CURRICULUM VITAE

03/2021

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Education:

Ph.D. (Mathematics), Cornell University, Ithaca, N.Y. 1982
- Advisor: James H. Bramble
- Thesis: "Numerical Analysis of the Nonlinear Magnetostatic Problem"
- Thesis Area: Analysis of the nonlinear singular integral magnetic field equation. Derivation of
   a new finite element formulation leading to a discrete problem with a sparse matrix

M.A. (Mathematics), Cornell University, 1981

M.S. (Physics/Mathematics), Moscow Institute of Physics and Technology 1971, Rostov University 1974.

Employment History:

3/2001- present	Professor, University of Alabama in Huntsville
6/1987 - 3/2001	Associate Professor, University of Alabama in Huntsville
1982-1987	Assistant Professor, Iowa State University
1979-1982	Teaching Assistant, Cornell University
4/1979 - 8/1979	Staff Scientist 2, Lawrence Berkeley Laboratory, University of California
1971-1978	Unskilled laborer, pending exit visa from USSR

Visiting positions:

Fall 2002	Visiting scholar, University of California at Berkeley.
July 2000	Visiting Professor, Philpps-Universitaet, Marburg, Germany.
May - June 1999	Visiting Professor, Philpps-Universitaet, Marburg, Germany.
Winter 1998	Visiting Associate Professor, Georgia Institute of Technology, Atlanta, GA.
Fall 1997	Visiting scholar, University of California at Berkeley.
June 1996	Visiting Scientist, Los Alamos National. Laboratory, Los Alamos, NM.
Feb. 1994	Visiting scholar, Kyoto Sangue University, Kyoto, Japan.
June 1992	Visiting scholar, Cornell Theory Center, Cornell University, Ithaca, NY.
Jan. 1984	Visiting Scientist, Brookhaven National Laboratory, Long Island NY.

Grants, Consulting:

6/2007 – 12/ 2007	Advanced Software Tool for Numerical Bifurcation Analysis for Nonlinear PDEs, grant with "Convergent Solutions", NSF-SBIR, $30,000.
9/2004 - 8/2008	CMG Research. Use of Nonlinear Analysis to Characterize the Behavior and Predictability of the Atmospheric Boundary Layer (Co-PI, R. T. McNider PI), NSF, $511,975, ATM-0417774.
7/2003 - 6/2006	Travel grant (PI), NSF, $12,000 NSF.
7/2002 - 6/2006	Bifurcation Analysis for Large Problems: Algorithms, Software, Applications to MicroElectroMechanical Systems (MEMS) (PI), NSF, $199,308, DMS-0209536.

7/2003 - 6/2005	Bifurcation Analysis for Large Problems: Algorithms, Software, Applications to MEMS, travel grant (PI), NSF, $12,000, DMS-0209536.
5/2002 - 7/2002	Application of Numerical Continuation and Bifurcation Analysis to Assess Aerospace Vehicle Stability, NASA Summer faculty program, Marshall Space Flight Center, $12,000.
6/1999 - 8/1999	Analysis of MHD Kelvin-Helmholts fluid instabilities in a solar physics problem, NASA Summer faculty program, Marshall Space Flight Center, $14,000.
6/1998 - 8/1998	Analysis of MHD Kelvin-Helmholts fluid instabilities in a solar physics problem, NASA Summer faculty program, Marshall Space Flight Center, $13,000.
7/1994 - 6/1997	Computational methods for global analysis of connecting orbits: development of algorithms and applications, NSF, $60,000, DMS-9404912.
7/97 - 8/97	Consultant, Stanford University.
11/1994 - 10/1997	Analytical and computational studies of oscillations in age – structured population models, U.S. Bulgaria cooperative res., NSF (Co-PI, J. Li PI), $29,441, INT9412284.
7/1992 - 6/1995	Nonlinear Dynamical Analysis of Time Dependent Nocturnal Boundary Layers, NSF (Co-Investigator, R. T. McNider PI), $44,023, ATM- 912-0321.
6/1992 - 6/1994	Computational methods for global analysis of homoclinic and heteroclinic orbits, theoretical analysis and applications, NSF, $45,000, DMS-910- 7705.
1/1992 - 9/1992	Heteroclinic orbits in turbulent boundary layers, NASA, $12,000.
10/1988 - 9/1990	Numerical computation and continuation of invariant manifolds connecting fixed points, EPSCoR in Alabama, $36,000.
10/1985 - 9/1986	Numerical analysis of some reaction-diffusion equations, (coinvestigator) AFOSR, $12,000.
Summer 1981	Numerical analysis of nonlinear magnetic field problems, NSF, $1,650.
Summer 1980	Numerical analysis of nonlinear magnetic field problems, NSF, $1,350.

