alpha$ AMG) ” *SIAM J. Sci. Comp.*, Vol. 27, pp. 1261-1286, (2006).
77. T. A. Manteuffel, S. F. McCormick, O. Roehle, and J. Ruge “Projection multilevel methods for quasilinear elliptic partial differential equations: numerical results”, *SIAM J. Numer. Anal.* Vol. 44, No. 1, pp. 120–138, (2006).

78. T. A. Manteuffel, S. F. McCormick, and O. Roehrlé, “Projection multilevel methods for quasilinear elliptic partial differential equations: theoretical results”, *SIAM J. Numer. Anal.* Vol. 44, No. 1, pp. 139–152, (2006).
79. J. J. Heys, C.G. DeGroot, T.M. Manteuffel, and S.F. McCormick, “First-Order System Least Squares for Flow in Compliant Blood Vessels”. *Medical Engineering & Physics*, Vol. 28, pp. 495–503, (2006).
80. T. A. Manteuffel, S. F. McCormick, J. Ruge and J. G. Schmidt, “First-order system  $\mathcal{LL}^*$  (FOSLL\*) for general scalar elliptic problems in the plane”, *SIAM J. Num. Anal.*, Vol. 43, NO. 5, pp. 2098–2120, (2006).
81. S. MacLachlan and T. A. Manteuffel, and S. F. McCormick, “Adaptive reduction-based AMG ( $\alpha$ AMGr)”, *Numer. Lin. Alg. App.*, Vol. 13, pp. 599–620, (2006).
82. S.-D. Kim, C.-O. Lee, T. Manteuffel, S. McCormick, and O. Roehrlé, “First-order systems least squares for the Oseen Equations”, *Numer. Lin. Alg. App.* , Vol. 13, pp. 461 – 486, (2006).
83. J. Brannick, M. Brezina, R. Falgout, T. Manteuffel, S. McCormick, J. Ruge, B. Sheehan, J. Xu, L. Zikatanov, “Extending the applicability of multigrid methods”, *J. Phys.: Conf. Ser.*, Vol. 446, No. 1, pp 443+, (2006).
84. J. Heys, E. J. Lee, T. A. Manteuffel, S. F. McCormick, “On mass conserving least-squares methods”, *SIAM J. Sci. Comp.*, Vol. 28, pp. 1675-1693, (2006).
85. T. M. Austin and T. A. Manteuffel, “A least-squares finite element method for the linear Boltzmann Equation with anisotropic scattering”, *SIAM J. Numer. Anal.*, Vol. 44, No. 2, pp 540–560, (2006).
86. E. J. Lee, T. A. Manteuffel, and C. R. Westphal, “Weighted norm first-order least squares (FOSLS) for problems with corner singularities”, *SIAM J. Numer. Anal.*, Vol. 44, No. 5, pp. 1974 (2006)
87. T. Manteuffel, S. McCormick, J. Schmidt, and C. Westphal, “First-order system least squares (FOSLS) for geometrically nonlinear elasticity”, *SIAM J. Numer. Anal.*, Vol. 44, No. 5, pp. 2057 (2006)
88. B. Chang, T. A. Manteuffel, S. F. McCormick, and B. Sheehan, “Spatial multigrid for isotropic neutron transport” *SIAM J. Sci. Comp.*, Vol. 29, No. 5, (2007).
89. E. J. Lee and T. A. Manteuffel, “ FOSLL\* method for the eddy current problem with three dimensional edge singularities,” *SIAM J. Numer. Anal.* Vol. 45, No. 2, pp. 787, (2007).
90. J. Brannick, M. Brezina, O. Livne, I. Livshits, S. MacLachlan, T. Manteuffel, S. McCormick, J. Ruge, and L. Zikatanov, “Adaptive smoothed aggregation in lattice QCD”, *Lecture Notes Comp. Sci. Eng.*, Springer Verlag, Vol. 55, pp. 505-512, (2007).

