December, 2012

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EDUCATION

San Diego State College: B.A. with honors in Spring, l966. Phi Kappa Phi, Blue Key, Wilma Tyler Trott Scholarship, and Outstanding Senior Student Award.

University of Southern California: Ph.D. in Spring, l971. Hughes Master Fellowship, NSF Traineeship, and Teaching Assistantship. Thesis advisor: E. K. Blum. Thesis Title: *A General Approach to One-Step Iterative Methods with Application to Eigenvalue Problems*

SOCIETY MEMBERSHIPS

ACM, AIAA, IEEE, SIAM, Sigma Xi, SIGNUM

PROFESSIONAL EXPERIENCE

9/66-1/69   Hughes Aircraft Company. Member of the technical staff for the Data Reduction Section, Surveyor Spacecraft Project.

1/69-6/70   University of Southern California. Teaching assistant.

8/70-9/73   Institute for Educational Computing, Claremont Colleges. Assistant to the Director.

9/70-6/72   Pomona College. Assistant Professor of Mathematics.

7/72-7/74   NSF Principal Investigator. Project title: *A numerical investigation of iterative methods for the solution of the linear eigenvalue problem,* grant no. GJ 34737.

9/73-12/83   Colorado State University. Assistant (1973), Associate (1977), and Full (1981) Professor of Mathematics.

5/74-4/76   NSF Principal Investigator. Project title: *A numerical investigation of one-step iterative methods for the solution of nonlinear equations*, grant no. GJ 42626.

9/74-6/80   Solar Environmental Engineering Company. Partner and Director of Computing.

3/75-2/77   NSF Associate Investigator. Project title: *Information processing for optimization of energy utilization in structures*, grant no. DCR 75-03578.

6/76-6/78   NSF Principal Investigator. Project title: *A numerical investigation of iterative methods for solving linear and nonlinear equations*, grant no. MSC 76-09215.

6/76-6/78   AFOSR Principal Investigator. Project title: *An investigation of numerical methods for the sparse generalized eigenvalue problem*, grant no. AFOSR-76-3019.

9/76-9/78   NSF Research Associate. Project title: *Efficient software for elementary function evaluation on microprocessors*, grant no. MCS 76-12457.

8/77-9/77   Organizer and Program Chairman for the *1st Rocky Mountain Symposium on Microcomputers: Systems, Software, Architecture*. Fort Collins, Colorado. Funded by NSF, AFOSR, ARO and ONR.

2/78-3/78   Organizer and Conference Co-chairman for the *2nd Rocky Mountain Symposium on Microcomputers: Systems, Software, Architecture*. Fort Collins, Colorado. Funded by AFOSR, ARO, and ONR.

9/77-9/78   Organizer and President of SIGNUM Rocky Mountain Chapter.

6/78-6/80   AFOSR Principal Investigator. Project title: *A numerical investigation of iterative techniques for solving eigenproblems and nonlinear boundary value problems*, grant no. AFOSR-76-3019.

10/78-9/80   NSF Principal Investigator. Project title: *A numerical investigation of iterative techniques for solving eigenproblems and nonlinear boundary value problems*, grant no. MCS 78-03847.

8/79-7/81   Lawrence Livermore Laboratory Consultant.

3/80-9/80   Battelle/ARO Consultant.

7/80-7/81   AFOSR Principal Investigator. Project title: *An investigation of numerical techniques for nonlinear boundary value and eigenvalue problems*, grant no. AFOSR-80-0201.

10/80-9/82   NSF Principal Investigator. Project title: *A numerical investigation of surface mesh refinement techniques*, grant no. MCS 80-17056.

1/81-1/92   *Multigrid Newsletter* Founder and Editor.

3/81-2/82   National Center for Atmospheric Research. Consultant.

7/81-7/82   AFOSR Principal Investigator. Project title: *Multigrid methods for nonlinear problems*, grant no. AFOSR-F-81-090.

7/81-8/81   Lawrence Livermore Laboratory. Summer Hire.

8/10-1/81   *Multigrid Short Course* Organizer and Lecturer. Lockheed Palo Alto Research Center, Palo Alto, CA.

1/82-6/84   Institute for Computational Studies. Research Scientist.

6/82-12/84   AFOSR Principal Investigator. Project title: *Multigrid methods for nonlinear problems*, contract no. AFOSR-F33615-82-3210.

7/82-8/85   National Bureau of Standards. Consultant.

