

**CURRICULUM VITAE****Douglas N. Arnold**

School of Mathematics	phone: +1 612 626-9137
512 Vincent Hall, 206 Church St. SE	FAX: +1 612 626-2017
University of Minnesota	email: arnold@umn.edu
Minneapolis, MN 55442	URL: <a href="http://umn.edu/~arnold">http://umn.edu/~arnold</a>

**EMPLOYMENT**University of Minnesota, Twin Cities

McKnight Presidential Professor of Mathematics	2008–
Director, Institute for Mathematics and its Applications	2001–2008
Professor, School of Mathematics	2001–2008

Penn State University, University Park

Distinguished Professor, Department of Mathematics	1995–2002
Co-Director, Ctr. for Comp. Math. and Appl.	1997–2001
Assoc. Director, Inst. for High Perf. Comp. and Appl.	1996–2001
Professor	1989–1995
Acting Department Chair	1994–1995
Assoc. Chair for Computing	1991–1994

University of Maryland, College Park

Professor	Department of Mathematics	1989
Associate Professor	University of Maryland	1984–1989
Assistant Professor	University of Maryland	1979–1984

**EDUCATION**

Ph.D. in mathematics	University of Chicago	1979
M.S. in mathematics	University of Chicago	1976
B.A. in mathematics	Brown University	1975

**SELECTED HONORS**

Foreign member, Norwegian Academy of Science and Letters, elected 2009.

SIAM Fellow, appointed 2009.

AMS-MAA Invited Address, Joint Math Meetings, 2009.

McKnight Presidential Professor of Mathematics, University of Minnesota, 2008–

Guggenheim Fellow, 2008–2009.

President of the Society for Industrial and Applied Mathematics (SIAM), 2009–2010.

2007 Science and Engineering Visualization Challenge winner (National Science Foundation and Science journal), honorable mention with J. Rogness.

“Highly Cited Author” designation by Thomson/ISI, 2002.

Plenary lecturer, International Congress of Mathematicians, 2002.

Distinguished Service Award of the Penn State Eberly College of Science Alumni Society, 2000.

Teresa Cohen Service Award, Penn State Math Department, 1998.

George W. Atherton Award for Excellence in Teaching (Penn State's highest level of recognition for undergraduate education), 1996.

Distinguished Professor of Mathematics, Penn State University, 1995–2002.

First International Giovanni Sacchi Landriani Prize, awarded by the Academy of Sciences and Letters, Milan, Italy (Istituto Lombardo), 1991.

NATO Postdoctoral Research Fellow, 1982–1983.

### **EDITORIAL BOARD MEMBERSHIPS**

Editorial Board, Foundations of Computational Mathematics, 2007–

Editorial Board, Acta Numerica, 2007–

Advisory Board, Foundations of Computational Mathematics, 2006–2007

Editorial Board, Mathematical Modelling and Numerical Analysis, 2006–2008

Editorial Board, Mathematical Models and Methods in Applied Sciences (M3AS), 2002–

Editorial Board, Central European Journal of Mathematics, 2002–

Editor, Studies in Mathematics and its Applications (North-Holland book series), 2001–2007.

Series Editor, IMA Volumes in Mathematics and its Applications, 2001–2008.

Moderator for numerical analysis, arXiv preprint server, 2000–

Editorial Board, Numerische Mathematik, 1998–

Editorial Board, Calcolo, 1997–

Editor, Advances in Computational Mathematics, 1992–

Editorial Board, SIAM Journal on Numerical Analysis, 1990–2001

Editorial Board, Electronic Research Announcements of the AMS, 1995–2001

Editorial Board, Mathematical Modelling and Numerical Analysis, 1995–1999

Editorial Advisory Board, Computational Mechanics, 1990–1996

### **PROFESSIONAL ORGANIZATION MEMBERSHIPS**

American Association for the Advancement of Science

American Mathematical Society

Association for Women in Mathematics

Mathematical Association of America

Society for Industrial and Applied Mathematics

### **DISTINGUISHED AND KEYNOTE LECTURES**

Feng Kang Distinguished Lecture, Chinese Academy of Sciences, Beijing, 2009.

Maxwell Institute Colloquium, keynote address, Edinburgh, 2009.

AMS-MAA Invited Address, Joint Math Meetings, Washington, DC, 2009.

*Lectio Magistralis*, Politecnico di Torino, 2008.

East Asian SIAM Section Annual Meeting, keynote address, Daejeon, Korea, 2008.

Institute of Technology Alumni Society Public Lecture, University of Minnesota, 2008.

Distinguished Lecture Series, University of California – Irvine, 2008.

University of St. Thomas Public Lecture, 2008.

Mathematics in Science and Society Lecture, University of Illinois at Urbana–Champaign, 2008.

Frontiers of Scientific Computing Lecture, Louisiana State University, 2007.

Harold J. Gay Lecture, Worcester Polytechnic Institute, 2007.

Opening Colloquium, Hausdorff Center for Mathematics, Bonn, Germany, 2007.

Arvid T. Lonseth Lecture, Oregon State University, 2005.

William Marshall Bullitt Lecture, University of Louisville, 2005.

Keynote address, New York State Regional Graduate Mathematics Conference, 2005.

$ncm_2$  Distinguished Lecture, Network for Computing and Mathematical Modeling, Montreal, 2003.

Mathematical Sciences Convocation Speaker, University of Illinois Urbana Champaign, 2003.

Keynote address for the inauguration of the Applied Mathematics Program at University of Illinois Urbana Champaign, 2003.

Plenary lecture, International Congress of Mathematicians, Beijing 2002.

MAC 02: Lockheed Martin Mechanical Analysis Conference, keynote address, Moorestown, NJ, 2002.

Abdul K. Aziz Lecture, University of Maryland, 1999.

