

Curriculum Vitae Bruno D. Welfert

School of Mathematical & Statistical Sciences
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Professional preparation

- 1985 Engineering degree (Aerospace), Ecole Centrale des Arts et Manufactures, Paris, France
Thesis title: Solution of transsonic flow equations with and without entropy correction
via domain decomposition and finite element techniques
Thesis advisor: Sébastien Candel
- 1985 M.Sc. (Numerical Analysis), Université Pierre et Marie Curie, Paris VI, France
- 1990 Ph.D. (Mathematics), University of California, San Diego
Thesis title: A posteriori error estimates and adaptive solution of fluid flow problems
Thesis advisor: Randolph E. Bank

Professional employment

- 1996-present Associate Professor
School of Mathematical and Statistical Sciences, Arizona State University
- 2006-2009 Associate Director, Undergraduate Programs
School of Mathematical and Statistical Sciences, Arizona State University
- July 2004 Visiting Professor
Department of Mathematics, University of Trieste, Italy
- 1996-1997 Visiting Professor
Department of Mathematics and Computer Science, Leiden University, The Netherlands
- Summer 1996 Visiting Professor
Department of Mathematical Sciences, NTNU, Trondheim, Norway
- 1990-1996 Assistant Professor
School of Mathematical and Statistical Sciences, Arizona State University
- Summer 1990 Research Engineer
Dassault Aviation, St Cloud, France
- Summer 1984 Internship (Fließbandarbeiter)
Deutsche Bundesbahn, Diesellokomotiv Ausbesserungswerk Bremen, Germany

Affiliations

- 2010-present Sustainable Engineering and the Built Environment
Ira A. Fulton School of Engineering, ASU
- 2008-present Honors faculty
Barrett, The Honors College, ASU
- 2005-present Sensor Signal and Information Processing (SenSIP) Center
Ira A. Fulton School of Engineering, ASU

Editorial positions

- 2016-present Editorial board, *Opuscula Mathematica*
- 2018-present Editorial board, *Proceedings of the Royal Society A*

Research publications (student authors are starred)

2019

1. LIU, R. AND WELFERT, B. D., Reduced Model of One-Dimensional Unsaturated Flow in Heterogeneous Soils with Spatially Stochastic Soil Hydraulic Conductivities, *International Journal of Geomechanics* (2019), accepted

2. YALIM*, J., WELFERT, B. D. AND LOPEZ, J. M., Parametrically forced stably stratified cavity flow: complicated nonlinear dynamics near the onset of instability, *Journal of Fluid Mechanics*, **871** (2019) 1067–1096

2018

3. WU*, K., WELFERT, B. D AND LOPEZ, J. M., Complex dynamics in a stratified lid-driven square cavity flow, *Journal of Fluid Mechanics*, **855** (2018) 43–66
4. STEELE*, A., YALIM*, J. AND WELFERT, B., QX factorization of centrosymmetric matrices, *Applied Numerical Mathematics* **134** (2018) 11–16
5. YALIM*, J., LOPEZ, J. M. AND WELFERT, B. D., Vertically forced stably stratified cavity flow: instabilities of the basic state, *Journal of Fluid Mechanics* **851** (2018) R6
6. WU*, K., WELFERT, B. D. AND LOPEZ, J. M, Librational forcing of a rapidly rotating fluid-filled cube, *Journal of Fluid Mechanics* **842** (2018) 469–494

2017

7. YALIM*, J., WELFERT, B. D., AND LOPEZ, J. M., Evaluation of closure strategies for a periodically-forced Duffing oscillator with slowly modulated frequency subject to Gaussian white noise, *Communications in Nonlinear Science and Numerical Simulation* **44** (2017) 144–158
8. LIU*, R., WELFERT, B. AND HOUSTON, S., Numerical issues arising in determination of interlayer conductivities in layered unsaturated soils, *International Journal of Geomechanics* **17:3** (2017)
9. BRASĆ*, M., CARDONE, A., JACKIEWICZ, Z. AND WELFERT, B., Order reduction phenomenon for general linear methods, *Applied Numerical Mathematics* **119** (2017) 94–114
10. LOPEZ, J. M., WELFERT, B. D., WU*, K. AND YALIM*, J., Transition to complex dynamics in the cubic lid-driven cavity, *Physical Review Fluids* **2** (2017) 074401

2016

11. LIU*, R., WELFERT, B. AND HOUSTON, S., Comparison of Averaging Methods for Interface Conductivities in one-dimensional Unsaturated Flow in Layered Soils, VIIIth International Symposium on Stratified Flows, 8/29-9/1 2016, San Diego CA
12. HOUSTON, S., BHARADWAJ*, A., WELFERT, B., HOUSTON, W. AND WALSH, K. D., Unsaturated Soil Mechanics Principles to Remove and Replace Mitigation for Expansive Clays, *Journal of Geotechnical and Geoenvironmental Engineering* **142:4** (2016) 04015102

2015

13. CARDONE, A., JACKIEWICZ, Z., VERNER, J. H. AND WELFERT, B., Order conditions for general linear methods, *Journal of Computational and Applied Mathematics* **290** (2015) 44–64

2013

14. KUNA*, B. R., WALSH, K. D., HOUSTON, S. L., ZAPATA, C. AND WELFERT, B., Full scale test of periodic irrigation infiltration in a cracked and intact clay slope, *Geotechnical Special Publication* **231** (2013) 828–837
15. RAHMAN, M AND WELFERT, B., Functional central limit theorem for Markov processes and chains, *Journal of Probability and Statistical Science* **11:2** (2013) 111–127