4/83   Organizer and Chairman of the *1st Copper Mountain Multigrid Conference*, Copper Mountain, CO. Funded by AFOSR, NASA, and GMD.

6/83-8/83   Gesellschaft für Mathematik und Datenverarbeitung. Visiting Scientist.

7/83   Editor, Proceedings of the *1st Copper Mountain Multigrid Conference*, AMC Special Issue.

8/83-9/91   Colorado Research and Development Corporation. Research Scientist, Treasurer, and Member of the Board.

11/83-2/92   Associate Editor, Applied Mathematics and Computation.

1/84-1/86   NASA Langley Principal Investigator. Project title: *Algebraic multigrid applied to finite elements with application to structural analysis and elasticity problems*, grant no. NAS-1-453.

5/84-2/92   Los Alamos National Laboratory. Consultant.

6/84-12/84   Mobil Oil Research Corp. Principal Investigator. Project title: *AMG applied to oil reservoir simulation*.

8/84-8/93   University of Colorado at Denver. Professor of Mathematics.

10/84-4/87   DOE Principal Investigator. Project title: *Fast adaptive composite grid methods for high performance computer systems*, grant no. DE-ACD3-84ER80155, Phases I and II.

1/85-1/87   Project with Veritas Research, Oslo. AMG in structures.

2/85-2/86   AFOSR Principal Investigator. Project title: *Algebraic multigrid and the fast adaptive composite grid method in large-scale computation*, grant no. AFOSR-85-0118.

5/85   Organizer and Chairman of the *2nd Copper Mountain Multigrid Conference*, Copper Mountain, CO. Funded by AFOSR, NASA, and GMD.

9/85   Editor, Proceedings of the *2nd Copper Mountain Multigrid Conference*, AMC Special Issue.

Fall/85   Founded the Computational Mathematics Group at CU-Denver. Obtained support from the University Office of Space Science and Technology, the College of Liberal Arts and Sciences, the Computer Center, and CRDC, including funds for operation, peripheral computer equipment, work-stations, and an Intel PSC Hypercube multicomputer.

3/86   Editor, SIAM Frontier Series in Applied Mathematics, Vol. V. on Multigrid Methods, SIAM, Philadelphia, 1987, pp. 1-282.

5/86-9/95   AFOSR Principal Investigator. Original title: *Algebraic multigrid and the fast adaptive composite grid method in large-scale computation*. Current title: *Multilevel methods in large-scale computation*. Grant nos. AFOSR-86-0126 and AFOSR-91-0156.

3/87   Organizer and Chairman of the *3rd Copper Mountain Multigrid Conference*, Copper Mountain, CO. Funded by AFOSR.

9/87-9/93   NSF Principal Investigator. Project title: *Multilevel algorithms for advanced computers*, grant no. DMS-8704169.

12/87-5/88   NASA Principal Investigator. Project title: *Asynchronous multilevel adaptive methods for partial differential equations*, grant no. NASI-18606.

5/88   Editor, Lecture Notes in Pure and Applied Mathematics/110, Marcel-Dekker (selected papers of the *3rd Copper Mountain Multigrid Conference*).

7/88-6/92 Associate Director of Applied Mathematics, Center for Applied Parallel Processing, University of Colorado.

10/88-9/90 Project with DRET (Paris) for *The use of algebraic multigrid (AMG) for the numerical simulation of inviscid and viscous compressible flows using finite element methods*.

3/89 Organizer and Co-Chairman of the *4th Copper Mountain Multigrid Conference*, Copper Mountain, CO. Funded by AFOSR.

6/89-12/89 NSF Co-Investigator. Project Title: *SCREMS-Local Area Network Equipment Grant*, grant no. DMS-8904404.

9/89-8/91 NASA Principle Investigator. Project Title: *The NASA Graduate Student Research Program*, grant no. NGT-50403.

11/89 Editor, Proceedings of the *4th Copper Mountain Conference on Multigrid Methods*, SIAM.

1/90-3/93 NASA Co-Investigator. Project Title: *Parallel multilevel adaptive methods for flows in transition*, Phases I and II, grant no. SBIR 89-1-06-01-8633.

3/90 Program Chairman of the *1st Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, and LANL.

5/90-11/90 AFOSR Co-Investigator. Project Title: *Multilevel adaptive methods for the Eagle code*, Phase I , grant no. SBIR FO8635-90-C-0368.