Awards, Honors:

12/2017 – present	NIH Special Volunteer program, "Development of testable and predictive mathematical and MATLAB models related to the physiology and pathophysiology of catecholamine systems."
4/2004	Distinguished Research/Creative Achievement Award, UAH
Feb. 1998	Invited participation in Workshop "Calcium dynamics in Cells", IMA, University of Minnesota, Minneapolis.
Sept. 1997	Invited participation in Workshop on Numerical Methods for Bifurcation Problems and Large-Scale Dynamical Systems, IMA, University of Minnesota, Minneapolis.
Oct. 1996	Invited participation in Workshop "Issues in the Computation of Bifurcations and Singularities in Dynamical Systems, IMA, University of Minnesota, Minneapolis.
June 26-July 9, 1994	Invited participation in Academy of Consciousness Studies, Princeton University.
July 27- Aug 2, 1991	Invited participation in the AMS-IMS-SIAM Joint Summer Research Conference "Systems of coupled oscillators", University of Washington, Seattle, WA, NSF.
Dec. 1990	Motoyama-Bentov 1990 Fellowship, The Motoyama Life Physics Institute, Tokyo, Japan.
9/1989, 4/1990	Visiting Membership to participate in the program on Dynamical Systems and their Applications, IMA, University of Minnesota, Minneapolis.
Fall 1979	Cornell University Fellowship.

RESEARCH

My research interests include:

a) Numerical aspects of bifurcation theory.
b) Numerical linear algebra.
c) Scientific computing and applied dynamical systems. Understanding complicated dynamics (e.g. chaos) in physical systems governed by ordinary or partial differential equations in terms of bifurcation theory. Global bifurcations (homoclinic and heteroclinic orbits). Applications to science and engineering.

d) Computational/System Physiology and Medicine.
e) Mathematical modeling in holistic and alternative medicine.

My ongoing research is focused on the following topics:

1. Numerical bifurcation analysis. Development of algorithms and software for bifurcation analysis in large systems, via subspace reduction, and their implementation in MATLAB.
2. Computational/System Physiology and Medicine. Development of testable and predictive mathematical and MATLAB models to elucidate mechanisms of onset of neurodegenerative diseases and of thyroid disorders, using a conceptual framework of homeostasis and escape from homeostasis.

COURSES TAUGHT

1. Calculus A, B, C
2. Intro. Ordinary Differential Equations
3. Intro. Partial Differential Equations
4. Intro Numerical Methods
5. Intro Numerical Analysis
3. Finite Element Method for Partial Differential Equations
4. Computational Linear Algebra and Fixed Point Iteration
5. Partial Differential Equations I, II
6. Numerical Solution of Partial Differential Equations
7. Linear Algebra
8. Applied Linear Algebra
9. Numerical Linear Algebra
10. Applied Bifurcation and Stability Analysis
11. Asymptotic and Perturbation Methods
12. Introduction to Nonlinear Differential Equations and Dynamical Systems

PUBLICATIONS

a) Publications in Refereed Journals:

1. I. I. Pekker and M. J. Friedman (Pekker), "On satisfaction of boundary conditions when calculating magnetic systems by integration over field sources", *ISV VUZ Electromekh*. <u>8</u> (1973) 904-909 (in Russian).
2. I. I. Pekker and M. J. Friedman (Pekker), "On the estimation of accuracy of solutions of magnetostatic problems", *Electrichestvo,* <u>4</u> (1975), 87-89 (in Russian).
3. I. I. Pekker, M. J. Friedman (Pekker), and A. G. Kirsanov, "Calculation of magnetic torus with air gap by integration over field sources", IZV VUZ *Electromekh*. <u>1</u> (1975), 11-15 (in Russian).
4. M. Friedman (M. Pekker) "A finite element method for the solution of a potential theory integral equation", *Math. Meth. in Appl. Sci.* **1** (1979), 581-587.
5. M. J. Friedman, "Mathematical Study of the nonlinear singular integral magnetic field equation, 1*", SIAM J. Appl. Math*. **39**, No. 1 (1980), 14-20.
6. M. J. Friedman "_____2", *SIAM J. Numer. Anal*. **18** (1981), 644-653.
7. M. J. Friedman "_____3", *SIAM J. Math. Anal*. **12** (1981), 536-540.
8. M. J. Friedman and J. S. Colonias, "On the coupled differential-integral equations for the solution of the general magnetostatic problem", *IEEE Trans. On Mag*. Vol. MAG **18**, No. 2, (March 1982) 336-339.
9. M. Friedman, "Finite element formulation of the general magnetostatic problem in the space of solenoidal vector functions", *Math. Comp.,* **43**, No. 168 (1984), 415-531.
10. M. J. Friedman and J. E. Pasciak, "Spectral properties for the magnetization integral operator", *Math. Comp.,* **43**, No. 168 (1984), 447-453.
11. M. Friedman, "A new finite element-boundary integral procedure for the solution of the magnetostatic problem", *COMPEL,* **4**, No. 3 (1985), 167-174.
12. M. Friedman, "Finite element approximation of a reaction-diffusion equation. Part I: Application of topological techniques to the analysis of asymptotic behavior of the semidiscrete solutions", *Quarterly of Appl. Math.,* **XLIV**, No. 2 (1986), 275-286.
13. M. Friedman, "Application of topological techniques to the analysis of asymptotic behavior of numerical solutions for a reaction-diffusion equeation", *SIAM J. Math. Anal.* **18**, No. 1 (1987).

14. "Numerical computation of heteroclinic orbits" (with E. J. Doedel), *J. Comp. and Appl. Math.* **26** (1989), 155-170.

15. M. J. Friedman, S. Birch, and W. A. Tiller "Towards the development of a mathematical model for acupuncture meridians", *Acupuncture and Electro-Ther. Res. Int. J.* **14**, Nos. 3/4 (1989), 217-226.

16. M. Friedman and S. Birch, "Mathematical Model development for the "Law of five elements" in acupuncture" *J. Amer. Acupuncture* **18** (1989) 361-366.

17. M.J. Friedman and E.J. Doedel, "Numerical computation and continuation of invariant manifolds, connecting fixed points, *SIAM J. Numer. Anal.* **28**, (1991) 789-808.

18. E. J. Doedel and M. J. Friedman, "Development of efficient computational methods for global analysis of homoclinic and heteroclinic orbits: a case study", *J. of Dynamics and Dif. Equations,* **5**, No. 1 (1993), 37-58.

19. M. Friedman, "Numerical analysis and accurate computation of heteroclinic orbits in the case of center manifolds", *J. of Dynamics and Dif. Equations,* **5**, No. 1 (1993), 59-87.

20. M. J. Friedman, E. J. Doedel, and A.C. Monteiro "On locating connecting orbits", *Applied Math. And Comp.* **65**, Nos. 1-3 (1994) 231-239.

21. E. J. Doedel, M. J. Friedman, and J. Guckenheimer, "On computing connecting orbits: general algorithm and application to the Sine-Gordon and Hodgkin-Huxley equations", *Special Section on Nonlinear Theory and Its Applications, The IEICE Trans. Fundamentals*, **E77 A**, No. 11 (1994) Japan.

22. R. T. McNider, D. England M. J. Friedman, and X. Shi "On the predictability of the stable atmospheric boundary layer", *J. of Atmospheric Sciences*, **52**, No 10 (1995), 1602-1614.

23. E. J. Doedel, M. J. Friedman, and B. I. Kunin, "Successive continuation for locating connecting orbits", *Numer. Algorithms* **14** (1997) 103-124.

24. M.J. Friedman, S. Birch and W.A. Tiller, "Mathematical Modeling as a tool for Basic Research in Acupuncture", *J. of Alternative and Complimentary Medicine 3* (1997), S89-S100.