2011

16. DYE*, H. B., HOUSTON, S. L. AND WELFERT, B. D., Influence of Unsaturated Soil Properties Uncertainty on Moisture Flow Modeling, *Geotechnical and Geological Engineering* **29** (2011) 161–169

2010

17. WELFERT, B., The weights of classical Gauss-Radau quadratures with double end-point, *Applied Numerical Mathematics* **60** (2010) 574–586
18. WELFERT, B., A note on classical Gauss-Radau and Gauss-Lobatto quadratures, *Applied Numerical Mathematics* **60** (2010) 637–644

2000s

19. IN 'T HOUT, K. J. AND WELFERT, B. D., Unconditional stability of second-order ADI schemes applied to multi-dimensional diffusion equations with mixed derivative terms, *Applied Numerical Mathematics* **59** (2009) 677–692
20. BURRAGE, K., JACKIEWICZ, Z. AND WELFERT, B. D., Spectral Approximation of time windows in the solution of dissipative linear differential equations, *Journal of Numerical Analysis, Industrial and Applied Mathematics* **4** (2009) 41–64
21. JACKIEWICZ, Z., RAHMAN*, M. AND WELFERT, B. D., Numerical solution of a Fredholm integro-differential equation modelling θ -neural networks, *Applied Mathematics and Computations* **195:2** (2008) 523–536
22. WELFERT, B., On quadrature formulae based on derivative collocation, *Applied Mathematics and Computation* **204** (2008) 647–657
23. JACKIEWICZ, Z., RAHMAN*, M. AND WELFERT, B. D., Stochastic approximations of perturbed Fredholm Volterra integro-differential equation arising in mathematical neurosciences, *Applied Mathematics and Computation* **186:2** (2007) 1173–1182
24. IN 'T HOUT, K. J. AND WELFERT, B. D., Stability of ADI schemes applied to convection–diffusion equations with mixed derivative terms, *Applied Numerical Mathematics* **57** (2007) 19–35
25. WELFERT, B., Analysis of Iterated ADI-FDTD Schemes for Maxwell Curl Equations, *Journal of Computational Physics* **222** (2007) 9–27
26. JACKIEWICZ, Z., RAHMAN*, M. AND WELFERT, B. D., Numerical solution of a Fredholm integro-differential equation modelling neural networks, *Applied Numerical Mathematics* **56** (2006) 423–432
27. KOJOUHAROV, H. V. AND WELFERT, B. D., Generalized Nonstandard Numerical Methods for Non-linear Advection-Diffusion-Reaction Equations, *Lecture Notes in Computer Science 2907, Large-Scale Scientific Computing*, Springer–Verlag, Berlin Heidelberg (Lirkov et al., Eds., 2004) 465–472
28. JACKIEWICZ, Z., WELFERT, B. D. AND ZUBIK-KOWAL, B., Spectral vs. pseudospectral solutions of the wave equation by relaxation methods, *Journal of Scientific Computing* **20:1** (2004) 1–28
29. KOJOUHAROV, H. AND WELFERT, B., A nonstandard Euler scheme for $y'' + g(y)y' + f(y)y = 0$, *Journal of Computational & Applied Mathematics* **151:2** (2003) 335–353
30. SPIJKER, M. N., TRACOGNA, S. AND WELFERT, B., About the Sharpness of the Stability Estimates in the Kreiss Matrix Theorem, *Mathematics of Computation* **72** (2003) 697–713
31. KITSIOS*, K., SPANIAS, A. AND WELFERT, B., Adaptive modified covariance algorithms for spectral analysis, *Signal Processing* **82** (2002) 715–720
32. GELB, A., JACKIEWICZ, Z. AND WELFERT, B., Absorbing boundary conditions of the second order for the pseudospectral Chebyshev methods for wave propagation, *Journal of Scientific Computing* **17:1-4** (2002) 501–512
33. JACKIEWICZ, Z. AND WELFERT, B., Stability of Gauss-Radau pseudospectral approximations of the one-dimensional wave equation, *Journal of Scientific Computing* **18:2** (2002) 287–313

34. MEAD, J. L., RENAULT, R. A. AND WELFERT, B. D., Stability of a Pivoting Strategy for Gaussian Elimination in Parallel, *BIT* **41**:3 (2001) 633–639
35. BURRAGE, K., HERTONO, G., JACKIEWICZ, Z. AND WELFERT, B. D., Acceleration of convergence of static and dynamic iterations, *BIT* **41**:4 (2001) 645–655
36. KOJOUHAROV, H. V. AND WELFERT, B. D., A New Numerical Approach for the Solution of Scalar Nonlinear Advection-Reaction Equations, *Int. Journal of Applied Science & Computations* **8**:2 (2001) 119–126
37. OWREN, B. AND WELFERT, B., The Newton Iteration on Lie Groups, *BIT* **40**:1 (2000) 121–145
38. TRACOGNA, S. AND WELFERT, B., Two-Step Runge-Kutta Methods: Theory and Practice, *BIT* **40**:4 (2000) 775–799