7/90-6/95 Sandia project on *Fast numerical methods for flow models for the WIPP project*.

10/90-now Front Range Scientific Computations, Inc. President.

12/90-9/93 Sandia Graduate Research WIPP Fellowship Advisor.

3/91 Organizer and Co-Chairman of the *5th Copper Mountain Conference on Multigrid Methods*, Copper Mountain, CO. Funded by AFOSR, NSF, and IBM.

6/91 Principal Lecturer, *NSF-CBMS Regional Research Conference,* George Washington University, Washington, D.C.

7/91-9/96 Colorado Offices, Ecodynamics Research Associates, Inc. Vice-President.

4/92 Co-Chairman of the *2nd Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE.

1/92-6/95   NASA Co-Investigator. Project Title: *Multilevel adaptive methods for combustion*, Phases I and II, grant no. SBIR 91-1-0101-4807.

12/92-1/96   ONR Co-Investigator. Project Title: *Multilevel adaptive methods for 3-D Reynolds averaged Navier-Stokes solvers*, Phases I and II, grant no. SBIR N00167-93-C-0009.

2/93-7/93   NASA Co-Investigator. Project Title: *A C++ virtual shared grid based programming model for architecture-independent development of structured grid codes*, Phase I, grant no. SBIR TBA.

4/93   Co-Chairman of the *6th Copper Mountain Conference on Multigrid Methods*, Copper Mountain, Colorado. Funded by DOE, NASA, and NSF.

8/93-now   University of Colorado at Boulder, Professor of Applied Mathematics.

8/93-12/99   Associate Editor, *SIAM Journal on Scientific Computing*.

4/94   Co-Chairman of the *3rd Copper Mountain Conference on Iterative Methods,* Breckenridge, Colorado. Funded by DOE and NSF.

4/94   Principal Lecturer (with J. Bramble). *Australian Workshop on Multigrid Methods*, Australian National University, Canberra.

5/94-11/97   NSF Principal Investigator. Cooperative research program with INRIA, grant no. INT-9310529.

6/94-6/95   Project with DRET (Paris) for *Multilevel methods for the Helmholtz equations*.

8/94-7/97   NSF Principal Investigator. Project title: *Multilevel algorithms for advanced computers*, grant no. DMS-9312752.

4/95   Co-Chairman of the *7th Copper Mountain Conference on Multigrid Methods*, Copper Mountain, Colorado. Funded by DOE, NASA, and NSF.

9/95   Editor, English translation, *Optimization in Solving Elliptic Problems*, Eugene G. D'Yakonov, CRC Press, 1995.

1/96-9/00   Associate Editor, *SIAM Journal on Numerical Analysis*.

4/96   Co-Chairman of the *4th Copper Mountain Conference on Iterative Methods,* Copper Mountain, Colorado. Funded by DOE and NSF.

4/97   Co-Chairman of the *8th Copper Mountain Conference on Multigrid Methods*, Copper Mountain, Colorado. Funded by DOE, IBM, the GMD, and NSF.

4/97   Editor, Special Issue of *E. T. N. A.* on Multigrid Methods.

6/97-5/00   DOE Co-Investigator. Project title: *Fast Algorithms for Transport Models*, grant no. DE-FG03-95ER25217.

8/97-7/00   NSF Principal Investigator. Project title: *Multilevel and Algebraic Iterative Methods in Large-Scale Computing*, grant no. DMS-9706866.

12/97   Co-Principal Investigator. IBM Shared Research Grant of 12-Node SP supercomputer.

8/97-8/98   Council on Research and Creative Works Fellowship, University of Colorado at Boulder, half-year faculty research leave support.

4/98   Co-Chairman of the *5th Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, and IBM.

10/98-9/01   DOE ASCI Level II Co-Investigator. Project Title: *Scalable Algorithms for Massive Parallel Computation*.

10/98-9/01   NIH Co-Investigator. Project Title: *Computational Biomechanics of Coupled Systems via FOSLS*, grant no. 1-R01-EY12291-01.

4/99   Co-Chairman of the *9th Copper Mountain Conference on Multigrid Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, and IBM.

4/00   Co-Chairman of the *6th Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, and IBM.

7/00-6/03   DOE Co-Investigator. Project title: *First-Order System Least Squares (FOSLS): Fundamentals and Applications*, grant no. DE-FG03-99ER25217.