## PUBLICATIONS

- Finite element exterior calculus: from Hodge theory to numerical stability. To appear in *Bull. Amer. Math. Soc.*, 74 pages, 2010. With R. S. Falk and R. Winther.
- Geometric decompositions and local bases for spaces of finite element differential forms. *Comput. Methods Appl. Mech. Engrg.*, 198:1660–1672, 2009. DOI 10.1016/j.cma.2008.12.017. With R. S. Falk and R. Winther.
- Stability of Lagrange elements for the mixed Laplacian. *Calcolo*, 46:245–260, 2009. DOI 10.1007/s10092-009-0009-6. With M. Rognes.
- Finite elements for symmetric tensors in three dimensions. *Math. Comput.*, 77:1229–1251, 2008. DOI 10.1090/S0025-5718-08-02071-1. With G. Awanou and R. Winther.
- Is the public hungry for math? *Notices Amer. Math. Soc.*, 55:1069, 2008. Chinese translation in *Shu Xue Yi Lin*, 28(2):171–173, 2009.
- Möbius transformations revealed. *Notices Amer. Math. Soc.*, 55:1226–1231, 2008. Chinese translation in *Shu Xue Yi Lin*, 28(2):109–115, 2009. With J. Rognes.
- Boundary conditions for the Einstein-Christoffel formulation of Einstein’s equations. *Electron. J. Differential Equations*, Conf. 15:11–27, 2007. With N. Tarfulea.
- Finite element differential forms. *Proc. Appl. Math. Mech.*, 7:1021901–1021902, 2007. DOI 10.1002/pamm.200700549. With R. S. Falk and R. Winther.
- Locking-free Reissner–Mindlin elements without reduced integration. *Comput. Methods Appl. Mech. Engrg.*, 96:3660–3671, 2007. With F. Brezzi, R. S. Falk and D. Marini.
- Mixed finite element methods for linear elasticity with weakly imposed symmetry. *Math. Comput.*, 76:1699–1723, 2007. DOI 10.1090/S0025-5718-08-02071-1. With R. S. Falk and R. Winther.

- 
- Differential complexes and stability of finite element methods I: The de Rham complex. In ARNOLD, D., P. BOCHEV, R. LEHOUCQ, R. NICOLAIDES, and M. SHASKOV, editors, *Compatible Spatial Discretizations*, volume 142 of *The IMA Volumes in Mathematics and its Applications*, pages 23–46. Springer, Berlin, 2006. With R. S. Falk and R. Winther.
  - Differential complexes and stability of finite element methods II: The elasticity complex. In ARNOLD, D., P. BOCHEV, R. LEHOUCQ, R. NICOLAIDES, and M. SHASKOV, editors, *Compatible Spatial Discretizations*, volume 142 of *IMA Vol. Math. Appl.*, pages 47–68. Springer, Berlin, 2006. With R. S. Falk and R. Winther.
  - Finite element exterior calculus, homological techniques, and applications. *Acta Numer.*, 15:1–155, 2006. With R. S. Falk and R. Winther.
  - A family of discontinuous Galerkin finite elements for the Reissner–Mindlin plate. *J. Sci. Comput.*, 22/23:25–45, 2005. With F. Brezzi and L. D. Marini.
  - Quadrilateral  $H(\text{div})$  finite elements. *SIAM J. Numer. Anal.*, 42(6):2429–2451, 2005. With D. Boffi and R. S. Falk.
  - Rectangular mixed finite elements for elasticity. *Math. Models Methods Appl. Sci.*, 15(9):1417–1429, 2005. With G. Awanou.
  - Asymptotic estimates of hierarchical modeling. *Math. Models Methods Appl. Sci.*, 13(9):1325–1350, 2003. With A. L. Madureira.
  - Mixed finite elements for elasticity in the stress-displacement formulation. In CHEN, Z., R. GLOWINSKI, and K. LI, editors, *Current trends in scientific computing (Xi'an, 2002)*, volume 329 of *Contemp. Math.*, pages 33–42. Amer. Math. Soc., Providence, RI, 2003. With R. Winther.
  - New first-order formulation for the Einstein equations. *Phys. Rev. D (3)*, 68(6):064013, 6, 2003. With A. M. Alekseenko.
  - Nonconforming mixed elements for elasticity. *Math. Models Methods Appl. Sci.*, 13(3):295–307, 2003. With R. Winther.
  - Approximation by quadrilateral finite elements. *Math. Comp.*, 71(239):909–922, 2002. With D. Boffi and R. S. Falk.
  - Differential complexes and numerical stability. In TATSUEN, L., editor, *Proceedings of the International Congress of Mathematicians, Vol. I (Beijing, 2002)*, pages 137–157, Beijing, 2002. Higher Ed. Press. Spanish translation in *Gac. R. Soc. Mat. Esp.*, 8(2):335–360, 2005.
  - Mixed finite elements for elasticity. *Numer. Math.*, 92(3):401–419, 2002. With R. Winther.
  - On the range of applicability of the Reissner–Mindlin and Kirchhoff–Love plate bending models. *J. Elasticity*, 67(3):171–185 (2003), 2002. With A. L. Madureira and S. Zhang.
  - Remarks on quadrilateral Reissner–Mindlin plate elements. In MANG, H., F. RAMMERSTORFER, and J. EBERHARDSTEINER, editors, *WCCM V - Fifth World Congress on Computational Mechanics*, pages 137–157. Technical University of Vienna, 2002. With D. Boffi and R. S. Falk.
  - Unified analysis of discontinuous Galerkin methods for elliptic problems. *SIAM J. Numer. Anal.*, 39(5):1749–1779, 2002. With F. Brezzi, B. Cockburn and L. D. Marini.
  - Finite element approximation on quadrilateral meshes. *Comm. Numer. Methods Engrg.*, 17(11):805–812, 2001. With D. Boffi, R. S. Falk and L. Gastaldi.
  - Discontinuous Galerkin methods for elliptic problems. In COCKBURN, B., G. KARNIADAKIS, and C. SHU, editors, *Discontinuous Galerkin methods (Newport, RI, 1999)*, volume 11 of *Lect. Notes*