1990s

39. BURRAGE, K., JACKIEWICZ, Z. AND WELFERT, B., Block Toeplitz Preconditioning for Static and Dynamic Linear Systems, *Linear Algebra and its Applications* **279** (1998) 51–74
40. JACKIEWICZ, Z., OWREN, B. AND WELFERT, B., Pseudospectra of waveform relaxation operators, *Computers & Mathematics with Applications* **36**:8 (1998) 67–85
41. WELFERT, B., Generation of Pseudospectral Differentiation Matrices, I., *SIAM Journal on Numerical Analysis* **34** (1997) 1640–1657
42. VICTORY*, J. J., SANCHEZ, J. J. , DEMASSA, T. A., WELFERT, B. D., A Static Physical VDMOS model based on the Charge-Sheet Model, *IEEE Transactions on Electron Devices*, **43**:1 (1996) 157–164
43. JONES, J. AND WELFERT, B., Zero-free Regions for a Rational Function with Applications, *Advances in Computational Mathematics* **3** (1995) 265–289
44. DEMASSA, T., SANCHEZ, J., VICTORY, J. AND WELFERT, B., Applications of the MOS Charge-Sheet Model to Non-Uniform Doping Along the Channel, *Solid State Electronics* **38**:8 (1995) 1497–1503
45. WELFERT, B., On the Eigenvalues of Second-Order Pseudospectral Differentiation Operators, *Computer Methods in Applied Mechanics and Engineering* **116** (1994) 281–292
46. BANK, R. E. AND WELFERT, B., A Posteriori Error Estimates for the Stokes Problem, *SIAM Journal on Numerical Analysis* **28** (1991) 591–623
47. BANK, R. E. WELFERT, B. AND YSERENTANT, H., A Class of Iterative Methods for Solving Saddle Point Problems, *Numerische Mathematik* **56** (1990) 645–666
48. BANK, R. E. AND WELFERT, B., A Posteriori Error Estimates for the Stokes Problem: a Comparison, *Computer Methods in Applied Mechanics and Engineering* **82** (1990) 323–340
49. BANK, R. E. AND WELFERT, B., A Comparison between the Mini-Element and the Petrov-Galerkin Formulations for the Generalized Stokes Problem, *Computer Methods in Applied Mechanics and Engineering* **83** (1990) 61–68

Submitted research work

1. WU*, K., WELFERT, B. D AND LOPEZ, J. M., Precessing cube: resonant excitation of modes and triadic resonance, *Journal of Fluid Mechanics* (Aug. 2019), submitted (19 pages)
2. GRAYER**, H., YALIM*, J., WELFERT, B. AND LOPEZ, J., Dynamics in a stably stratified tilted square cavity *Journal of Fluid Mechanics* (Jun. 2019), submitted (19 pages)
3. YALIM*, J., WELFERT, B. D. AND LOPEZ, J. M., Modal reduction of a parametrically forced confined viscous flow, *Physical Review Fluids* (Jan. 2019), submitted (16 pages)

Conference proceedings

1. YALIM*, J., WELFERT, B. AND LOPEZ, J., Linear model of infinite dimensional viscous Mathieu system (Nov. 2018), Bulletin of the American Physical Society, 71th Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, Georgia.
2. YALIM*, J., WELFERT, B. AND LOPEZ, J., Complex dynamics of the vertical oscillating and stably stratified square cavity (Nov. 2018), Bulletin of the American Physical Society, 71th Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, Georgia.
3. WU*, K., WELFERT, B. AND LOPEZ, J., The dynamics of a rotating cubic cavity flow under libration (Nov. 2018), Bulletin of the American Physical Society, 71th Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, Georgia.
4. YALIM*, J., WELFERT, B. AND LOPEZ, J., Linear model of infinite dimensional viscous Mathieu system (Nov. 2018), Bulletin of the American Physical Society, 71th Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, Georgia.
5. YALIM*, J, LOPEZ, J. AND WELFERT, B., Video: Resonant collapse in a harmonically forced stratified cavity (Nov. 2017), APS Meeting Abstracts, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, Colorado.
6. YALIM*, J., WELFERT, B., LOPEZ, J. AND WU*, K., Fluid flow in a vertically oscillating, stably stratified cubic cavity (Nov. 2017) APS Meeting Abstracts, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, Colorado.
7. WELFERT, B., WU*, K. AND LOPEZ, J., Detailed study of fluid flow in a stably stratified square lid-driven cavity (Nov. 2017) APS Meeting Abstracts, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, Colorado.
8. YALIM*, J., WELFERT, B., LOPEZ, J. AND TAYLOR*, S., Harmonic Forcing on the Stratified Square Lid Driven Cavity (Nov. 2016) APS Meeting Abstracts, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, Oregon.
9. WU*, K., LOPEZ, J., WELFERT, B. AND YALIM*, J., Transition to complex dynamics in the cubic lid-driven cavity (Nov. 2016) APS Meeting Abstracts, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, Oregon.
10. LIU*, R., WELFERT, B. AND HOUSTON, S., Comparison of averaging methods for interface conductivities in one-dimensional unsaturated flow in layered soils (Aug.-Sept. 2016), VIIIth Symposium on Stratified Flows, San Diego, California.
11. YALIM*, J., WELFERT, B. AND LOPEZ, J., Reduction of Stochastic Duffing Equation with Frequency Drift (Oct. 2015) Annual Meeting of the APS Four Corners Section, Tempe, Arizona, <http://meetings.aps.org/link/BAPS.2015.4CF.D9.3>
12. WELFERT, B., LOPEZ, J. AND TAYLOR*, S., 2D stratified cavity flow under harmonic forcing (Nov. 2014) APS Meeting Abstracts, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, California.
13. HOUSTON, S. AND WELFERT, B., Experiences with unsaturated flow modeling and unsaturated flow property determination for expansive clays (Jul. 2014) 6th International Conference on Unsaturated Soils, UNSAT 2014, Sydney, Australia
14. KUNA*, B. R., WALSH, K. D., HOUSTON, S. L., ZAPATA, C. AND WELFERT, B., Full Scale Test of Periodic Irrigation Infiltration in a Cracked and Intact Clay Slope, Proceedings GeoCongress 2013, <https://doi.org/10.1061/9780784412787.084>
15. BHARADWAJ*, A., HOUSTON, S. L., HOUSTON, W. N., WELFERT, B. AND WALSH, K. D., Effect of soil replacement option on surface deflections for expansive clay profiles, Advances in Unsaturated Soils - Proceedings of the 1st Pan-American Conference on Unsaturated Soils, PanAmUNSAT 2013, 551–556