91. J. Heys, E. Lee, T. A. Manteuffel, S. F. McCormick, “An alternate least-squares formulation for the Navier-Stokes equations with improved mass conservation”, *J. Comp. Phys.*, Vol. 226, pp.994-1006, (2007).
92. E. J. Lee, T. A. Manteuffel, and C. R. Westphal, “Weighted norm first-order least squares (FOSLS) for Div/Curl systems with edge singularities”, *SIAM J. Numer. Anal.*, Vol.46, No.3 (2008).
93. H. De Sterck, T. Manteuffel, S. McCormick, Q. Nguyen, J. Ruge, “Multilevel adaptive aggregation for Markov chains, with application to web ranking”, *SIAM J. Sci. Comp.*, Vol.30, No.5, (2008).
94. H. De Sterck, T. Manteuffel, S. McCormick, J. Nolting, J. Ruge, L. Tang, “Efficiency-based h- and hp-refinement strategies for finite element methods”, *Numer. Lin. Alg. App.*, Vol. 15, pp. 84–114 (2008).
95. M. Brezina, T. Manteuffel, S. McCormick, G. Sanders, P. Vassilevski, “A generalized eigensolver based on smoothed aggregation (GES-SA) for initializing smoothed aggregation multigrid (SA)”, *Numer. Lin. Alg. App.*, Vol. 15, pp 249-269, (2008).
96. J. J. Heys, E. Lee, T. A. Manteuffel, S. F. McCormick, J. W. Ruge, “Enhanced mass conservation in least-squares methods for Navier-Stokes equations”, *SIAM J. Sci. Comp.*, Vol.31, No.3. (2009).
97. M. Brezina, T. Manteuffel, S. McCormick, J. Ruge, G. Sanders “Towards adaptive smoothed aggregation ( $\alpha$ SA) for nonsymmetric problems; *SIAM J. Sci Comp.*, Vol. 32, No. 1, (2010), pp.14 - 39.
98. H. De Sterck, T. Manteuffel, S. McCormick, J. Pearson, J. Ruge, and G. Sanders, “Smoothed aggregation multigrid for Markov chains”, *SIAM J. Sci. Comp.*, Vol.32, No.1, (2010), pp. 40 - 61
99. J. A. Adler, T. A. Manteuffel, S. F. McCormick, J. W. Ruge, “First-Order System Least Squares for Incompressible Resistive Magnetohydrodynamics”, *SIAM J. Sci Comp.*, Vol.32, No.1, (2010), pp. 229 - 248.
100. J. Brannick, C. Ketelsen, T. Manteuffel, and S. McCormick, “Least-squares finite element methods for quantum electrodynamics”, *SIAM J. Sci. Comp.*, Vol.32, No.1, (2010), pp. 398 - 417.
101. H. De Sterck, T. Manteuffel, S. McCormick, K. Miller, J. Ruge, and G. Sanders, “Algebraic multigrid for Markov chains”, *SIAM J. Sci. Comp.*, Vol. 32, No. 2, (2010), pp. 544 - 562.
102. J. Adler, T. Manteuffel, S. McCormick, J. Ruge, and G. Sanders “Nested iteration and first-order system least squares for incompressible, resistive magnetohydrodynamics”, *SIAM J. Sci. Comp.*, Vol.32, No. 3, (2010), pp. 1506 -1526.