25. W.A. Tiller, M.J. Friedman, R. Shaw, N. Cuendet, and T. Halicioglu "Grown-in point defects and microscopic defect formation in CZ silicon, Part I: the one-dimensional, steady state approximation", *Int. J. Crystal Growth* **186** (1998) 113 - 127.

26. A.R. Champneys, B. Malomed, and M. Friedman, "Solitary waves in a coupled Massive Thirring Model with self-phase modulation and dispersion", *Phys. Rev. Lett.* **80** (1998), 4169 - 4173.

27. E. Godik and M. Friedman, "Hi-tech framework for Future Alternative Medicine, *J. of Alternative and Complimentary Medicine 4/4* (1998).

28. S.N. Chow, B. Deng and M. Friedman, "Heteroclinic Loop Bifurcations with Nongeneric parameters", *SIAM. J. Appl. Math.* **59** (1999), 1303 - 1321.

29. T. Kostova, J. Li, and M. Friedman, "On two simple models for competition between age classes" (with), *Mathematical Biosciences,* **157** (1999), 65 - 89.

30. A.I. Fedoseyev, M.J. Friedman, and E.J. Kansa, "Continuation for Nonlinear Elliptic Partial Differential Equations Discretized by the Multiquadric Method", *Int. J. Bifur. & Chaos*, **10**, No. 2 (2000), 481 - 492.

31. J. Demmel, L. Dieci, and M. Friedman, "Computing connecting orbits via an improved algorithm for continuing invariant subspaces", *SIAM J. Sci. Comp.*, **22**, No. 1 (2001), 81 - 94.

32. L. Dieci and M. Friedman, "Continuation of Invariant Subspaces", *Numer. Lin. Alg. Appl.* **8** (2001), 317 - 327.

33. M. Friedman, "An improved detection of bifurcations in large nonlinear systems via the Continuation of Invariant Subspaces algorithm", *Int. J. Bifur. & Chaos* **11**, No. 8 (2001), 2277-2285.

34. A.I. Fedoseyev, M. J. Friedman, and E.J. Kansa, "An improved Multiquadric method for nonlinear elliptic partial differential equations via PDE collocation on the boundary", *Comput. Math. Applic.,* the Special Issue on Radial Basis Functions, **43**, Nos (3-5) (2002), 439-455.

35. M. Friedman, R. Banis, and U. Banis "Mathematical modelling as a research tool towards basic research in Psychosomatic Energetics" (9 pages) in Lesebuch der Psychosomatische Energetik Band 2 2005 ca. 240 S. Anthologie interessanter Beiträge aus unterschiedlichsten Gebieten zur PSE 19.80 EUR 30,- Sfr. erscheint Anfang 2006, paper.

36. P. Gariaev, M. Friedman, and E. Leonova-Gariaeva, "Crisis in Life Sciences. The Wave Genetics Response", *JNLRMI*, **IV**, No. 1 (2006).

37. M. Friedman and W. Qiu, "On the location and continuation of Hopf bifurcations in large-scale problems", *Int. J. Bifur. & Chaos*. **18**, No 5 (2008), 1589-1597.

38. D. Bindel, J. Demmel, and M. Friedman, "Continuation of Invariant Subspaces in Large Scale Bifurcation Problems", *SIAM J. Sci. Comp.* **30**, No 2 (March 2008), 637-656.

39. J. Hughes and M. Friedman, "A bisection-like algorithm for branch switching at a simple branch point", J. Sci. Comput. **41**, No 2 (2009), 62-69.