16. ABBASZADEH*, M., HOUSTON, S., ZAPATA, C., HOUSTON, W., WELFERT, B. AND WALSH, K., Laboratory determination of soil-water characteristic curves for cracked soil (Sep. 2010), 5th International Conference on Unsaturated Soils, Barcelona, Spain.
17. KOJOUHAROV, H. AND WELFERT, B., A new numerical approach for the solution of advection-reaction equations, Proceedings International Conf. on Scientific Computing and Mathematical Modeling (D. Shultz, B. Wade, J. Vigo-Aguiar, and S.K. Dey, Eds.), Institute of Applied Science and Computations, Milwaukee, Wisconsin (2000) 124–127
18. KITSIOS*, K., SPANIAS, A., WELFERT, B. AND LOIZOU, P., An adaptive modified covariance algorithm for spectral analysis, Statistical Signal and Array Processing, 1996. Proceedings (1996) 56–59
19. K. Kitsios*, A. Spanias and B. Welfert, Optimum Block Modified Covariance Algorithm for Spectral Analysis, 3rd Mediterranean Symposium on New Directions in Control and Automation, Limassol (1995) 398–405
20. VICTORY*, J., MILLER, I., SANCHEZ, J., DEMASSA, T. AND WELFERT, B., A New Physical Power MOSFET Model for Improved Simulation in power electronic design, Power Electronics in Transportation, Proceedings (1994) 83–90

Awarded research grants

1. High Order Reconstruction Using Spectral Methods (PI: Anne Gelb, 25% co-PI), National Science Foundation DMS 0510813, 2005-2008, \$226,547.
2. Stochastic Parametric Forcing in Hydrodynamics (PI: John Lopez, 50% co-PI), National Science Foundation DMS 0505489, 2005-2008, \$294,390.
3. Computing with Uncertainty: Effects of Noise on Flow Instability and Transition to Turbulence (PI), DOD Air Force Office of Scientific Research, 2007, \$36,471.
4. Collaborative Research: Surface Flux for Cracked and Intact Clays for Poned and Sloped Conditions, 2008, (PI: Sandra Houston, 33% co-PI), National Science Foundation, CMMI 0825089, 2008-2011, \$224,500.

Declined research proposals

1. Stochastic closure strategies for periodically forced flows, 2016, National Science Foundation, DMS 1614701, \$297,369
2. Development of Adapted Wavelet-Based Signal Analysis and Classification Methods for Biothreat Agent Detection, 2012, National Science Foundation, DMS 1222720, \$644,886
3. Wavelet-Based Signal Analysis and Classification for Nanopore Sensors, 2011, National Science Foundation, DMS 1120605, \$550,056
4. A Novel Approach to Local Absorbing Boundary Conditions: Preconditioning and Acceleration Strategies, 2011, National Science Foundation, DMS 1114968, \$294,085
5. Collaborative Proposal: Coupled Flow/Deformation Analyses for Effective Depth of Wetting for Mitigation of Moisture Sensitive Soils, 2010, National Science Foundation, CMMI 1000945, \$280,000
6. Collaborative Research: Effective Depth of Wetting as Related to Mitigation of Collapsible and Expansive Soil Geo-Hazards to Infrastructure, 2009, National Science Foundation, CMMI 0928052, \$260,000
7. International Workshop on General Linear Methods for Differential Equations, 2006, National Science Foundation, DMS 0620639, \$23,000
8. High Order Reconstruction Using Spectral Methods, 2005, National Science Foundation, DMS 0510813, \$522,803

9. Hydrodynamics with stochastic parametric forcing, 2004, National Science Foundation, DMS 0410588, \$297,079
10. Implementation and Stability Analysis of Absorbing Boundary Conditions for Wave Propagation Problems, 2004 National Science Foundation, DMS 0410580, \$402,737
11. Waveform Relaxation Methods for Large Differential Systems, 2003, National Science Foundation, DMS 0309980, \$229,273
12. Collaborative Research: A New Numerical Approach for the Solution of Stiff Advection-Diffusion-Reaction Systems, 2001, National Science Foundation, DMS 0107157, \$204,705
13. A New Numerical Approach for the Solution of Advection-Diffusion-Reaction Equations, 2000, National Science Foundation, DMS 0074322, \$259,489

Educational publications

1. RODRIGUEZ, A. A., METZGER, R. P., CIFALUZ, O., DHIRASAKDANON, T. AND WELFERT, B., Modelling, simulation, animation, and real-time control (MoSART) for a class of electromechanical systems: a system-theoretic approach, *International Journal of Mathematics Education in Science and Technology* **35** (2004) 877–896
2. WELFERT, B. AND POTHOVEN, K., *MATLAB and MAPLE Manual to accompany: Fundamentals of Differential Equations (6th ed) and Fundamentals of Differential Equations and Boundary Value Problems (4th ed)* by R. Nagle, E. Saff & A. Snider, Addison-Wesley (2004). ISBN 0-321-17320-1
3. AGUILAR, R. AND WELFERT, B., Applied Numerical Methods and Graphical Visualization, *Computer Applications in Engineering Education* **4:2** (1996) 127–143