- 
- Comput. Sci. Eng.*, pages 89–101. Springer, Berlin, 2000. With F. Brezzi, B. Cockburn and D. Marini.
- Locally adapted tetrahedral meshes using bisection. *SIAM J. Sci. Comput.*, 22(2):431–448, 2000. With A. Mukherjee and L. Pouly.
  - Multigrid in  $H(\text{div})$  and  $H(\text{curl})$ . *Numer. Math.*, 85(2):197–217, 2000. With R. S. Falk and R. Winther.
  - Numerical problems in general relativity. In NEITTAANMÄKI, P., T. TIHONEN, and P. TARVAINEN, editors, *Numerical Mathematics and Advanced Applications*. World Scientific, 2000.
  - Derivation and justification of plate models by variational methods. In FORTIN, M., editor, *Plates and shells (Québec, QC, 1996)*, volume 21 of *CRM Proc. Lecture Notes*, pages 1–20. Amer. Math. Soc., Providence, RI, 1999. With S. M. Alessandrini, R. S. Falk and A. L. Madureira.
  - Tetrahedral bisection and adaptive finite elements. In BERN, M., J. FLAHERY, and M. LUSKIN, editors, *Grid generation and adaptive algorithms (Minneapolis, MN, 1997)*, volume 113 of *IMA Vol. Math. Appl.*, pages 29–42. Springer, New York, 1999. With A. Mukherjee.
  - Adaptive finite elements and colliding black holes. In GRIFFITHS, D., D. HIGHAM, and G. WATSON, editors, *Numerical analysis 1997 (Dundee)*, volume 380 of *Pitman Res. Notes Math. Ser.*, pages 1–15. Longman, Harlow, 1998. With A. Mukherjee and L. Pouly.
  - Multigrid preconditioning in  $H(\text{div})$  on non-convex polygons. *Comput. Appl. Math.*, 17(3):303–315, 1998. With R. S. Falk and R. Winther.
  - Analysis of a linear-linear finite element for the Reissner–Mindlin plate model. *Math. Models Methods Appl. Sci.*, 7(2):217–238, 1997. With R. S. Falk.
  - Computer-aided instruction. In *Encarta Encyclopedia*. Microsoft, 1997.
  - Dimensional reduction for plates based on mixed variational principles. In *Shells (Santiago de Compostela, 1997)*, volume 105 of *Cursos Congr. Univ. Santiago de Compostela*, pages 25–28. Univ. Santiago de Compostela, Santiago de Compostela, 1997. With S. M. Alessandrini, R. S. Falk and A. L. Madureira.
  - Interior estimates for a low order finite element method for the Reissner–Mindlin plate model. *Adv. Comput. Math.*, 7(3):337–360, 1997. With X. Liu.
  - Locking-free finite element methods for shells. *Math. Comp.*, 66(217):1–14, 1997. With F. Brezzi.
  - The partial selective reduced integration method and applications to shell problems. *Comput. Structures*, 64:879–880, 1997. With F. Brezzi.
  - Preconditioning discrete approximations of the Reissner–Mindlin plate model. *RAIRO Modél. Math. Anal. Numér.*, 31(4):517–557, 1997. With R. S. Falk and R. Winther.
  - Preconditioning in  $H(\text{div})$  and applications. *Math. Comp.*, 66(219):957–984, 1997. With R. S. Falk and R. Winther.
  - Asymptotic analysis of the boundary layer for the Reissner–Mindlin plate model. *SIAM J. Math. Anal.*, 27(2):486–514, 1996. With R. S. Falk.
  - Preconditioning discrete approximations of the Reissner–Mindlin plate model. In BJØRSTAD, P., M. ESPEDAL, and D. KEYES, editors, *Ninth International Conference on Domain Decomposition Methods*, pages 215–221. DDM.org, 1996. With R. S. Falk and R. Winther.

- 
- Preconditioning in  $h(\text{div})$  and applications. In BJØRSTAD, P., M. ESPEDAL, and D. KEYES, editors, *Ninth International Conference on Domain Decomposition Methods*, pages 12–19. DDM.org, 1996. With R. S. Falk and R. Winther.
  - Local error estimates for finite element discretizations of the Stokes equations. *RAIRO Modél. Math. Anal. Numér.*, 29(3):367–389, 1995. With X. B. Liu.
  - On nonconforming linear-constant elements for some variants of the Stokes equations. *Istit. Lombardo Accad. Sci. Lett. Rend. A*, 127(1):83–93 (1994), 1993.
  - Some new elements for the Reissner–Mindlin plate model. In BAIOCCHI, C. and J.-L. LIONS, editors, *Boundary value problems for partial differential equations and applications*, volume 29 of *RMA Res. Notes Appl. Math.*, pages 287–292. Masson, Paris, 1993. With F. Brezzi.
  - Quadratic velocity/linear pressure stokes elements. In VICHNEVETSKY, R., D. KNIGHT, and G. RICHTER, editors, *Advances in Computer Methods for Partial Differential Equations–VII*, pages 28–34. IMACS, 1992. With J. Qin.
  - Innovative finite element methods for plates. *Mat. Apl. Comput.*, 10(2):77–88, 1991.
  - The boundary layer for the Reissner–Mindlin plate model. *SIAM J. Math. Anal.*, 21(2):281–312, 1990. With R. S. Falk.
  - Mixed finite element methods for elliptic problems. *Comput. Methods Appl. Mech. Engrg.*, 82(1-3):281–300, 1990.
  - Coercivity of the single layer heat potential. *J. Comput. Math.*, 7(2):100–104, 1989. With P. J. Noon.
  - Edge effects in the reissner-mindlin plate theory. In NOOR, A., T. BELYTSCHKO, and J. SIMO, editors, *Analytical and Computational Models for Shells*, pages 71–90. American Society of Mechanical Engineers, 1989. With R. Falk.
  - A uniformly accurate finite element method for the Reissner–Mindlin plate. *SIAM J. Numer. Anal.*, 26(6):1276–1290, 1989. With R. S. Falk.
  - The delta-trigonometric method using the single-layer potential representation. *J. Integral Equations Appl.*, 1(4):517–547, 1988. With R. S.-C. Cheng.
  - A new mixed formulation for elasticity. *Numer. Math.*, 53(1-2):13–30, 1988. With R. S. Falk.
  - Regular inversion of the divergence operator with Dirichlet boundary conditions on a polygon. *Ann. Scuola Norm. Sup. Pisa Cl. Sci. (4)*, 15(2):169–192 (1989), 1988. With L. R. Scott and M. Vogelius.
  - Boundary integral equations of the first kind for the heat equation. In BREBBIA, C., W. WENDLAND, and G. KUHN, editors, *Boundary elements IX, Vol. 3 (Stuttgart, 1987)*, pages 213–229. Comput. Mech., Southampton, 1987. With P. J. Noon.
  - Well-posedness of the fundamental boundary value problems for constrained anisotropic elastic materials. *Arch. Rational Mech. Anal.*, 98(2):143–165, 1987. With R. S. Falk.
  - Continuous dependence on the elastic coefficients for a class of anisotropic materials. Technical Report 165, Institute for Mathematics & its Applications, 1985. With R. S. Falk.
  - The convergence of spline collocation for strongly elliptic equations on curves. *Numer. Math.*, 47(3):317–341, 1985. With W. L. Wendland.
  - Mixed and nonconforming finite element methods: implementation, postprocessing and error estimates. *RAIRO Modél. Math. Anal. Numér.*, 19(1):7–32, 1985. With F. Brezzi.