40. De Witte, W. Govaerts, Yu.A. Kuznetsov, and M. Friedman, "Initialization and Continuation of Homoclinic and Heteroclinic Connections in Matlab", *ACM Trans. Math. Software* **38**, No. 3 (2012), 18:1-18:34.
41. Selivanov VA, Friedman M, Schumaker MF, Cascante M, Trucco M, Votyakova TV, 'Multistationary and Oscillatory Modes of Free Radicals Generation by the Mitochondrial Respiratory Chain Revealed by a Bifurcation Analysis, *PLoS Comput Biol*. 2012, 8(9): e1002700.
42. Max Myakishev-Rempel, Istvan Stadler, Philip Brondon, David R. Axe, Mark Friedman, Frances Barg Nardia, Raymond Lanzafame, "A preliminary study of the safety of red light phototherapy of tissues harboring cancer", *Photomedicine and Laser Surgery,* **30**, No 9, (2012) 551-558.
43. D. Bindel, M. Friedman, W. Govaerts, J. Hughes, and Yu.A. Kuznetsov, "Numerical computation of bifurcations in large equilibrium systems in MATLAB", *J. Comput. Appl. Math*., 261 (2014), 232-248.
44. M. Pekker, "Numerical bifurcations methods for studying large parametrized nonlinear problems", *Izv VUZ Electromekh,* No. 4(540) (2015), 5-11.
45. H.J. de Blank, Yu.A. Kuznetsov, M.J. Pekker (formerly M.J. Friedman), D.W.M. Veldman, "Degenerate Bogdanov-Takens bifurcations in a one-dimensional transport model of a fusion plasma", *Physica D: Nonlinear Phenomena,* 331 (09/2016), 13-26.
46. David S. Goldstein, Mark J. Pekker (formerly Mark J. Friedman), Graeme Eisenhofer, Yehonatan Sharabi, "Computational modeling reveals multiple abnormalities of myocardial noradrenergic function in Lewy body diseases", *JCI Insight*. 2019;4(16):e130441. https://doi.org/10.1172/jci.insight.130441. Impact Factor 6.014.
47. Rudolf Hoermann; Mark J Pekker; John E M Midgley; Rolf Larisch; Johannes W Dietrich, "Triiodothyronine Secretion in Early Thyroid Failure: The Adaptive Response of Central Feedforward Control", *Eur J Clin Invest*. 2019 Dec 9:e13192. doi: 10.1111/eci.13192. [Epub ahead of print] https://onlinelibrary.wiley.com/doi/abs/10.1111/eci.13192 Impact factor:2.784.

c) Manuscripts submitted for Publication:
1. David S. Goldstein, Mark J. Pekker (formerly Mark J. Friedman), Yehonatan Sharabi, "Computational modeling of effects of stress, autotoxicity, and genetics on catecholaminergic neurodegeneration in Lewy body diseases", *JCI Insight* (under review)**.**
2. Lucas dos Anjos, Mark J. Pekker; Michel Iskin da S. Costa, "Complex dynamics arising from predator cull in predator-prey dynamics", *Ecological Complexity* (under review).
3. Rudolf Hoermann; Mark J Pekker; John E M Midgley; Rolf Larisch; Johannes W Dietrich, "Modelling the Hypothalamic-pituitary-thyroid Axis Using both feedback and feedforward motifs: expression of Homeostasis in response to changing thyroid Production", *Mathematical Biosciences* (under review)

d) Refereed Conference Publications:
1. I. I. Pekker and M. J. Pekker, "On the synthesis of magnetic systems using integration over field sources", *XIX Intern. Wiss. Koll. Th. Ilmenou* (1974*) "Gerateentwichlung"* (in Russian).
2. M. Friedman, "Finite element approximation of a reaction-diffusion equation. Part II: Approximation of the spontaneous bifurcation and error estimates uniform in time*", Proc. 4th Army Conf. on Applied Math. And Computing*, Cornell University, Ithaca, N.Y., May 1986
3. M. J. Friedman and E. J. Doedel, "Numerical computation and continuation of invariant manifolds connecting fixed points with application to computation of combustion fronts", in: T.J. Chung and Gerald R. Karr, Ed., *Finite Element Analysis in Fluids,* Proc. 7th Int. Conf. on Finite Element Methods in flow problems, April 1989. (UAH Press, Huntsville, AL, 1989), 277-282.
4. M. J. Friedman, S. Birch and W. A. Tiller, "A dynamical systems approach to modeling meridians and Ki" in: *Energy Fields in Medicine. A Study of Device Technology Based on acupuncture meridians and Chi Energy*, Proc. Int. Roundtable, The John E. Fetzer Foundation, May 1989, 218-229.
5. M. Friedman, S. Birch, "Dynamical systems modeling as a research tool in traditional acupuncture", *Proc. First Symp. Soc. For Acupuncture Research*, Rockville, MD, January 1993.
6. "On Computing Connecting Orbits in the Sine-Gordon and Hodgkin-Huxley equations*," Proc. 1993 Int. Symp. On Nonlinear Theory and its Applications*, Hawaii, U.S.A., December 1993 (with E. J. Doedel)
7. "An improved Multiquadric method for elliptic partial differential equations" (with A.I. Fedoseyev and E.J. Kansa), in: D. Schultz, B. Wade, J. Vigo-Aguiar and S.K. Dey Ed., *Proc. of Int. Conf. on Scientific Computing & Mathematical Modeling*, May 2000. (Univ. of WI , Milwaukee, WI, 2000), 174-177.
8. "Continuation of Invariant Subspaces for Large Bifurcation Problems" (with D. Bindel and J. Demmel), *PROCEEDINGS, SIAM Conference on Applied Linear Algebra*, July 2003.
9. D. Bindel, J. Demmel, M. Friedman, W. Govaerts, and Yu.A. Kuznetsov, "Bifurcation analysis of large equilibrium systems in Matlab". In: V.S. Sunderam et al. (eds.) "Proceedings of the International Conference on