Awarded educational grants

1. CSUMS: Undergraduate Research Experiences for Computational Math Sciences Majors at ASU (PI: Eric Kostelich, 50% co-PI), National Science Foundation DMS 0703587, Arizona State University, 2007–2014, \$1,033,904.
2. Development of a Suite of Interactive Modeling, Controls, Rapid Prototyping, and Embedded System E-Book Module (PI: Armando Rodriguez, 20% co-PI), National Science Foundation DUE 0817584, 2008–2010 \$456,052.
3. Development of an Interactive Systems and Controls E-Book (PI: Armando Rodriguez, 10% co-PI), National Science Foundation DUE 0231440, 2002–2005, \$307,910.
4. Preparing Students in Scientific Research (25% co-PI), CLAS grant to improve undergraduate education, Arizona State University, 2004, \$14,923.
5. Preparing Life Science Students in Scientific Research (33% co-PI), CLAS grant to improve undergraduate education, Arizona State University, 2003, \$14,815.
6. Educational Tools for Numerical Methods, (100% PI), CLAS grant to improve undergraduate education, Arizona State University, 1995, \$4,500.

Declined educational proposals

1. Supporting Access to Mathematical Careers, 2006, National Science Foundation, DUE 0631185, \$500,000
2. Integrated Systems Approach for an Introductory Ordinary Differential Equations Course, 2002, National Science Foundation, DUE 0231444, \$74,999
3. Development of a First-of-its-Kind Interactive Control E-Book, 2001, National Science Foundation, DUE 0127596, \$494,718

Other scholarly work (internal reports)

1. WELFERT, B., A unifying view of classical gyrovector spaces, 2017. School of Mathematical and Statistical Sciences, Arizona State University, Tempe, Arizona.
2. WELFERT, B., A compact representation of simple rotations with application to Thomas gyration, 2016. School of Mathematical and Statistical Sciences, Arizona State University, Tempe, Arizona.
3. WELFERT, B., Stability of ADI for higher order FD stencils, 2015
4. WELFERT, B. AND RAHMAN, M., Comments on and extensions of several singular values inequalities, 2014
5. WELFERT, B., Eigenvalue Pairings in ADI Matrices, 2012. School of Mathematical and Statistical Sciences, Arizona State University, Tempe, Arizona.
6. WELFERT, B., Stability of parallel stationary ADI splittings for the one-dimensional diffusion equation, 2010. School of Mathematical and Statistical Sciences, Arizona State University, Tempe, Arizona.
7. WELFERT, B., Stability and dispersion of ADI-FDTD for the Maxwell-Curl System with Lumped Elements, 2005, Department of Mathematics, Arizona State University, Tempe, Arizona.
8. WELFERT, B., A Remark on Pseudospectral Differentiation Operators, 2000, Department of Mathematics, Arizona State University, Tempe, Arizona.
9. WELFERT, B., Convergence of Inexact Uzawa Algorithms for Saddle Point Problems, 1994, Department of Mathematics, Arizona State University, Tempe, Arizona.
10. TRACOGNA, S. AND WELFERT, B., Numerical differentiation and Peano kernel functions, Rept TW-97-01, January 1997, Leiden University, Department of Mathematics and Computer Science, Leiden University, The Netherlands.
11. TRACOGNA, S. AND WELFERT, B., Spectral Analysis of Generalized Top to Random Shuffles, Rept TW-97-04, June 1997, Leiden University, Department of Mathematics and Computer Science, Leiden University, The Netherlands.
12. WELFERT, B. AND ABERLE, J. T., Computation of Higher-Order Tangential Vector Finite Element Matrices, 1996, Department of Mathematics & Electrical Engineering, Arizona State University
13. WELFERT, B., Notes on Riffle Shuffle, 1997, Department of Mathematics, Arizona State University, Tempe, Arizona.
14. WELFERT, B. AND ABERLE, J. T., On the role of gradient fields in vector FE solutions of Maxwell's equations: higher order elements vs. penalty method, Oct. 1997, Department of Mathematics & Electrical Engineering, Arizona State University
15. HEAP, R., SHEPHARD, S., SHERWOOD, J. AND WELFERT, B., On the derivation and simulation of a model of double suspension roof, 2003, Department of Mathematics, Arizona State University, Tempe, Arizona
16. AL-RABTAH, A. AND WELFERT, B., Algebraic interpretation and stability of one-dimensional enslaved finite difference schemes, Dec. 2002, Department of Mathematics, Arizona State University, Tempe, Arizona.
17. JACKIEWICZ, Z., MASET, S, WELFERT, B. AND ZENNARO, M., Exponential Runge-Kutta methods for ordinary differential equations, June 2004, Department of Mathematics, University of Trieste, Italy.
18. LOPEZ, J. M. AND WELFERT, B., Slow parameter variations through resonances and Hopf bifurcations