- 
- The effect of the test functions on the convergence of spline projection methods for singular integral equations. In GERASOULIS, A. and R. VICHNEVETSKY, editors, *Numerical Solution of Singular Integral Equations*, pages 1–4. IMACS, 1984.
  - A family of higher order mixed finite element methods for plane elasticity. *Numer. Math.*, 45(1):1–22, 1984. With J. Douglas, Jr. and C. P. Gupta.
  - Finite element methods: principles for their selection. *Comput. Methods Appl. Mech. Engrg.*, 45(1–3):57–96, 1984. With I. Babuška and J. Osborn.
  - A new mixed formulation for the numerical solution of elasticity problems. In VICHNEVETSKY, R. and R. STEPLEMAN, editors, *Advances in Computer Methods for Partial Differential Equations–V*, pages 353–356. IMACS, 1984.
  - On the asymptotic convergence of spline collocation methods for partial differential equations. *SIAM J. Numer. Anal.*, 21(3):459–472, 1984. With J. Saranen.
  - PEERS: a new mixed finite element for plane elasticity. *Japan J. Appl. Math.*, 1(2):347–367, 1984. With F. Brezzi and J. Douglas, Jr.
  - A stable finite element for the Stokes equations. *Calcolo*, 21(4):337–344 (1985), 1984. With F. Brezzi and M. Fortin.
  - On the asymptotic convergence of collocation methods. *Math. Comp.*, 41(164):349–381, 1983. With W. L. Wendland.
  - Selection of finite element methods. In ATLURI, S., R. GALLAGHER, and O. ZIENKIEWICZ, editors, *Hybrid and mixed finite element methods (Atlanta, Ga., 1981)*, Wiley-Intersci. Pub., pages 433–451. Wiley, New York, 1983. With I. Babuška and J. Osborn.
  - A spline-trigonometric Galerkin method and an exponentially convergent boundary integral method. *Math. Comp.*, 41(164):383–397, 1983.
  - Collocation versus Galerkin procedures for boundary integral methods. In BREBBIA, C., editor, *Boundary element methods in engineering (Southampton, 1982)*, pages 18–33. Springer, Berlin, 1982. With W. L. Wendland.
  - An interior penalty finite element method with discontinuous elements. *SIAM J. Numer. Anal.*, 19(4):742–760, 1982.
  - A superconvergent finite element method for the Korteweg-de Vries equation. *Math. Comp.*, 38(157):23–36, 1982. With R. Winther.
  - Discretization by finite elements of a model parameter dependent problem. *Numer. Math.*, 37(3):405–421, 1981.
  - Robustness of finite element methods for a model parameter dependent problem. In VICHNEVETSKY, R. and R. STEPLEMAN, editors, *Advances in Computer Methods for Partial Differential Equations–IV*, pages 18–22. IMACS, 1981.
  - Superconvergence of a finite element approximation to the solution of a Sobolev equation in a single space variable. *Math. Comp.*, 36(153):53–63, 1981. With J. Douglas, Jr. and V. Thomée.
  - Superconvergence of the Galerkin approximation of a quasilinear parabolic equation in a single space variable. *Calcolo*, 16(4):345–369, 1979. With J. Douglas, Jr.

### BOOK EDITED

D. N. Arnold, P. B. Bochev, R. B. Lehoucq, R. A. Nicolaides, and M. Shashkov, Editors, *Compatible Spatial Discretizations*, The IMA Volumes in Mathematics and its Applications, vol. 142, Springer-Verlag 2006.

### BOOK REVIEWS

L. B. Walhbin, *Superconvergence in Galerkin Finite Element Methods*, Springer-Verlag 1995. Reviewed in *Math. Comp.* 66 (1997).

P. G. Ciarlet, *Mathematical Elasticity, Volume 1: Three-Dimensional Elasticity*, North-Holland 1988. Reviewed in *Math. Comp.* 52 (1989), 715–716.

L. F. Shampine and M. K. Gordon, *Computer Solution of Ordinary Differential Equations*, Freeman 1975. Reviewed in *Math. Comp.* 37 (1981), 237–238.

### GRANTS AND CONTRACTS

Guggenheim Fellowship, September 2008–August 2009, \$42,000.

National Science Foundation grant DMS-0713568: Finite Element Exterior Calculus and Applications, July 1, 2007–June 30, 2011. Sole investigator. \$296,564

National Science Foundation grant DMS-0411388: Numerical Solution of Differential Equations and Applications, July 1, 2004–June 30, 2007. Sole investigator. \$124,111

2001–2008, principal investigator for numerous grants and contracts in support of the IMA from various funding sources including National Science Foundation, Army Research Office, Department of Energy, NSA, SIAM, and numerous corporations. Total amounts over \$20,000,000.

National Science Foundation grant DMS-0196549: Numerical Solution of Differential Equations and Applications, September 1, 2001–August 31, 2004. Sole investigator. \$180,000

National Science Foundation equipment grant: Acquisition of Virtual Reality and Visualization Facilities for Advanced Scientific and Engineering Computation, September 15, 1999 to June 15, 2002, one of five lead investigators. \$690,000

National Science Foundation IGMS grant 9972835: Numerical Methods in General Relativity, June 1, 1999 to May 1, 2000. Principal investigator (with Dean D. J. Larsen, co-PI). \$100,000

National Science Foundation VIGRE grant 9810759: A Vertically Integrated Program for Training in the Mathematical Sciences, one of four investigators, chair of the preparation committee, and chair of the implementation committee, awarded July 1, 1999 to June 30, 2004. \$2,286,472

National Science Foundation grant DMS-9870399: Numerical Solution of Differential Equations and Mechanics, July 15, 1998–June 30, 2001. Sole investigator. \$200,000

National Science Foundation equipment grant DMS-9512483: Acquisition of a multi-processor computing facility for nonlinear mathematical field problems. Awarded August 1995. Co-principal investigator.