103. J. J. Heys, T.A. Manteuffel, S.F. McCormick, M. Milano, and M. Belohlavek, Weighted Least-Squares Finite Elements for Particle Imaging Velocimetry Analysis, *J. Comp. Physics*, Vol. 229, No. 1, pp. 107-118, (2010).
104. T. Manteuffel, S. McCormick, J. Nolting, J. Ruge, and G. Sanders, “Further results on error estimators for local refinement with first-order system least squares (FOSLS)”, *SIAM J. Numer. Anal.*, Vol 17, N0. 2-3, pp 387–413, (2010).
105. T. Manteuffel, S. McCormick, M. Park, and J. Ruge “Operator-based interpolation for bootstrap algebraic multigrid”, *J. Num. Lin. Alg. Appl.*, Vol. 17, No. 2-3, pp 519–537, (2010).
106. C. Ketelsen, T. Manteuffel, S. McCormick, and J. Ruge, “Finite elements for quantum electrodynamics using a Helmholtz decomposition of the gauge field”, *J. Num. Lin. Alg. Appl.*, Vol. 17, pp. 539 – 556, (2010).
107. R. Babich, J. Brannick, R. Brower, M. Clark, T. Manteuffel, S. McCormick, J. Osborn, and C. Rebbi, “Adaptive Multigrid Algorithm for the Lattice Wilson-Dirac Operator”, *Physical Review Letters*, Vol. 105, pp. 1–4, (2010)
108. H. DeSterck, K. Miller, T. Manteuffel, G. Sanders, “Top-level acceleration of adaptive algebraic multilevel methods for steady-state solution to Markov chains,” *Advances in Computational Mathematics*, Vol. 35, Num. 2-4, pp 375–403, (2011).
109. T. M. Austin, M. Brezina, T. A. Manteuffel and J. Ruge, “Automatic Construction of Sparse Preconditioners for High-Order Finite Element Methods”, Chapter in “Efficient preconditioning methods for elliptic partial differential equations”, Editors: O. Axelson and J. Karatson, Springer Verlag, pp. 84 – 102, (2011).
110. J. Adler, T. Manteuffel, S. McCormick, J. Nolting, J. Ruge, and L. Tang “Efficiency based adaptive local refinement for first-order system least-squares formulations”, *Siam J. Sci. Comp.*, Vol.33, No.1, pp. 1-24, (2011)
111. J. H. Adler, J. Brannick, C. Liu, T. Manteuffel, L. Zikatanov, “First-order system least squares and the energetic variational approach for two-phase flow”, *J. Comput. Phys.* 230(17):6647–6663, (2011)
112. M. Brezina, J. Garcia, T. Manteuffel, S. McCormick, J. Ruge, L. Tang, “Parallel adaptive mesh refinement for first-order system least squares”, *J. Num. Lin. Alg. Appl.*, Vol. 19, No. 2, pp. 343–366, (2012)
113. M. Brezina, C. Ketelsen, T. Manteuffel, S. McCormick, M. Park, and J. Ruge, “Relaxation-corrected bootstrap algebraic multigrid (*r*BAMG)”, *J. Num. Lin. Alg. Appl.*, Vol. 19, pp. 178–193, (2012).
114. T. Austin, M. Brezina, B. Jamroz, C. Jhurani, T. Manteuffel, and J. Ruge, “Semi-automatic Sparse Preconditioners for High-order Finite Element Methods on Non-uniform Meshes”, *J. Comp. Physics*, Vol. 231, No. 14, pp. 4694–4708, (2012)

115. J.H. Adler, M. Brezina, T.A. Manteuffel, S.F. McCormick, J.W. Ruge, and L. Tang, “Island coalescence using parallel first-order system least-squares on incompressible, resistive magnetohydrodynamics”, *SIAM J. Sci. Comp.*, 35-5, pp S171– S191, (2013).
116. K. Liu, T. Manteuffel, S. McCormick, J. Ruge, L. Tang, “Hybrid first-order system least squares finite element methods with application to Stokes equations”, *SIAM J. Numer. Anal.*, 51(4), pp. 2214-2237, (2013).
117. M. Brezina, A. Doostan, T. Manteuffel, S. McCormick, John Ruge, “Smoothed Aggregation Algebraic Multigrid for SPDE Problems with Layered Materials”, *J. Num. Lin. Alg. Appl.*, to appear, (2014)
118. J. Chaudhry, E. Cyr, L. Kuo, T. Manteuffel, L. Olson, L. Tang, “A Goal-Oriented Approach to Least-Squares Finite Element Methods.” *SIAM J. Numer. Anal.*, submitted September 9, 2011.
119. E. Lee, T. Manteuffel, C. Westphal, “FOSLL\* for nonlinear partial differential equations” *SIAM J. Numer. Anal.*, submitted January 2013.