Presentations

Conferences & Workshops

1. Modal reduction of a parametrically forced confined viscous flow, Workshop on the Numerical Solution of Integral and Differential Equations (NSIDE), University of Gdańsk, Poland, 18 Jul. 2019.
2. Viscous model of infinite dimensional Mathieu system, Workshop on Turbulence, Arizona State University, 9 Jan. 2019.
3. Linear model of infinite dimensional viscous Mathieu system, 71th Annual Meeting of the APS Division of Fluid Dynamics, Atlanta, GA, Nov. 2018.
4. Cooling & Heating presentation, Simiode Model INstructors in Differential Equations Workshop, Manhattan College, Riverdale NY USA, 22–28 July 2018.
5. Detailed study of fluid flow in a stably stratified square lid-driven cavity, 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, CO, Nov. 2017.
6. Comparison of Averaging methods for Interface Conductivities in 1D unstaturated Flow in Layered Soils, VIIIth International Symposium on Stratified Flows, San Diego CA, Aug. 2016.
7. Complex dynamics in a stratified lid-driven cavity flow, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, Nov. 2014.
8. Stability of stratified 2D cavity flow, 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Madrid, Spain, Jul. 2014.
9. Slow passage through resonance: the big picture, Joint Mathematics Meetings, San Diego, California, Jan. 2013.
10. Reduction of Dynamical Systems Under Stochastic Parametric Forcing, SIAM Conference on Analysis of Partial Differential Equations (PD07), SIAM, Mesa, Arizona, Dec. 2007.
11. Coherence Resonance Via Harmonic and Stochastic Parametric Forcing in SIR, SIAM Conference on Applications of Dynamical Systems (DS07), Snowbird, Utah, May 2007.
12. Impact of noise on the onset of vortex breakdown, 58th Annual Meeting of the Division of Fluid Dynamics, American Physical Society, Chicago, Nov. 2005.
13. Stochastic Parametric Forcing in Hydrodynamics, NISS/SAMSI Workshop on Collaborations in the Mathematical Geosciences, Poster, Raleygh, Oct. 2005.
14. Numerical solution of a Fredholm integro-differential equation modeling neural networks, 3rd International Conference on the Numerical Solution of Volterra and Delay Equations, Tempe, Arizona, May 2004.
15. Stochastic Navier-Stokes, NA day on Numerical Analysis and Geometric Integration, Ljublanja, Slovenia, May 2004.
16. Stability of pseudospectral approximations of the one-dimensional wave equation, Conference on Scientific Computation, Geneva, Switzerland, June 26–29, 2002.
17. Trials & tribulations in establishing a new BS degree in Computational Mathematical Sciences at ASU, Excellence in Undergraduate Mathematics: Mathematics for the Non-traditional Major, American Mathematical Society-Mathematical Education Reform Workshop, Washington University, St. Louis, MO, May 2-5, 2002.
18. On some combinatorial aspects of riffle shuffles with an application to the reduction of order conditions in the analysis of Runge-Kutta methods of the Crouch-Grossmann type, Workshop on the Numerical Solution of Ordinary Differential Equations on Manifolds, Arizona State University, Tempe, Arizona, April 2-3, 1998.

19. Hierarchical vector finite elements and a posteriori error estimation for Maxwell's equations, Progress in Electromagnetics Research Symposium, Innsbruck, Austria, July 1996.
20. Block Toeplitz preconditioning for static and dynamic linear systems, Volterra Centennial, Arizona State University, Tempe, Arizona, May 30, 1996.
21. On the Convergence of Inexact Uzawa Algorithms, Colorado Conference on Iterative Methods, Breckenridge, Colorado, April 5–9, 1994.
22. Towards Adaptive Spectral Methods, Adaptive Methods in Partial Differential Equations, Oberwolfach, Germany, Oct. 10–16, 1993.
23. On the Eigenvalues of Second-Order Pseudospectral Differentiation Operators, 2nd International Conference on Spectral and High Order Methods, Montpellier, France, June 1992.
24. Error Estimates and Adaptive Solution of Physical Problems, Forum USA 92, Los Angeles, April 1992.
25. A Posteriori Error Estimates for the Stokes Problem, SIAM Annual meeting, San Diego, California, June 1990.
26. Iterative Method for Saddle Point Problems, International Conference on Finite Element Methods in Engineering, Huntsville, Alabama, April 1989.

Colloquia and seminars at other universities

1. What is stiff order?, Department of Mathematics, University of Udine, Italy, May 2004.
2. Spectral methods for the wave equation, University of Fribourg, Switzerland, June 2002.
3. A nonstandard Euler scheme for $y'' + g(y)y' + f(y)y = 0$, Department of Mathematics, University of Texas at Arlington, Texas, Nov. 28, 2000.
4. The Newton iteration on Lie groups, Department of Computer Science, University of Bergen, Norway, Sept. 1996.
5. On the Determination of Higher-Order Pseudospectral Matrices, University of California, San Diego, California, March 1993.
6. Zero-free Regions of $\phi_n(z) = \sum_{i=1}^n (z - p_i)^{-1} - \sum_{i=1}^{n-1} (z - q_i)^{-1}$ with applications, Stanford University, California, Jan. 1993.
7. Sur la détermination des matrices de dérivation dans les méthodes pseudospectrales, University of Fribourg, Switzerland, June 16, 1992.

Presentations at ASU

1. Consistency of FD schemes for multidimensional diffusion PDEs with cross-derivative terms, SoMSS, Dec. 9, 2015.
2. Absorbing Boundary Conditions for Wave Problems: A Review of current Practices and future Perspectives, SoMASS, Feb. 18, 2011.
3. On Gauss Quadrature, SoMASS, Mar. 23, 2010.
4. Stability of Parallel Stationary ADI Splittings for the 1D Diffusion Equation, Dept. Math. & Stats, Sept. 30, 2008.
5. On the Structure of the Spectrum of Alternate Direction Implicit Iteration Operators, Dept. Math. & Stats, Sept. 28, 2007.
6. Alternating Direction Implicit FDTD Methods for solving Maxwell's Curl Equations, Dept. Math. & Stats, Nov. 10, 2005.