9/00   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

10/00-10/03 NSF Principal Investigator. Project title: *First-Order System Least Squares (FOSLS) for Partial Differential Equations*, grant no. DMS-0084438.

1/01-1004   Sandia National Laboratories Co-Investigator. Project title: *Fast and Accurate Numerical Solution of Maxwell* Equations, grant no. 1100.12.1512B.

1/01-12/05   Editor, *SIAM Journal on Multiscale Modeling and Simulation*.

4/01   Co-Chairman of the *10th Copper Mountain Conference on Multigrid Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, and IBM.

7/01-7/06   DOE SciDAC Principal Investigator. Project title: *Terascale Optimal PDE Simulations (TOPS)*, grant number no. DE-FC02-01ER25479.

9/01   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

3/02   Co-Chairman of the *7th Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, and IBM.

9/02   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

4/03   Conference Committee of the *11th Copper Mountain Conference on Multigrid Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, and IBM.

7/03-3/07   LLNL Principal Investigator. Project Title: *FAC, Adaptive AMG, and Compatible Relaxation for Solving Problems That Arise in LLNL Applications*.

7/03-6/06   DOE Co-Investigator. Project title: *First-Order System Least Squares (FOSLS): Fundamentals and Applications (Fast Algorithms for Transport Models)*.

9/03   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

10/04-10/07   NSF Co-Investigator. Project title: *hp-adaptive FOSLS Methods for Nonlinear PDE Problems with Singularities*, grant no. DMS-0410318.

3/04   Conference Committee of the *8th Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, IBM, LANL, LLNL, and Sandia.

9/04   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

4/05   Conference Committee of the *12th Copper Mountain Conference on Multigrid Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, IBM, LANL, LLNL, and Sandia..

9/05   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

4/06   Conference Committee of the *9th Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, IBM, LANL, LLNL, and Sandia.

9/06   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

9/06-8/11   NSF Co-Investigator. Project Title: *CMG Research: Modeling River Basin Dynamics: Parallel Computing and Advanced Numerical Methods*.

10/06-9/11   DOE Principal Investigator. Project Title: *Towards Optimal Petascale Simulations (TOPS)*.

10/06   Co-Editor, *Multigrid Computing*, Special Issue of Computing in Science and Engineering, Vol. 8, IEEE, pp. 1-104.

3/07   Conference Committee of the *13th Copper Mountain Conference on Mutigrid Methods*. Funded by DOE, NSF, IBM, LANL, LLNL, and Sandia.

9/07   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

10/07-5/13   DOE Co-Investigator. Project title: *First-order system least squares (FOSLS) for nonlinear systems arising in DOE applications*.

11/07-9/09   LLNL Principal Investigator. Project Title: *Geometric and Algebraic Multigrid Methods for QCD, MHD, Elasticity, Transport, and Other DOE Applications*.

12/07-12/11 NSF Principal Investigator. Project Title: *Multigrid QCD at the Petascale*.

4/08   Conference Committee of the *10th Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, IBM, Boeing, LANL, LLNL, and Sandia.

9/08   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

10/08-9/11   NSF Principal Investigator. Project Title: *Enhanced Least-Squares Methods for PIV Analysis*.

3/09   Conference Committee of the *14th Copper Mountain Conference on Mutigrid Methods*. Funded by DOE, NSF, IBM, LANL, LLNL, and Sandia.

9/09   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

3/10   Conference Committee of the *11th Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, IBM, Boeing, LANL, LLNL, and Sandia.

10/10   Chair of the *AMG Summit*, Boulder, Colorado. Funded by FRSC and LLNL.

3/11   Conference Committee of the *15th Copper Mountain Conference on Mutigrid Methods*. Funded by DOE, NSF, IBM, LANL, LLNL, and Sandia.

9/11   Chair of the *AMG Summit*, Lake City, Colorado. Funded by FRSC and LLNL.

3/12   Conference Committee of the *12th Copper Mountain Conference on Iterative Methods*, Copper Mountain, Colorado. Funded by DOE, NSF, IBM, Boeing, LANL, LLNL, and Sandia.

10/12   Chair of the *AMG Summit*, Boulder, Colorado. Funded by FRSC and LLNL.

3/13-2/16   NSF Co-Investigator. Project Title: *Collaborative Research: Least-Squares Finite Element Methods for Data Assimilation in Large-Scale Simulations*.