#### **PROCEEDINGS:**

1. T.A. Manteuffel, “The Shifted Incomplete Cholesky Factorization,” Proceedings of the Symposium on Sparse Matrix Computation, Knoxville, TN, Nov. 1978, SIAM Press.
2. T.A. Manteuffel, “Solving Structures Problems Iteratively with a Shifted Incomplete Cholesky Preconditioning,” Proceedings of the Fourth International Symposium on Computing Methods in Applied Sciences and Engineering, Versailles, France, Dec. 1979, North Holland.
3. I.Y. Bucher, P.O. Frederickson, T.A. Manteuffel and A.B. White, “An Approach to the Study of Numerical Methods for Parallel Computations,” Proceedings of the Workshop on Taxonomy of Parallel Algorithms, Santa Fe, NM, November 1983.
4. J.M. Hyman and T.A. Manteuffel, “High Order Factorization Methods for the Solution of Elliptic Boundary Value Problems,” Advances in Computer Methods for Partial Differential Equations, Proceedings of the Fifth IMACS Symposium, June 1984.
5. C.D. Levermore, T.A. Manteuffel and A.B. White, “Numerical Solution of Partial Differential Equations on Irregular Grids,” Proceedings of the International Symposium on Computational Fluid Dynamics and International Conference on Computational Techniques and Applications, Sydney, Australia, August 24-27, 1987.
6. T.A. Manteuffel and A.B. White, “Second-order Accurate Difference Schemes on Highly Irregular Meshes,” Proceedings of the BAIL V Conference, Shanghai, China, 20-24 June 1988.
7. W.D. Joubert and T.A. Manteuffel, “Iterative Methods for Nonsymmetric Linear Systems,” Proceedings of the Conference on Iterative Methods, Austin, Texas, 19-21 October 1988.



8. S. F. Ashby, T.A. Manteuffel and J. S. Otto, "Adaptive Polynomial Preconditioning for HPD Linear Systems," Proceedings of the Ninth International Conference on Computing Methods in Applied Sciences and Engineering, Paris, France, January 29 - February 2, 1990.
9. T.A. Manteuffel, S. F. McCormick, J. E. Morel and G. Yang, "Fast Multigrid Solver for Transport Problems," Proceedings of the IMACS First International Conference on Computational Physics, Boulder, Colorado, June 11 - 15, 1990.
10. D.L. Brown, R.C.Y. Chin, G W. Hedstrom and T.A. Manteuffel, "Layer Tracking, Asymptotics and Domain Decomposition," ICASE Workshop on Heterogeneous Boundary Conditions, September 26-27, 1990, Hampton, VA
11. T.A. Manteuffel, S.F. McCormick, J.E. Morel, S. Oliveira and G. Yang, "Parallel Multigrid Methods for Transport Equations," Proceedings of the Copper Mountain Conference on Iterative Methods, April 10-15, 1992.
12. T.A. Manteuffel and K. Ressel, "Multilevel Methods for Transport Equations in Diffusive Regimes", Proceedings of the Copper Mountain Conference on Multigrid Methods, April 5-9, 1993.
13. M. Limber, T.A. Manteuffel, S. F. McCormick and D. Scholl, "Optimal resolution in maximum entropy image reconstruction from projections with multigrid acceleration", Proceedings of the Copper Mountain Conference on Multigrid Methods, April 5-9, 1993.
14. B. Lee, T.A. Manteuffel, S. McCormick and J. Ruge, "Multilevel first-order system least-squares (FOSLS) for Helmholtz equations", *Procs. 2nd International Conf. on Approx. and Num. Meths. for the Solution of the Maxwell Equations*, Wash. D.C., John Wiley and Sons, Oct., 1993.
15. T.L. Barth and T.A. Manteuffel, "Variable Metric Conjugate Gradient Methods", Proceedings of the 10th International Symposium on Matrix Analysis and Parallel Computing, Keio University, Yokohama, Japan, March 14-16, 1994.
16. T.A. Manteuffel and S. McCormick, "Multilevel projection methods for first-order system least-squares", Proc. ASME Fluids Eng. Div. Summer Meeting, Lake Tahoe, CA, June 9-23, 1994.
17. Z. Cai, T.A. Manteuffel and S. McCormick, "First-order System Least Squares for Stokes Equations with Application to Linear Elasticity", Proceedings of the Seventh Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, April 3-7, 1995, NASA Conference Publication 3339, Part 1, p 133.
18. T.A. Manteuffel, S. McCormick and G. Starke, "First-Order Systems Least-Squares for Second-Order Elliptic problems with Discontinuous Coefficients", Proceedings of the Seventh Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, April 3-7, 1995, NASA Conference Publication 3339, Part 2, p 551.