Computational Science ICCS 2005, Atlanta, GA, USA, May 22-25, 2005, Part I". Springer Verlag *Lecture Notes in Computer Science* 3514 (2005), 50-57.

10. B. Sautois, W. Govaerts, M. Friedman, and Yu.A. Kuznetsov, "Continuation of Homoclinic Orbits in Matlab". In: V.S. Sunderam et al. (eds.) "Proceedings of the International Conference on Computational Science ICCS 2005, Atlanta, GA, USA, May 22-25, 2005, Part I". Springer Verlag *Lecture Notes in Computer Science* 3514 (2005), 263-270.

11. M. Friedman, "Mathematical modelling as a research tool towards basic research in Psychosomatic Energetics", *Proc. Whole Person Health Summit* 2005, 2006 Washington, D.C.

e) Technical Reports:

1.   M.J. Friedman and A. C. Monteiro, "Accurate Computation and Continuation of Homoclinic and Heteroclinic Orbits for Singular Perturbation Problems", *NASA Technical Report # 5-32341*, September 1992.

2.   L. Dieci and M. Friedman, "Continuation of Invariant Subspaces", *Tech. Report CDSNS98-310*, Center of Dynamical Systems and Nonlinear Studies, Georgia Institute of Technology, 1998.

3.   M. Friedman, B.J. Hollingsworth, S.T. Suess, and S. Parhi, "Analysis of Kelvin Helmholtz instabilities of plasma jets", *Tech. Report,* NASA Marshall Space Flight Center, 1998.

4.   M.J. Friedman and M.E. Jackson, "An improved RLV stability analysis via a continuation", *Tech. Report,* NASA Marshall Space Flight Center, 2002.

5.   D. Bindel, J. Demmel, and M. Friedman, "Continuation of Invariant Subspaces for Large Bifurcation Problems (with), *Tech. Report,* University of California at Berkeley, 2006, http://www.eecs.berkeley.edu/Pubs/TechRpts/2006/EECS-2006-13.html

6.   D. Bindel, M. Friedman, W. Govaerts, J. Hughes, Yu.A. Kuznetsov, "CL_MATCONTL2.1 Tutorial", University of Alabama in Huntsville, December 2008, http://webpages.uah.edu/~hughesjs/.

7.   D. Bindel, M. Friedman, W. Govaerts, J. Hughes, Yu.A. Kuznetsov, "CL_MATCONTL2.2,b Tutorial", University of Alabama in Huntsville, June 2010, http://webpages.uah.edu/~hughesjs/.

8.   Bindel, D., Govaerts, W., Hughes, J., Kuznetsov, Yu.A., Pekker, M., Veldman, D., "CL_MATCONTL2015p0: Tutorial", Oct. 2015, http://uah.edu/faculty/pekker.

f)   Software developed:

1.   M. Friedman, Demos "nag, fsh, stw" in E.J. Doedel, A.R. Champneys, T.F. Fairgrieve, Yu.A. Kuznetsov, B. Sandstede, and X.J. Wang*, AUTO97: Continuation and bifurcation software for ordinary differential equations (with HomCont)* , 1997.