12/09-3/12   LLNL Principal Investigator. Project Title: *Error Estimators for Uncertainty Quantification, Adaptive Mesh Refinement, Multilevel Solvers for Transport, Adaptive AMG/SA for Quantum Chromodynamics, and the AMG Summit.*

9/12-10/15   AFOSR Principal Investigator. Project Title: *Parallel Multilevel Decomposition Methods for Plasma Fluid Models*.

3/12-3/15   LLNL Principal Investigator. Project Title: *Error Estimators for Uncertainty Quantification, Adaptive Mesh Refinement, Solvers for Stochastic Partial Differential Equations, Parallel Adaptive AMG/SA, and Parallel Solution of Systems of Partial Differential Equations.*

PUBLICATIONS AND REPORTS

1.   *A general approach to one-step iterative methods with application to eigenvalue problems*, J. Comput. Sys. Sci. 6 (l972), pp. 354-372.

2.   *An iterative procedure for the solution of constrained nonlinear equations with application to optimization problems*, Numer. Math. 23 (l975), pp. 371-385.

3.   *A uniform approach to gradient methods for linear operator equations*, J. Math. Anal. Appl. 49 (l975), pp. 275-285 (with G.H. Rodrigue).

4.   *Some numerical results on the method of gradients for $Ax = \lambda Bx$*, J. Comput. Sys. Sci. 13 (l976), pp. 213-222.

5.   *Simultaneous iteration for the matrix eigenvalue problem*, J. Lin. Alg. Appl. 16 (l977), 43-56 (with A.D. Noe).

6.   *Newton's method with mesh refinements for numerical solution of nonlinear two-point boundary value problems*, Numer. Math. 29 (l978), pp. 237-260 (with E.L. Allgower).

7.   *The methods of Kaczmarz and iterative row orthogonalization for solution of linear equations in Hilbert space*, Indiana Univ. Math. J. 2 (l977), pp. 1137-1150.

8.   *A general mesh independence principle for Newton's method applied to second order boundary value problems*, Computing 23 (l979), pp. 223-246 (with E. Allgower and D. Pryor).

9.   *A revised mesh refinement strategy for numerical solution of two-point boundary value problems*, Numerical treatment of differential equations in applications (Proc. Meeting, Math. Res. Center, Oberwolfach, 1977), pp. 15-23, Lecture Notes in Math., 679, Springer, Berlin, 1978.

10.   *Evaluation of square root functions on microprocessors*, Procs. of ACM 76 (10/76) (with M. Andrews and G.D. Taylor).

11.   *A microprocessor-based control system for solar heated/cooled residential dwellings*, Procs. SIAM Joint Automatic Control Conf. (l977) (with G. Johnson, D. Pryor, and B. Eisenberg).

12.   *Evaluation of functions on microcomputers: square roots*, Comp. Math. Appl. 4 (l979), pp. 359-367 (with M. Andrews and G.D. Taylor).

13.   *Evaluation of functions on microcomputers: k-th roots*, Comp. Math. Appl. 5 (l979), pp. 163-167 (with M. Andrews and G.D. Taylor).

14.   *Evaluation of functions on microcomputers: exp(x)*, Comp. Math. Appl. 7 (l981), pp. 503-508 (joint with M. Andrews, D. Jaeger, and G. Taylor).

15.   *The microcomputer numerical software project at CSU*, Procs. 2nd Rocky Mountain Symp. Microcomputers, IEEE, l978 (with M. Andrews, D. Jaeger ,and G. Taylor).

16.   *Toward optimal control of solar energy systems*, Procs. 1978 IEEE Conf. Decision and Control (1/l9/79), San Diego.

17.   *Microprocessor control in solar heating and cooling*, Int'l. Survey in Applications of Microprocessors (l979), pp. 125-134, Infotech Int'l., Berkshire, England.

18.   *Numerical software for fixed point microcomputer applications*, report commissioned by ARO, Fall, l980 (with G.D. Taylor).

19.   *Evaluation of functions on microcomputers: ln x*, Comp. Math Appl. 8 (l982), pp. 389-392 (with G.D. Taylor and D.V. Pryor).

20.   *Simultaneous optimization of the Rayleigh quotient for Ax =λBx*, Lin. Alg. Appl. 34 (1980), pp. 195-234 (with D. Longsine).

21.   *A mesh refinement method for Ax = λBx*, Math Comp. 36 (l981), pp. 485-498.