19. T.A. Manteuffel and K. J. Ressel, "A Systematic Solution Approach for Neutron Transport Problems in Diffusive Regimes", Proceedings of the Seventh Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, April 3-7, 1995, NASA Conference Publication 3339, Part 2, p 519.
20. P. Bochev, Z. Cai, T.A. Manteuffel and S F. McCormick, "First-Order Systems Least-Squares for the Navier-Stokes Equations", Proceedings of the Seventh Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, April 3-7, 1995, NASA Conference Publication 3339, Part 1, p 57.
21. Z. Cai, T.A. Manteuffel and S. McCormick, "Least-Squares Method for the Stokes Equations Based on Vorticity Formulation, with Applications to Linear Elasticity", Proceedings of the Seventh Copper Mountain Conference on Multigrid Methods, Copper Mountain, CO, April 3-7, 1995, NASA Conference Publication 3339, Part 1, 123.
22. T. Barth and T.A. Manteuffel, "Conjugate Gradient Algorithms Using Multiple Recursions", Proceedings of the Workshop on Conjugate gradient Methods, University of Washington, Seattle, WA, July 9-14, 1995.
23. J. J. Heys, C.G. DeGroof, W.W. Orlando, T.A. Manteuffel, and S.F. McCormick, "First-Order System Least Squares for Elastohydrodynamics with Application to Flow in Compliant Blood Vessels.", Biomed. Sci. Instr., Conference Proceedings, 38:277-282, Copper Mountain, CO.,April (2002).
24. R. D. Falgout, J. Brannick, M. Brezina, T. A. Manteuffel, S. F. McCormick, "New Multigrid algorithms in TOPS", Proc. of SciDAC 2005 held in San Francisco, CA, June 26–30, 2005, Journal of Physics: Conference Series, Institute of Physics, (Also available as LLNL Technical Report UCRL-PROC-213270), (2005)
25. T. Chartier, R. Falgout, J. Jones, V. E. Henson, T. Manteuffel, S. F. McCormick, J. Ruge, and P. Vassilevski, "Spectral element agglomerate AMGe", Proceedings: 16th International Conference on Domain Decomposition Methods, New York, NY (US), 01/12/2005–01/15/2005; Lecture Notes in Comp. Sci. Eng., Springer Verlag, (2005) (Also available as LLNL Technical Report UCRL-PROC-212439).
26. J. Brannick, M. A. Clark, R. C. Brower, T. Manteuffel, S. McCormick, J. C. Osborn, and C. Rebbi, "The removal of critical slowing down", Procs. XXVI Int'l Symp. On Lattice Field Thoery, July 14-19, (2008)
27. J. Adler, T. A. Manteuffel, S. F. McComrick, J. Ruge, and L. Tang "An efficiency-based adaptive refinement scheme applied to incompressible, resistive magnetohydrodynamics", Proceedings of 7th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria, June 4-8, Springer Lecture Notes in Computer Science (LNCS), (2010).
28. J. Adler, T. Manteuffel, S. McCormick, J. Nolting, J. Ruge, and L. Tang, "A parallel, adaptive first-order system least-squares (FOSLS) algorithm for incompressible, resistive magnetohydrodynamics (MHD)", Proceedings of Ninth International Conference

of Numerical Analysis and Applied Mathematics, ICNAAM 2011, Halkidiki, Greece, September 19-24, 2011

29. K.Liu, T. Manteuffel, S. McCormick, J. Ruge, and L. Tang, "Hybrid First-Order System Least Squares with Application to Stokes Equations", Proceedings of the Eleventh International Conference of Numerical Analysis and Applied Mathematics, ICNAAM 2013, Rhodes, Greece, September 21-27, 2013.