National Science Foundation grant DMS-9500672: Numerical Solution of Differential Equations and Mechanics, July 1995–June 1998. Sole investigator. \$124,000

IBM equipment grant: Instruction and research facilities for high performance computing. Awarded June 1995.

National Science Foundation grant DMS-9301980: Seventh International Conference on Domain Decomposition in Scientific and Engineering Computing. June 1993–November 1994. One of three investigators. \$15,000

Supercomputer time grant from Pittsburgh Supercomputer Center, Numerical Computations of Stability Constants for Finite Element Methods for Incompressible Flow, awarded November 1992. Principal investigator.

Director of DEC Visualization Reference Center for PSU Math Department. Digital Equipment Corporation grant of computer equipment, software, and support personnel funding. Awarded September 1992.

National Science Foundation equipment grant DMS-9206985: Mathematical Sciences Computing Research Environments. July 1992–December 1994. Principal investigator (with 4 co-investigators). \$30,793

National Science Foundation grant DMS-9205300: Numerical Solution of Differential Equations and Mechanics, July 1992–August 1995. Principal investigator (with 1 co-investigator). \$255,000

National Science Foundation grant DMS-8913121: Differential Equations of Mechanics and their Numerical Solution, July 1989–December 1992. Sole investigator. \$163,370

Chairman of the organizing committee for Conference on Advances in Mathematical Modelling and Numerical Analysis, University of Chicago, September 1987, funded by National Science Foundation, Air Force Office of Scientific Research, and Office of Naval Research.

National Science Foundation grant INT-8716250: U.S.-France Cooperative Research: Numerical Solution of Partial Differential Equations in Engineering Problems, March 1988–February 1991. One of four investigators. \$17,410

National Science Foundation grant DMS-8601489: Differential Equations of Mechanics and their Numerical Solution, June 1986–November 1989. Sole investigator. \$108,000

National Bureau of Standards grant on Implementation and Convergence of Boundary Element Methods, January 1985–March 1987. Sole investigator.

National Science Foundation equipment grant: Mathematical Sciences Computing Research Environments. Awarded May 1986. Co-principal investigator.

National Science Foundation grant DMS-8313247: Boundary Element and Finite Element Methods for Partial Differential Equations, September 1983–February 1986. Sole investigator.

National Science Foundation equipment grant: Mathematical Sciences Computing Research Environments. Awarded May 1982. Co-principal investigator.

National Science Foundation grant: Numerical Solution of Differential Equations, faculty coinvestigator with J. Osborn, principal investigator, June 1981–June 1983.

University of Maryland General Research Board summer grant, 1980.

### **VISITING POSITIONS**

Centre of Mathematics for Applications (CMA), University of Oslo, Norway, 4 months, March–June 2009.

Istituto di Matematica Applicata e Tecnologie Informatiche (IMATI), Pavia, Italy, 2 months, September–October 2008.

Mittag-Leffler Institute, Stockholm, 1 month, May 1998.

ETH Zürich, 3 weeks, June 1997.

Institute for Mathematics and its Applications, Minneapolis, 1 year, September 1995–August 1996.

Heriot-Watt University, Edinburgh, Scotland, 6 weeks, July–August 1993.

Università di Pavia, Italy, 6 months, January–June 1993.

Institute for Mathematics and its Applications, Minneapolis, 1 year, September 1986–September 1987.

University of Chicago, 3 weeks, February 1986.

Institute for Mathematics and its Applications, Minneapolis, 2 months, May–July 1985.

Universität Freiburg, West Germany, 2 months, June–August 1983.

Università di Pavia, Italy, 5 months, January–June 1983.

Technische Hochschule Darmstadt, West Germany, 5 months, August 1982–January 1983.

**INVITED CONFERENCE PRESENTATIONS** (see also Distinguished Lectures, p. 2)

50<sup>th</sup> Anniversary of Numerische Mathematik, Munich, plenary lecture, June 2009.

8<sup>th</sup> MSU–UAB Conference on Differential Equations & Computational Simulations, Columbus, Mississippi, plenary lecture, May 2009.

International Conference on Partial Differential Equations and Applications, Hong Kong, plenary lecture, December 2008.

SIMAI National Congress, Rome, Italy, plenary lecture, September 2008.

A Maryland Mathematical Celebration, College Park, Maryland, plenary lecture, April 2008.

Modelling and Simulation 07, plenary lecture, Paris, December 2007.

US National Congress on Computational Mechanics, plenary lecture, San Francisco, July 2007.

US National Congress on Computational Mechanics, minisymposium lecture, San Francisco, July 2007.

International Congress of Industrial and Applied Mathematics, minisymposium lecture, Zurich, July 2007.

Biennial Conference on Numerical Analysis, University of Dundee, plenary lecture, Scotland, June 2007.

Mathematical Association of America Upper Penninsula Region Meeting, plenary lecture, November 2006.

American Mathematical Society Central Sectional Meeting, plenary lecture, University of Notre Dame, April 2006.

International Congress of Applications of Mathematics, Santiago, plenary lecture, Chile, March 2006.

Compatible Discretizations for PDE, Centre of Mathematics for Applications workshop, Oslo, Norway, September 2005.

Frontiers of Applied Analysis (Center for Nonlinear Analysis 15<sup>th</sup> anniversary conference), plenary lecture, Pittsburgh, PA, September 2005.

US National Congress of Computational Mechanics, minisymposium lecture, Austin, TX, July 2005.

Foundations of Computational Mathematics, plenary lecture, Santander, Spain, July 2005.