7. On the derivation and simulation of a model of double suspension roof, Computational Math Proseminar, Department of Mathematics, Mar. 21, 2002.
8. Stability of Pseudospectral Approximations of 1d Hyperbolic Problems, Computational Math Proseminar, Sept 20, 2001.
9. A Time-Splitting Method for Nonlinear Advection-Diffusion-Reaction Equations, Computational Math Proseminar, Nov. 4, 1999.
10. On the finite element solution of Maxwell's equations, Telecommunication Research Center, Arizona State University, Nov. 1997.
11. The Newton Iteration on Lie Groups, Department of Mathematics, Oct. 14, 1997.
12. Notes on Riffle Shuffles, Department of Mathematics, Sep. 30, 1997.
13. Spectral Analysis of Generalized Top to Random Shuffles, Department of Mathematics, Sep. 23, 1997.
14. Numerical differentiation and Peano kernel functions, Department of Mathematics, Sep. 4, 1997.
15. Effects of overlap in the convergence of iterative processes, Department of Mathematics, 1996.
16. A priori and a posteriori error estimates in finite element methods, Telecommunication Research Center, Arizona State University, April 12, 1995.
17. Adaptive finite element solution of PDEs in a nutshell, Department of Mathematics, Mar. 22, 1995.
18. On the determination of pseudospectral differentiation matrices, Department of Mathematics, Sept. 10, 1992.

Teaching

Courses taught

1. "Hollywood Mathematics" (3 lectures in freshman seminar)
2. MAT265, MAT270: Calculus I (engineering/math freshman undergraduate)
3. MAT266, MAT271: Calculus II (engineering/math sophomore undergraduate)
Beamer presentations, animations, MAPLE tools
4. MAT267, MAT272: Calculus III (engineering/math sophomore undergraduate)
MAPLE tools
5. MAT274, MAT275: Elementary Differential Equations (sophomore undergraduate)
MATLAB & SIMULINK project book
6. online MAT275
7. MAT242: Elementary Linear Algebra
8. MAT342, MAT343, MAT343 Honors: (Modern) Linear Algebra (with MATLAB) (junior undergraduate)
Beamer presentations, animations, MATLAB labs
9. online MAT343
10. MAT394: Advanced Mathematics for Engineers and Scientists (junior undergraduate).
(1994,1995). Precursor to MAT421
11. MAT421: Applied Computational Methods (senior undergraduate)
Developed course, Beamer presentations, animations, MATLAB tools
12. STP421: Probability (senior undergraduate)

13. MAT462: Applied Partial Differential Equations (senior undergraduate)
14. MAT420: Scientific Computing (senior undergraduate, Linux based)
Beamer presentations, animations: `bash`, `perl`, `python`, \LaTeX scripting, Fortran, visualization
15. MAT423: Numerical Analysis I (senior undergraduate)
16. MAT425: Numerical Analysis II (senior undergraduate)
17. MAT598: Finite Element Methods (graduate)
18. MAT520: Numerical Linear Algebra (graduate)
19. MAT521: Iterative Methods (graduate)
20. APM522: Numerical Partial Differential Equations (graduate)
21. MAT530: Numerical Solution of Ordinary Differential Equations (graduate)
22. MAT531: Numerical Solution of Stiff Differential Systems (graduate)
23. APM523: Spectral Methods for Partial Differential Equations (graduate)
24. APM506: Numerical Methods (advanced graduate)
25. APM520: Advanced Numerical Linear Algebra - Inverse Problems (advanced graduate)

Student supervision

Ph.D. graduates

1. Ke Wu, Parametrically forced rotating and/or stratified confined flows (May 2019, co-chair with Juan Lopez). Current position: Post-Doctoral assistant professor, Purdue University, West Lafayette.
2. Jason Yalim, Parametric forcing of confined and stratified flows (May 2019, co-chair with Juan Lopez). Current position: Post-Doctoral Research Scholar, Research Computing and School of Mathematical & Statistical Sciences, Arizona State University, Tempe.
3. Lin Zhou, Optimum experimental design issues in functional neuroimaging studies (June 2017, co-chair with Jason Kao).
4. Ruowen Liu, Numerical issues arising in the simulations of transient water flows in layered unsaturated soils (May 2017). Current position: Post-Doctoral Assistant Professor of Mathematics, University of Michigan, Ann Arbor.
5. Anushree Bharadwaj, Effect of soil replacement option on surface deflections for expansive clay profiles (April 2013, co-chair with Sandra Houston). Current position: Geotechnical engineer, Bay Area Geotechnical Group, San Francisco.
6. Heather Dye, Moisture Movement through Expansive Soil and Impact on Performance of Residential Structures (May 2008, co-chair Sandra Houston). Current position: Defaulted mortgage note investor, AZA Investment Group, Morristown NJ.
7. Mahbubur Rahman, Numerical Approximations of Stochastic Differential Equations with Applications to Mathematical Neurosciences (June 2004, co-chair Zdzislaw Jackiewicz). Current position: Associate Professor, University of North Florida, Jacksonville.
8. Adel Helal Al-Rabtah, Algebraic Interpretation and Stability of Enslaved Finite Difference Schemes (June 2002). Current position: Associate Professor, Department of Mathematics & Statistics, Mu'tah University, Jordan.
9. Leigh Little, A Finite Element Solver for the Navier-Stokes Equations Using a Preconditioned Adaptive BICGSTAB(L) Method (May 1998, co-chair Hans Mittelmann). Current position: Associate Professor, Department of Earth Sciences, Brockport State University of New York.