#### **BOOKS EDITED:**

- *Transport Theory, Invariant Embedding and Integral Equations, Lecture Notes in Pure and Applied Mathematics*, Vol. 115. Editors: V. Faber, T.A. Manteuffel, P. Nelson, D. Seth, A.B. White, and G.M. Wing, Marcel-Dekker, New York, April 1989.

#### **SPECIAL JOURNAL ISSUES EDITED**

1. Special Issue on Iterative Methods in Numerical Linear Algebra, *SIAM Journal of Scientific Computation*, Vol 13, No. 1, 1992 (From the Copper Mountain Conference on Iterative Methods, April 1-5, 1990.)
2. Special Issue on Iterative Methods in Numerical Linear Algebra, *SIAM Journal Matrix Analysis*, Vol. 13, No. 3, 1992. (From the Copper Mountain Conference on Iterative Methods, April 1-5, 1990.)
3. Special Issue on Iterative Methods in Numerical Linear Algebra, *SIAM Journal of Scientific Computation*, Vol 15, No. 2, 1994 (From the Copper Mountain Conference on Iterative Methods, April 9-14, 1992.)
4. Special Issue on Iterative methods in Numerical Linear Algebra, *SIAM Journal of Scientific Computation*, Vol 15, No. 3, 1994 (From the Copper Mountain Conference on Iterative Methods, April 9-14, 1992.)
5. Special Issue Dedicated to Seymour V. Parter, *SIAM Journal of Numerical Analysis*, Vol 31, No 6, 1994.
6. Special Issue on Iterative Methods in Numerical Linear Algebra, *SIAM Journal of Scientific Computation*, Vol 17, No. 1, 1996 (From the Copper Mountain Conference on Iterative Methods, April 5-9, 1994.)
7. Special Issue on Multilevel Methods, *E.T.N.A.* , Vol. 6, (1998.)

#### **PROCEEDINGS EDITED**

- Proceedings of the Sixth Copper Mountain Conference on Multigrid Methods, April 4-9, 1993, NASA Conference Publication 3224.
- Proceedings of the Seventh Copper Mountain Conference on Multigrid Methods, April 2-7, 1995, NASA Conference Publication 3339.

## **SELECTED UNPUBLISHED REPORTS:**

1. T.A. Manteuffel, “The Shifted Incomplete Cholesky Factorization,” Sandia National Laboratories Report, SAND78-8226, May 1978.
2. T.A. Manteuffel, “The Weighted Linear Least Squares Problem: An Interval Analysis Approach to Rank Determination,” Sandia National Laboratories Report, SAND80-1260, August 1980.
3. T. Barth and T.A. Manteuffel, “Estimating the Spectrum of a Matrix Using the Roots of the Polynomials Associated with the QMR Iteration” Center for Computational Mathematics Report, University of Colorado at Denver, March, 1993.
4. S. F. Ashby, M. J. Holst, T.A. Manteuffel and P. E. Saylor, “The Role of the Inner Product in Stopping Criteria for Conjugate Gradient Iterations”, Lawrence Livermore National Laboratory Report, UCRL-JC-112586, November, 1992.
5. T.A. Manteuffel and J. S. Otto, “On the transformation to an orthogonal coordinate system aligned with a vector field, Part one: Hyperbolic grid generation”, Center for Nonlinear Studies Report, Los Alamos Report Series, 1994.

## **OTHER PROFESSIONAL PUBLICATIONS:**

- “Future Directions in Computational Mathematics, Algorithms, and Scientific Software,” (W.C. Rheinboldt, Chairman), SIAM, Philadelphia, 1985.