- Midwest Numerical Analysis Conference, plenary lecture, Iowa City, IA, May 2005.
- BIRS workshop on Numerical Relativity, Banff, Canada, April 2005.
- Association for Women in Mathematics luncheon speaker, SIAM Annual Meeting, Portland, OR, July 2004.
- SIAM Annual Meeting, minisymposium lecture, Portland, OR, July 2004.
- SIAM Great Lakes Section Annual Meeting, plenary lecture, Ann Arbor, MI, April 2004.
- Recent Advances and State-of-the-Art in Discontinuous Galerkin Methods in Computational Structural Mechanics, Army High Performance Computing Research Center, Minneapolis, MN, October 2003.
- United Kingdom and Republic of Ireland SIAM Annual Meeting, plenary lecture, Bath, England, January 2003.
- Joint NSF Division of Physical Sciences/Intelligence Community meeting on Activities for Combatting Terrorism: Opportunities for Basic Research, November 2002.
- International Conference on Nonlinear Partial Differential Equations—Theory and Approximation, Hong Kong, September 2002.
- Scientific Computing, Xi'an, China, August 2002.
- Foundations of Computational Mathematics, Semiplenary lecture, Minneapolis, August 2002.
- International Conference on Multifield Problems, Stuttgart, April 2002.
- Current and Future Trends in Numerical PDEs: Where is the field, and where is it going?, Austin, Texas, February 2002.
- International Symposium on Computational and Applied PDEs, Zhangjiajie, China, July 2001.
- Mixed Finite Element Methods, Oberwolfach, Germany, February 2001.
- Finite Element Analysis and Eigenvalue Problems, College Park, Maryland, September 2000.
- Workshop on Elastic Shells, MSRI, Berkeley, April 2000.
- ENUMATH, plenary lecture, Jyväskylä, Finland, July 1999.
- Special session on Finite Element Methods in Mechanics, SIAM Annual Meeting, Atlanta, May 1999.
- Special session on Multiscale Partial Differential Equations, SIAM Annual Meeting, Atlanta, May 1999.
- Numerical Modelling in Continuum Mechanics, Prague, Czech Republic, September 1997.
- International Conference on Shells, Santiago de Compostela, Spain, July 1997.
- Biennial Conference on Numerical Analysis, plenary lecture, University of Dundee, Scotland, June 1997.
- Special session on Numerical solutions of Differential Equations, A.M.S. meeting, College Park, MD, April 1997.
- Binary Black Hole Alliance Meeting, Penn State, April 1997.
- SIAM-SEAS Annual Meeting, plenary lecture, Raleigh, April 1997.
- Special session on Numerical solutions for Partial Differential Equations, A.M.S. meeting, Memphis, March 1997.

- Canadian Mathematical Society Summer Seminar on Plates and Shell: From Mathematical Models to Engineering Practice, Laval University, Quebec, July 1996.
- Engineering problems: Mathematical Formulation, Analysis, and Computational Treatment, University of Maryland, College Park, March 1996.
- SIAM Annual Meeting, Charlotte, NC, October 1995.
- International Congress on Industrial and Applied Mathematics, Hamburg, Germany, July 1995.
- Mathematics and its Applications to Physical Problems, University of Maryland, College Park, May 6, 1995.
- Midwest Numerical Analysis Day, University of Iowa, Iowa City, April 29, 1995.
- Mathematics of Finite Elements and Applications, Brunel University, Uxbridge, England, April 1993.
- American Association for the Advancement of Science, Boston, February 1993.
- Conference on Asymptotics and Adaptivity, Oberwolfach, February 1993.
- Society for Natural Philosophy, University Park, PA, October 1992.
- Seventh IMACS International Conference on Computer Methods for Partial Differential Equations, New Brunswick, NJ, June 1992.
- Three Rivers Applied Math Colloquium, Carnegie-Mellon University, April 1991.
- Gesellschaft für Angewandte Mathematik und Mechanik, opening plenary lecture, Hannover, April 1990.
- Workshop on Corneal Biophysics, National Eye Institute, Bethesda, February 1990.
- Symposium on Analytical and Computational Models for Shells, Winter meeting of the American Society of Mechanical Engineers, San Francisco, December 1989.
- Workshop on Innovative Finite Element Methods, Rio de Janeiro, November 1989.
- Workshop on the Reliability in Computational Mechanics, Austin, Texas, October 1989.
- Reliability of Finite Element Analysis Workshop, University of Maryland, College Park, April 1988.
- U.S.-China Seminar on Boundary Integral Equations and Boundary Finite Element Methods in Physics and Engineering, Xi'an, China, December 1987.
- Advances in Mathematical Modelling and Numerical Analysis, University of Chicago, September 1987.
- 9th International Conference on Boundary Elements, Universität Stuttgart, September 1987.
- Conference on Finite Element Methods, Oberwolfach, October 1986.
- The Impact of Mathematical Analysis on the Solution of Engineering Problems, University of Maryland, College Park, September 1986.
- IMACS Minisymposium on Cauchy Singular Integral Equations, Lehigh University, June 1984.
- Fifth IMACS International Symposium on Computer Methods for Partial Differential Equations, Lehigh University, June 1984.
- Fourth IMACS International Symposium on Computer Methods for Partial Differential Equations, Lehigh University, June 1981.
- Conference on Finite Elements, Oberwolfach, Germany, August 1980.
- Finite Element Workshop 1980, Laboratory for Numerical Analysis, University of Maryland, College Park, March 1980.
- Special session on Computational Fluid Mechanics, summer meeting of A.M.S., Duluth, August 1979.