2.   M. Friedman, "*AUTO 97a*", *a modification of AUTO 97* to include new routines for numerical analysis of connecting orbits, an experimental version, based on E.J. Doedel, A.R. Champneys, T.F. Fairgrieve, Yu.A. Kuznetsov, B. Sandstede, and X.J. Wang*, AUTO97: Continuation and bifurcation software for ordinary differential equations (with HomCont).* University of Alabama in Huntsville, 1997.

3.   M. Friedman, "*SUBCON, a collection of subroutines for continuing invariant subspaces of a parameter dependent matrix*", an experimental version. University of Alabama in Huntsville, 1998-2001.

4.   D. Bindel and M. Friedman, "*CIS03, a collection of MATLAB subroutines for continuing invariant subspaces of a parameter dependent matrix*" University of California at Berkeley and University of Alabama in Huntsville, 2003.

5.   D. Bindel, M. Friedman, W. Govaerts, J. Hughes, Yu.A. Kuznetsov, "Cl_matcontL2.1*, Continuation Toolbox in MATLAB*" University of Alabama in Huntsville, January 2009, http://webpages.uah.edu/~hughesjs/.

6.   D. Bindel, M. Friedman, W. Govaerts, J. Hughes, Yu.A. Kuznetsov, "Cl_matcontL2.2b*, Continuation Toolbox in MATLAB*" University of Alabama in Huntsville, June 2010, http://webpages.uah.edu/~hughesjs/.

7.   Bindel, D., Govaerts, W., Hughes, J., Kuznetsov, Yu.A., Pekker, M., Veldman, D., Oct. 2015. CL_MATCONTL2015p0: continuation toolbox in *MATLAB*. http://uah.edu/faculty/pekker.

8.   Bindel, D., Jonkhout C, Govaerts, W., Hughes, J., Kuznetsov, Yu.A., Pekker, M., Veldman, D., CL_MATCONTL2019: continuation toolbox in *MATLAB*. http://uah.edu/faculty/pekker

PRESENTATIONS

a) Invited Talks:

- "Numerical computation of heteroclinic orbits", (with E. J. Doedel). Midwest-Southeast differential equations conference, Vanderbilt University, Nashville, Tennessee, October 1987.
- "Towards the development of a mathematical model for acupuncture meridians" (with S. Birch and W. A. Tiller), 4th Annual International Symposium on Acupuncture and Electrotherapeutics, Columbia University, New York, New York. October 1988.
- "On numerical computation and continuation of invariant manifolds connecting fixed points, State Polytechnic Institute, Novocherkassk, USSR, December 1988.
- "Numerical computation and continuation of invariant manifolds connecting fixed points", Center for dynamical systems and nonlinear studies, Georgia Institute of Technology, Atlanta, Georgia, May 1989.
- "Numerical analysis and computation of heteroclinic orbits", North Carolina State University, Raleigh, North Carolina, June 1989.
- "Towards the development of a mathematical model for acupuncture meridians" (with S. Birch and W. A. Tiller), 5th Annual International Symposium on Acupuncture and Electrotherapeutics, Columbia University, New York, New York, October 1989.
- "Numerical analysis and efficient computation of heteroclinic orbits", SIAM Conference on Dynamical Systems, Orlando, Florida, May 1990.
- "Computational methods for global analysis of homoclinic and heteroclinic orbits", Tokyo University, Tokyo, Japan, December 1990.
- "Computational methods for global analysis of homoclinic and heteroclinic orbits", Kyoto Sangyo University, Kyoto, Japan, January 1991.
- "Global analysis of homoclinic and heteroclinic orbits", First International Congress on Nonlinear Analysis, Tampa, Florida, August 1992.
- "Dynamical systems modeling as a research tool in traditional acupuncture", First Symp. Soc. For Acupuncture Research, Rockville, MD, January 1993.
- "The successive continuation method for obtaining homoclinic and heteroclinic orbits", SIAM Annual Meeting, Philadelphia, PA, July 1993.
- "On global analysis of connecting orbits: numerical analysis, algorithms, applications", GA Tech., Atlanta, GA, November 1993.
- "On global analysis of connecting orbits: numerical analysis, algorithms, applications", Kyoto University, Kyoto, Japan, February 1994.
- "On global analysis of connecting orbits: numerical analysis, algorithms, applications", Hiroshima University, Hiroshima, Japan, February 1994.
- "On global analysis of connecting orbits: numerical analysis, algorithms, applications", Waseda University, Tokyo, Japan, February 1994.
- "On global analysis of connecting orbits: numerical analysis, algorithms, applications", The Weizmann Institute of Science, Rehovot, Israel, January 1995.
- "On global analysis of connecting orbits: numerical analysis, algorithms, applications", Bulgarian Academy of Science, Sofia, Bulgaria, January 1995.
- "On efficient computation of connecting orbits", International Conference on Scientific Computation and Differential Equations, Stanford, California, March 1995.
- "Successive continuation for locating connecting orbits", The Tel Aviv University, Tel Aviv, Israel, March 1996.
- "Successive continuation for locating connecting orbits", Los Alamos Nat. Lab., Los Alamos, New Mexico, July 1996.
- "On computing connecting orbits", Issues in the Computation of Bifurcations and Singularities in Dynamical Systems, the University of Minnesota, October 1996.
- "An efficient algorithm for computing connecting orbits", Workshop on Numerical Methods for Bifurcation Problems, IMA, University of Minnesota, Minneapolis, MN, September 1997.
- "Efficient algorithms for computing and continuing connecting orbits; applications", Georgia Inst. Technology, Atlanta, Georgia, March 1998.
- "Employing numerical continuation for studying MHD Kelvin-Helmholts fluid instabilities in a solar physics problem", NASA/Marshall Space Flight Center, August 1998.
- "Continuation of invariant subspaces algorithm. Applications to bifurcation analysis of large systems", Philpps-Universitaet Marburg, Germany, June 1999.