## **RESEARCH FUNDING RECORD:**

- Air Force Office of Scientific Research, AFOSR-86-0061, “Fast Algorithms for Partial Differential Equations on Advanced Computers” Feb 1, 1986—Jan 31, 1988, \$64,539.
- National Science Foundation Grant DMS-8704169, “Multilevel Algorithms for Advanced Computers,” 1 September 1987—28 February 1991, \$540,000 (Principal Investigators; Thomas A. Manteuffel and Steve McCormick).
- National Science Foundation Grant DMS-8904404, “CMG Local Area Network,” July 1, 1989–December 31, 1990, \$30,000.
- Department of Energy, Applied Mathematical Sciences, Grant DE-FG02-89ER25082, “Copper Mountain Conference on Iterative Methods,” September 25, 1989–September 24, 1990, \$6,500.
- National Science Foundation Grant DMS-8920562 “Math Sciences: Copper Mountain Conference on Iterative Methods,” March 15, 1990 – November 30, 1990, \$17,500.
- Sandia National Labs, “Research Fellowship: Jim Jones”, August 15, 1990 – May 31, 1992, \$31,510.

- Department of Energy, Applied Mathematical Sciences Grant DE-FG02-90ER25086, “Fast Algorithms for Transport Models”, June 1, 1990 – May 31, 1993, \$168,878.
- National Science Foundation Grant ASC-9015308, “Postdoctoral Research Associate: Wayne Joubert”, January 1, 1991 – June 30, 1993, \$39,730.
- National Science Foundation, DMS-9015259, “Multilevel Algorithms for Advanced Computers”, March 15, 1991 – August 31, 1993, \$450,000. (Principal Investigators; Thomas A. Manteuffel and Steven F. McCormick).
- National Science Foundation Grant ASC-9108785, “Postdoctoral Research Associate: James Otto”, January 1, 1992 – February 28, 1994, \$39,790.
- Department of Energy, Applied Mathematical Sciences Grant DE-FG02-90ER25086, “Copper Mountain Conference on Iterative Methods”, October 1, 1991 – September 31, 1992, \$46,500.
- Department of Energy, Applied Mathematical Sciences Grant DE-FG03-93ER25165, “Fast Algorithms for Transport Models”, June 1, 1993 – May 31, 1994, \$100,801.
- Department of Energy, Applied Mathematical Sciences Grant DE-FG03-94ER25217, “Fast Algorithms for Transport Models”, July 1, 1994 – June 30, 1996, \$178,157.
- National Science Foundation, DMS-9312752, “Multilevel and Algebraic Iterative Methods in Large-Scale Computing”, August 8, 1994 – July 31, 1997, \$450,000. (Principal Investigators; Thomas A. Manteuffel, Steven F. McCormick and Thomas F. Russell).
- National Science Foundation, DMS-9706866, “Multilevel and Algebraic Iterative Methods in Large-Scale Computing”, September 1, 1997 – August 31, 2000, \$435,000. (PIs: Thomas A. Manteuffel, Steven F. McCormick and Thomas F. Russell)
- Department of Energy, Applied Mathematical Sciences Grant DE-FG03-94ER25217, “Fast Algorithms for Transport Models”, (PI: Tom Manteuffel, Co-PI: Steve McCormick) July 1, 1996 – June 30, 1999, \$312,896.
- IBM, Shared University Research Proposal, 12 node IBM - SP2, list price \$889,000.
- National Institute of Health, “Computational Biomechanics of Coupled Systems via FOSLS”, (PI: Victor Barocas), September 1, 1998 - August 31, 2000, \$146,340.
- Department of Energy, ASCI 2, “Scalable Algorithms for Massively Parallel Computers”, (PI: Tom Manteuffel, Co-PI: Steve McCormick, Charbel Farhat, K.C. Park) December 1, 1998 - October 31, 2001, \$1,890,000.
- Department of Energy, Applied Mathematical Sciences Grant DE-FG03-99ER25217, “First-order system least-squares (FOSLS): fundamentals and applications”, (PI: Tom Manteuffel, Co-PI: Steve McCormick) July 1, 1999 – June 30 2002, \$300,000.