**COLLOQUIA, SEMINARS, AND OTHER SCIENTIFIC TALKS**

Simula Research Laboratory, Oslo, May 2009.  
University of Oslo, Centre of Mathematics for Applications, May 2009.  
Fudan University, Shanghai, Math. Dept. Colloquium, April 2009.  
Chinese Academy of Sciences, ICMSEC Colloquium, Beijing, April 2009.  
Tsinghua University, Beijing, Math. Dept. Colloquium, April 2009.  
Stanford University, ICME Colloquium, February 2009.  
Politecnico di Milano, Italy, MOX Seminar, October 2008.  
University of Pavia, Italy, 9 hour lecture series, September–October, 2008.  
University of Colorado at Boulder, Appl. Math. Dept. Colloquium, September 2008.  
Purdue University, Math. Dept. Colloquium, February 2008.  
Harvard University, Brandeis–Harvard–MIT–Northeastern Joint Math. Colloquium, December 2007.  
University of Washington, Math. Dept. Colloquium, November 2007.  
Northern Illinois University, Math. Dept. Colloquium, April 2007.  
Georgia Tech, Math. Dept. Colloquium, March 2007.  
North Carolina State University, Math. Dept. Colloquium, March 2006.  
University of Oslo, Centre of Mathematics for Applications, February 2004.  
Oxford University, Mathematical Institute Colloquium, January 2004.  
University of Notre Dame, Math. Dept. Colloquium, November 2003.  
McGill University Computational Science and Engineering Seminar, October 2003.  
University of Houston, Math. Dept. Colloquium, March 2003.  
University of Pittsburgh, Math. Dept. Colloquium, February 2003.  
Kent State University, Math. Dept. Colloquium, February 2003.  
Caltech, Applied Math Colloquium, February 2003.  
Lawrence Livermore National Laboratory, Livermore, California, February 2003.  
Sandia National Laboratory, Livermore, California, February 2003.  
Penn State University, Math. Dept. Colloquium, October 2002.  
University of Wisconsin, Math. Dept. Colloquium, April 2002.  
University of Wisconsin, VIGRE Seminar, April 2002.  
IBM T. J. Watson Research Center, March 2002.  
University of Arizona, Math. Dept. Colloquium, February 2002.  
Sandia National Laboratory, Albuquerque, New Mexico, February 2002.  
Indiana University, Math. Dept. Colloquium, January 2002.  
University of Minnesota, Math. Dept. Colloquium, December 2001.  
Morningside Institute, Beijing, China, June 2001.  
Pacific Institute of Mathematics, Distinguished Lecture, May 2001.  
University of Delaware, Math. Dept. Colloquium, April 2001.  
University of Minnesota, Math. Dept. Colloquium, January 2001.  
Wayne State University, Math. Dept. Colloquium, November 2000.  
Penn State University, Applied and Computational Math Seminar, November 2000.  
Penn State University, Slow Pitch Seminar, November 2000.  
Penn State University, Center for Gravitational Physics and Geometry, October 2000.  
Penn State University Math Club, October 2000.  
Finite Element Circus: Rutgers University, October 2000.  
Penn State University, PDEs & Numerical Methods Seminar, series of 4 lectures, October 2000.  
Carnegie Mellon University, Math. Dept. Colloquium, September 2000.  
University of Rennes, France, Numerical Analysis Seminar, July 2000.  
Finite Element Circus: University of Texas, Austin, February 2000.

University of Maryland, College Park, Aziz Lecture, December 1999.  
University of Maryland, College Park, Special Applied Math Colloquium, December 1999.  
Finite Element Circus, Cornell University, October 1999.  
University of Texas, Austin, TICAM Colloquium, February 1999.  
Finite Element Circus, College Park, MD, November 1998.  
Penn State University, Slow Pitch Seminar, November 1998.  
Penn State University, PDEs & Numerical Methods Seminar, series of 4 lectures, September 1998.  
Mittag-Leffler Institute, Sweden, May 1998.  
Finite Element Circus, Denver, March 1998.  
Brown University, Applied Math Seminar, March 1998.  
Purdue University, Applied Math Seminar, January 1998.  
ETH Zurich, Seminar Angewandte Mathematik, June 1997.  
Penn State University, IHPCA seminar, January 1997.  
Rutgers University, Math. Dept. Colloquium, November 1996.  
Penn State University, MASS Colloquium, November 1996.  
Finite Element Circus, University of Tennessee, October 1996.  
Penn State University, Applied Math Seminar, October 1996.  
University of Minnesota, Numerical Analysis Seminar, July 1996.  
Caltech, Applied Math Colloquium, May 1996.  
University of Minnesota, Math. Dept. Colloquium, May 1996.  
University of Minnesota, Numerical Analysis Seminar, May 1996.  
Finite Element Circus, University of South Carolina, April 1996.  
Rutgers University, Numerical Analysis Seminar, April 1996.  
University of Minnesota, IMA Postdoc Seminar, March 1996.  
University of Minnesota, Numerical Analysis Seminar, March 1996.  
University of Colorado at Denver, February 1996.  
University of Colorado at Denver, February 1996.  
University of Minnesota, Aerospace Eng. Mech. Seminar, January 1996.  
Finite Element Circus, University of Maryland Baltimore County, October 1995.  
University of Chicago, May 1995.  
University of Maryland Baltimore County, March 1995.  
Penn State, University Park, February 1995.  
University of Texas at Austin, January 1995.  
University of Texas at Austin, January 1995.  
Finite Element Circus, Rutgers University, April 1994.  
University of Maryland, February 1994.  
University of Pittsburgh, January 1994.  
Finite Element Circus, Ithaca, NY, November 1993.  
Penn State, University Park, October 1993.  
Heriot-Watt University, Edinburgh, Scotland, August 1993.  
Istituto Lombardo, Milan, Italy, June 1993.  
Université Paris VI, France, June 1993.  
Université Rennes, France, June 1993.  
Universität Stuttgart, Germany, May 1993.  
Politecnico di Torino, Italy, May 1993.  
Politecnico di Milano, Italy, March 1993.  
Università di Pavia, Italy, March 1993.  
Finite Element Circus, Newark, DE, November 1992.

Università di Genova, Italy, March 1991.  
Università di Pavia, Italy, March 1991.  
Schlumberger Doll Research Labs, Ridgefield Conn., January 1991.  
Indiana University, November 1990.  
Carnegie Mellon University, March 1990.  
United States Naval Academy, April 1989.  
University of Maryland, March 1989.  
Purdue University, March 1989.  
Finite Element Circus, Penn State, October 1988.  
University of Delaware, October 1988.  
University of Maryland, October 1988.  
Penn State, University Park, September 1988.  
Istituto per le Applicazioni del Calcolo, Rome, June 1988.  
I.N.R.I.A., Paris, June 1988.  
Zhongshen University, Guangzhou, China, January 1988.  
Academia Sinica, Beijing, China, January 1988.  
Tsinghua University, Beijing, China, 2 lectures, January 1988.  
University of Tennessee, Knoxville, February 1987.  
Institute for Mathematics and its Applications, February 1987.  
Universität Heidelberg, January 1987.  
Università Cattolica di Brescia, January 1987.  
Università di Pavia, January 1987.  
Universität Stuttgart, W. Germany, October 1986.  
University of Maryland, College Park, May 1986.  
Purdue University, 2 lectures, April 1986.  
University of Chicago, February 1986.  
Finite Element Circus, Brookhaven National Laboratory, November 1985.  
Institute for Mathematics and its Applications, Minneapolis, July 1985.  
University of Maryland, College Park, February 1985.  
Finite Element Circus, College Park, November 1984.  
University of Waterloo, Canada, October 1984.  
Oregon State University, Corvallis, March 1984.  
University of Maryland, College Park, October 1983.  
Universität Freiburg, West Germany, 4 lectures, June-August 1983.  
Akademie der Wissenschaften, Berlin, East Germany, 2 lectures, June 1983.  
École Polytechnique, Lausanne, Switzerland, June 1983.  
Università di Pavia, Italy, May 1983.  
Università di Pisa, Italy, May 1983.  
Università di Roma, Italy, March 1983.  
I.N.R.I.A., Paris, France, March 1983.  
École Polytechnique, Paris, France, March 1983.  
Università di Pavia, Italy, February 1983.  
Universität Bonn, West Germany, December 1982.  
Universität Erlangen-Nuremberg, West Germany, November 1982.  
Universität Göttingen, West Germany, November 1982.  
Technische Hochschule Darmstadt, West Germany, November 1982.  
University of Oslo, Norway, November 1982.  
Chalmers Institute of Technology, Göteborg, Sweden, October 1982.