22.   *An adaptive differential correction algorithm*, J. Approx. Theory 37 (1983), pp. 197-211 (with E. Kaufman and G.D. Taylor).

23.   *The sparse matrix eigenproblem*, report, Colo. State Univ., l975.

24.   *Multigrid methods: An alternate approach*, Lawrence Livermore Lab. report, l979.

25.   *An algebraic interpretation of multigrid methods*, SIAM J. Numer. Anal. 19 (l982), pp. 548-560.

26.   *Discrete correction methods for operator equations*, Procs. Conf. Numerical Solution of Nonlinear Equations: Simplicial and Classical Methods, Bremen, l980 (H.-O. Peitgen, ed.), Springer Lecture Notes in Mathematics, Vol. 878, l981 (with E. Allgower and K. Böhmer).

27.   *Multigrid methods for multiprocessor computers*, report, Lawrence Livermore Lab. report, l979 (with G. Rodrigue).

28.   *Mesh refinement methods for integral equations*, Numerical Treatment of Integral Equations (J. Albrecht and L. Gilatz, eds.), 183-90, Birkhauser Verlag, Berlin, l980.

29.   *Multigrid methods for differential eigenproblems*, SIAM J. Sci. Stat. Comp. 4 (l983), pp. 244-260 (with A. Brandt and J. Ruge).

30.   *Discrete corrections: Basic ideas*, Zeit. Ang. Math. Mech. 2 (l982), pp. 371-377 (with E. Allgower and K. Böhmer).

31.   *Numerical software for fixed point microprocessor applications and for fast implementation of multigrid techniques*, Procs. US Army Num. Anal. Comp. Conf., Feb., l981.

32.   *Multigrid methods for variational problems*, SIAM J. Numer. Anal. 19 (l982), pp. 924-929 (with J. Ruge).

33.   *Unigrid for multigrid simulation*, Math. Comp. 41 (l983), pp. 43-62 (with J. Ruge).

34.   *Unigrid methods for boundary value problems on nonrectangular domains*, J. Comp. Phys. 48 (l982), pp. 412-422 (with W. Holland and J. Ruge).

35.   *Multigrid methods applied to water wave problems*, Procs. 3rd Int'l. Conf. Ship Hydrodynamics, Paris, June 1981.

36.   *Multigrid methods for variational problems: the V-cycle*, Math Comp. Sim. XXV (l983), pp. 63-65, North Holland Pub. Co.

37.   *Uniform rational approximation on large data sets*, Int'l. J. Numer. Meth. Eng. (l982), pp. 1569-1575.

38.   *Multigrid methods for variational problems: further results*, SIAM J. Numer. Anal. 21 (l984), pp. 255-263.

39.   *Algebraic multigrid (AMG) for automatic multigrid solution with application to geodetic computations*, report, Inst. Comp. Studies, Colo. State Univ., l982 (with A. Brandt and J. Ruge).

40.   *Multigrid image reconstruction*, Procs. Workshop Multi-Resolution Image Processing and Anal., Leesburg, VA, July 1982 (A. Rosenfeld, ed.), Springer, l983 (with G. Herman, H. Levkowitz, and H. Tuy).

41.   *SOR, multigrid and preconditioned conjugate gradients for solving a diffusion problem on the CYBER 205*, Appl. Math. Comp. Spec. Issue on Multigrid Methods (S.

McCormick and U. Trottenberg, eds.) 13 (l983), pp. 285-310 (with J. Gary and R. Sweet).

42.   *Multigrid methods for variational problems: general theory for the V-cycle*, SIAM J. Numer. Anal. 22 (l985), pp. 634-643.

43.   *A variational theory for multilevel adaptive techniques (MLAT)*, Multigrid Methods for Integral and Differential Equations (D.J. Patton and H. Holstein, Eds.), JMAA Conf. Ser., New Ser., New 3 (l985), pp. 225-230, Clarendon Press.

44.   *Multigrid methods and adaptive techniques for oil reservoir simulation*, report, Inst. Comp. Studies, Colo. State Univ., 1983 (with J. Ruge, S. Schaffer, and J. Thomas).

45.   *Fast adaptive composite grid (FAC) methods: theory for the variational case*, in Defect Correction Methods: Theory and Applications (K. Böhmer and H.J. Stetter, eds.), Computations Supplementation 5 (l984), pp. 115-122.