Current Ph.D. students

1. Casey Smith, SoMSS student (co-chair with Juan Lopez, SoMSS, ASU, est. graduation 2022)

Undergraduate students (2008–)

- Hezekiah Grayer (2019, Barrett honors college dissertation, co-chair with Juan Lopez)
Dynamics of tilted stably stratified square cavities
- Aaron Steele (2019, Undergraduate Research)
Numerical calculation of inviscid linearized Euler modes with $\overline{\mathcal{K}}_z \times \mathcal{R}_\pi$ symmetry in a rotating cube
- Rohit Kumar, Alexander Yurowkin (2019, Barrett honors college dissertation)
Design and Analysis of Algorithmic Trading Automation
- Stephanie Taylor (2014, Barrett honors college dissertation)
Two-Dimensional Stratified Cavity Flow Under Harmonic Forcing
- Jarom Hogue, Stephanie Reed, Stephanie Taylor (summer 2013 REU)
Fluid flows with parametric noise
- Kevin Coltin (2012, Barrett honors college dissertation)
Markov and Itô representation of option price models
- Kevin Coltin, Yue Pan, Iulia Hociota (summer 2011 REU)
Stochastic models in finance
- Ashley Gleckler, Jessica Prellberg, Samantha Ramsey (summer 2009 REU)
Fluid flow through unsaturated soils
- Matthew Grimes, Susan Seal (summer 2008 REU)
Fluid flow with additive noise

Service**Arizona State University**

School of Mathematical & Statistical Sciences

- Associate Chair, undergraduate programs (2006–2009)
Outreach (correspondence, liaison, ATF, SeeASU), curriculum (articulation, minors, major, education, honors), advising/grievances (students, faculty, internships, REUs, CSUMS), scheduling.
- Undergraduate Advisory Committee (1992–1995, 2000–2001, 2006–2009, 2010–present)
- Graduate Advisory Committee (1998–1999)
- Undergraduate advisor (1999–2002, 2005–present)
- Computing Committee (1993–1995)
- Engineering Liaison committee
- Lecturer evaluation committee (2001)
- Ph.D. examination committees
- Oversight Calculus committee (chair, 2004–2006)
- Course coordinator (Calculus II, Elementary Differential Equations)
- Awards Committee (2012)
- Hiring Committee for professor of practice in actuarial studies, chair (2016)

College of Liberal Arts & Sciences

- Curriculum committee (1999–2003)
- Committee on Quality of Instruction (1999–2002)

University

- Hiring committee (professor of practice actuary, 2015)
- Obama Scholar mentor (2010–2012)
- Affiliated faculty, Department of Civil & Environmental Engineering, ASU (2007–present)
- Honors College Advisor (2006–present)
- Graduate College Representative at Ph.D defenses (1993–1995)
- Faculty Ambassador (1994–1995)

Professional

1. Scientific journal referee (30 sources)

Abstract and Applied Analysis, Acta Mathematica Scientia, Advances in Computational Mathematics, American Mathematical Monthly, Applicable Analysis and Discrete Mathematics, Applied Mathematical Modelling, Applied Mathematics and Computation, Applied Numerical Mathematics, BIT Numerical Mathematics, Bulletin of Mathematical Biology, Complexity, Computational Optimization and Applications, Discrete and Continuous Dynamical Systems - B, IMA Journal of Numerical Analysis, Impact of Computing in Science and Engineering, International Journal of Nonlinear Sciences and Numerical Simulation, Journal of Computational and Applied Mathematics, Journal of Computational Finance, Journal of Computational Physics, Journal of Scientific Computing, Numerical Algorithms, Numerical Methods for Partial Differential Equations, Numerische Mathematik, Opuscula Mathematica, Proceedings of the Royal Society A, SIAM Frontiers in Applied Mathematics, SIAM Journal on Matrix Analysis and Applications, SIAM Journal on Numerical Analysis, SIAM Journal on Scientific Computing, Transactions on Microwave Theory and Techniques

2. Book reviewer

Addison–Wesley–Longman, Brooks–Cole, Harper–Collins, Pearson/Prentice–Hall, SIAM, Wadsworth, WH Freeman

3. Research proposal reviewer

National Science Foundation, CONICYT (Chilean funding agency equivalent to NSF).

4. Consulting

- Flow Technology, Phoenix, Arizona, Sep–Nov 2001.
Interpolation of 3D scattered data from flow measurements with multiquadrics.
- Skill Technologies Inc., Scottsdale, Arizona, Jan. 2000.
Development and implementation of a strategy for moving map of 3D space from electromagnetic readings.
- Valley Tool Room, Inc., April 1993.
Modified Sine-Curve Motion of a Cam.

5. Judging

- Poster presentation, Joint Mathematics Meetings, San Diego, January 2013.
- More Graduate Education at Mountain States Alliance and Western Alliance to Expand Student Opportunities, ASU Tempe, April 2006.
- Intel International Science and Engineering Fair, Grand Award Judge, Phoenix, May 2005.

6. Conference organization

- Session chair, Annual Meeting of the Division of Fluid Dynamics, American Physical Society, Atlanta, Georgia, Nov. 2018.
- NODEM98, Arizona State University, April 2–3, 1998 (with Prof. Z. Jackiewicz; about 60 participants).

7. Focus groups

- Calculus placement focus group (IP & IB issues), Tucson, March 2008.
- McGraw Hill Calculus focus group, San Diego, March 11–13, 2007.
- W. H. Freeman Calculus focus group, San Francisco, February 23–24, 2006.
- Addison-Wesley focus group, AMS annual meeting, Phoenix, AZ, Jan. 9, 2004