Oregon State University, Corvallis, 2 lectures, June 1982.  
University of Maryland, College Park, May 1982.  
Finite Element Circus, University Park, PA, April 1982.  
Rice University, January 1982.  
Finite Element Circus, Austin, TX, October 1981.  
Courant Institute of Mathematical Sciences, October 1981.  
University of Chicago, August 1981.  
University of Delaware, Newark, May 1981.  
Finite Element Circus, College Park, MD, February 1981.  
Finite Element Circus, New Brunswick, NJ, November 1980.  
Finite Element Circus, Ann Arbor, April 1980.  
Finite Element Circus, Ithaca, NY, November 1979.  
Finite Element Circus, College Park, MD, May 1979.

### SELECTED EDUCATIONAL ACTIVITIES

Keynote lecture for American Mathematical Society's high school math competition *Who Wants To Be A Mathematician?*, entitled "Start Seeing Mathematics!", October 23, 2007.

Lead organizer of *Math is Cool! / Who Wants to be a Mathematician?* program for about 100 high school students from under-represented groups, November 3, 2006.

Coproduced the award-winning video *Möbius Transformations Revealed* which has been viewed over 1.5 million times on YouTube and falls among the Most Viewed, Most Favorited, Most Discussed, and Most Rated of all time in the Education category.

Wrote and maintain extensive web pages in various areas of mathematics instruction. My *Graphics for the Calculus Classroom* webspace has received over 1 million hits and won a dozen Web awards, and is listed as one of the 60 most linked English language web pages in mathematics and statistics (by MathSearch, University of Sydney). *Graphics for Complex Analysis* has received about 175,000 hits and several Web awards.

Authored article on Computer-Assisted Instruction for Encarta '97 Encyclopedia.

### DOCTORAL STUDENTS SUPERVISED

Nicolae Tarfulea 2004; Sheng Zhang 2001; Alexandre Madureira 1999; Arup Mukherjee 1996; Changyi Chen 1995; Jason Qin 1994; Xiaobo Liu 1993; Patrick Noon 1988; Raymond Cheng 1987.

### SELECTED SERVICE ACTIVITIES

President, Society for Industrial and Applied Mathematics, 2009-2010 (President-elect 2008, Past President 2011).

International Council on Industrial and Applied Mathematics (ICIAM), 2009–2010.

AAAS Section on Mathematics Electorate Nominating Committee, 2009–2012.

Director, Institute for Mathematics and its Applications, 2001–2008.

U.S. National Committee for Mathematics, 2007–2010.

Advisory Board, Maxwell Institute for the Mathematical Sciences, Scotland, 2006–

SIAM Diversity Advisory committee, 2008–2010.

Scientific Advisory Board, Centre of Mathematics for Applications, Norway, 2003–

American Mathematical Society liaison committee to the AAAS, 2000-2002, 2007-2009.

International Advisory Committee for formation of the Spanish Institute of Mathematics (IEMath), 2007.

External Review Committee for School of Mathematics, Georgia Tech, 2007.

UMN Supercomputing Institute Task Force on Initiatives in High-Performance Computing, 2006–2008.

Lead organizer, Blackwell–Tapia Conference, November 3–4, 2007.

Mathematical and Physical Sciences Advisory Committee, National Science Foundation, 2005–2008.

Block Community Lecturer selection committee, Society of Industrial and Applied Mathematics, 2005–2008.

Advisory committee for Mathematics Awareness Month 2005.

Search committee for Dean of the Institute of Technology, University of Minnesota, 2004.

Member-at-Large of the Council, Society of Industrial and Applied Mathematics, 2004–2007. Council Delegate to the Board of Trustees.

Major Awards Committee, Society of Industrial and Applied Mathematics, 2004–2008.

DIMACS Advisory Board, 2004–2008.

MRSEC Internal Advisory Committee, University of Minnesota, 2004–

Co-organizer of IMA workshop on Compatible Discretization Methods for PDE, May 11–14, 2004.

Program Committee of the International Congress of Mathematicians, 2003–2006.

External review committee, Kavli Institute of Theoretical Physics, 2003.

Advisory Board for TAMU STEPS (NSF-funded Science, Technology, Engineering and Mathematics Talent Expansion Program), Texas A&M University, 2003–2008.

Scientific Advisory Board, Banff International Research Station, Canada, 2002–2005.

Co-coordinator, International Mathematical Science Institutes consortium, 2002–2006

Co-organizer of IMA workshop on Numerical Relativity, June 24-29, 2002.

Board of Governors, Institute for Mathematics and its Applications, 1999–2001.

Selection committee for the Birkhoff Prize, SIAM and AMS, 2002.

SIAM Committee on Science Policy, 2001–

Selection Committee for Ralph Kleinman Prize, SIAM, 2001, 2002.

Organizer of program on Elastic Shells, the Mathematical Sciences Research Institute, 2000.

External advisory panel, University of Puerto Rico and Puerto Rico Board of Higher Education, 2000.

IMA Board of Governors, 1999–2001.

Co-organizer of the twice-yearly “Finite Element Circus” 1995–2003.

National Advisory Board, CAS Intensive Mathematics Project, 1997–1999.

Interim Head, Penn State Math Department, 1995. (Established the Chowla Research Assistant Professorship Program and made three permanent faculty appointments.)

Selection Committee for SIAM Student Paper Competition, Chair 1994.