- National Science Foundation, DMS-0084438, “First-order System Least Squares (FOSLS) for Partial Differential Equation”, (PI: Steve McCormick, Co-PI: Tom Manteuffel), October 1, 2000 – September 30, 2003, \$329,999.
- Sandia National Laboratories, grant no. 1100.12.1512B, “Fast and Accurate Numerical Solution of Maxwell Equations”, October 1, 2000 – September 31, 2006, \$382,865.
- DOE, SciDAC: Project title: Terascale optimal PDE systems (TOPS), grant no. : DE-FC02-01ER25479, (PI: Steve McCormick, Co-PI: Tom Manteuffel, Xiao-Chuan Cai), 7/01-6/06 Total Award \$1,580,000.
- Lawrence Livermore National Laboratory, “FAC, Adaptive AMG, and Compatible Relaxation for solving problems that arise in LLNL applications.” (PI; Steve McCormick, Co-PI: Tom Manteuffel), 7/03-3/04, Total award: \$124,662
- DOE, ASCR: “First-order system least-squares (FOSLS): fundamentals and applications.” grant no. DE-FG02-03ER25574. (PI: Tom Manteuffel, Co-PI: Steve McCormick) 9/15/03-9/14/06, Total award: \$489,246.
- NSF, Project: “hp-adaptive FOSLS methods for nonlinear problems with singularities”, grant no. DMS-0410318, (PI: Tom Manteuffel, Co-PI: Steve McCormick), 10/04 - 9/07, Total Award: \$350,000.
- IBM Shared University Research (SUR) Proposal, Gift of Linux Cluster: Occam (PI Henry Tufo, Co-PI: Tom Manteuffel), 10/04-9/05
- NSF MRI Grant, (PI: Henry Tufo, Co-PI: Tom Manteuffel, Steve McCormick, Xiao-Chuan Cai) 11/04 - 12/07, Total Award: \$1,200,000.
- NSF, Project title: CMG: Modelling River Basin Dynamics: Parallel Computing and Advanced Numerical Methods, (PI: Scott Peckham, PI: Tom Manteuffel, Co-PIs: Steve McCormick, and Greg Tucker), Grant no: EAR - 0621199, 9/15/06 - 8/31/10, Total award; \$900,000.
- DOE, Project title: Towards Optimal Petascale Simulation (TOPS), (PI: Steve McCormick, Co-PI: Tom Manteuffel, X.C. Cai), Grant no: , 9/15/06 - 9/14/11, Total award: \$900,000
- DOE, Project Title: First-order system least-squares (FOSLS) for nonlinear systems arising from DOE applications, (PI: Tom Manteuffel, Co-PI: Steve McCormick) 11/15/06 – 10/01/09, Total Award: \$623,499.
- NSF, Project Title: Petascale Multilevel Quantum Chromodynamics, (PI: Steve McCormick, Co-PI: Tom Manteuffel), 1/01/08 – 12/31/11, Total Award: \$488,704.
- NSF, Project Title: Enhanced Least-Squares Methods for PIV Analysis, (PI: Steve McCormick, Co-PI: Tom Manteuffel, 10/1/08 – 9/30/11, Total Award: \$150,000.

- DOE, Project Title: First-order system least-squares (FOSLS) for nonlinear systems arising from DOE applications, (PI: Tom Manteuffel, Co-PI: Steve McCormick) 10/01/10 – 1/31/14, Total Award: \$759,836.
- NSF, Project Title: Collaborative Research: Least-Squares Finite Element Methods for Data Assimilation in Large-Scale Simulations, (PI: Tom Manteuffel, Co-PI: Steve McCormick) 3/01/13 – 2/28/16, Total Award: \$262,000.
- DOE, Project Title: Center for Exascale Radiation Transport, (PI: Tom Manteuffel, Co-PI: Steve McCormick) (subcontract throughout Texas A &M) 10/01/13 – 09/30/18, Total Award: \$1,000,000.
- DOE, Project Title: First-order system least-squares (FOSLS) for nonlinear systems arising from DOE applications, (PI: Tom Manteuffel, Co-PI: Steve McCormick) 1/31/14– 1/31/17, Total Award: \$750,094.