46.   *Algebraic multigrid (AMG) for sparse matrix equations*, Sparsity and Its Applications (D.J. Evans, ed.), Cambridge Univ. Press, l984 (with A. Brandt and J. Ruge).

47.   *The fast adaptive composite grid method for solving differential boundary value problems*, Procs. 5th ASCE-EMD Specialty Conf., Aug., l984 (with R. Ewing and J. Thomas).

48.   *The fast adaptive composite grid method (FAC) for elliptic boundary value problems*, Math Comp. 46 (1986), pp. 439-456 (with J. Thomas).

49.   *An algebraic theory for multigrid methods for variational problems*, SIAM J. Numer. Anal. 25 (1988), pp. 91-110 (with J. Mandel and J. Ruge).

50.   *A multilevel variational method for Au = λBu on composite grids*, J. Comp. Phys. 80 (1989), pp. 442-450 (with J. Mandel).

51.   *The fast adaptive composite grid method (FAC): algorithms for advanced computers*, Appl. Math. Comp. Spec. Issue on Multigrid Methods, North Holland, 1985 (with L. Hart, A. O'Gallagher, J. Thomas).

52.   *The fast adaptive composite grid method in oil reservoir simulation*, Procs. SEG-SIAM-SPE Conf. Math. Comput. Meths. Seismic Expl. and Res. Mod., Houston, Jan., l985 (with J. Thomas).

53.   *Variational theory for multigrid methods*, Chapt. 5 in SIAM Frontiers in Applied Math., Vol. III on Multigrid Methods (S. McCormick, ed.), 1987 (with R. Bank and J. Mandel).

54.   *Fast adaptive methods and advanced architectures*, SUPRENUM Proj. Rep. No. 51, GMD, St. Augustin, W. Germany, 1985.

55.   *Introduction [to multigrid methods]*, Chapt. 1 in SIAM Frontiers in Applied Math, Vol. III on Multigrid Methods (S. McCormick, ed.), 1987 (with W. Briggs).

56.   *Algebraic multigrid methods applied to problems in computational structural mechanics*, A.M.D. State-of-the-Art Survey on Comp. Mech., Part 2, Chapt. 1, ASME, NY, 1989 (with J. Ruge).

57.   *Application of the fast adaptive composite grid method to computational fluid dynamics*, Procs. 5th Int. Conf. Numer. Meths. in Laminar and Turbulent Flow, Montreal, Canada, 1987 (with J. Thomas and A. Thomas).

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1981   J. Ruge, *Multigrid for eigenproblems, variational problems, and multigrid simulation*

1982   S. Schaffer, *Higher-order multigrid methods*

1989   C. Liu, *Multilevel adaptive methods in computational fluid dynamics*

1990   Z. Cai, *A theoretical foundation for the finite volume element method*

1993   Z. Liu, *Multilevel methods for flow transition*

1993   D. Quinlan, *Adaptive mesh refinement for distributed parallel architectures*

1995   J. Jones, *Multilevel methods for mixed finite element applications*

1996   B. Lee, *Multilevel methods for first-order system least squares*

1999   M. Berndt, *Parallel multilevel adaptive methods*

2001   A. Codd, *First-order system least squares (FOSLS) for elliptic grid generation (EGG)*

2001   T. Chartier, *Algebraic multigrid based on element interpolation (AMGe) and spectral AMGe*

2001   B. Philip, *Asynchronous fast adaptive composite grid methods for elliptic problems on adaptively-refined curvilinear grids*

2001   H. MacMillan, *First-order system least squares for electrical impedance tomography* (Co-advisor)

2003   L. Olson, *Least-squares methods for hyperbolic problems* (Co-advisor)

2004   S. MacLachlan, *Adaptive algebraic multigrid methods and homogenization*

2004   C. Westphal, *Least-squares methods for nonlinear elasticity* (Co-advisor)

2004   O. Röhrle, *Multilevel first-order system least squares for nonlinear PDEs*

2005   J. Brannick, *Adaptive algebraic multigrid methods*

2010   M. Park, *Relaxation-corrected bootstrap algebraic multigrid (rBAMG)*

RESEARCH INTERESTS

Multilevel methods, partial differential equations, integral equations, computational fluid dynamics, adaptive mesh refinement methods, iterative schemes in general, least squares problems, eigenvalue problems, image reconstruction, human organ simulation, math software, vector and parallel supercomputing, inverse problems, particle transport, structural analysis, plasma physics, combustion, and quantum chromdynamics.