- "Continuation of solutions to 1D and 2D Nonlinear Elliptic PDEs discretized by the Multiquadric Method", Philpps-Universitaet Marburg, Germany, June 1999.
- "Continuation of invariant subspaces algorithm. Applications to bifurcation analysis of large systems", "Continuation of solutions to 1D and 2D Nonlinear Elliptic PDEs discretized by the Multiquadric Method", Workshop on Bifurcations, Analysis, Numerical Methods, Software, University of Gent, Belgium, June 1999.
- "Analysis of MHD Kelvin-Helmholts fluid instabilities in a solar physics problem", NASA/Marshall Space Flight Center, August 1999.
- "An improved detection of bifurcations in large nonlinear systems via the Continuation of Invariant Subspaces algorithm", Workshop on Bifurcations, Analysis, Numerical Methods, Software, University of Gent, Belgium, June 2000.
- "Continuation of Invariant Subspaces for large and sparse bifurcations problems", Workshop on Bifurcations, Analysis, Numerical Methods, Software, Utrecht University, The Netherlands, June 2001.
- "Practical continuation of invariant subspaces for bifurcations problems.", Workshop on Numerical Methods for Nonlinear Dynamics and Bifurcations, the University of Bristol, UK, July 2002.
- "An improved RLV stability analysis via a continuation approach", NASA/Marshall Space Flight Center, August 2002.
- "Practical continuation of invariant subspaces for bifurcations problems", University of California at Berkeley, November 2002.
- "Continuation of Invariant Subspaces for Large and Sparse bifurcations problems", SIAM Conference on Applied Linear Algebra, Williamsburg, VA, July 2003.
- "Bifurcation analysis for large problems via subspace reduction", Workshop on Analysis and Continuation of Bifurcations, University of Sevilla, Spain, May 2004.
- "Bifurcation analysis for large problems via subspace reduction", Utrecht University, The Netherlands, June 2004.
- "Locating connecting orbits. Continuation of Invariant Subspaces with applications to connecting orbits and Bifurcation problems", University of Gent, Belgium, June 2004.
- "Mathematical modelling as a research tool towards basic research in Psychosomatic Energetics", Whole Person Health Summit 2005, April 14 – 17, 2005 Washington, D.C.
- "Bifurcation analysis of large equilibrium systems in Matlab", University of Gent, Belgium, June 2005.
- "Cl_matcontL: an extension of Cl_matcont to Bifurcation analysis of large equilibrium systems in Matlab", A workshop on Applied Dynamical Systems "Advanced numerical methods for mathematical modeling", University of Gent, Belgium, June 2006.
- "Cl_matcontL Tutorial', Mini-course and Workshop on Advanced Algorithms and Numerical Software for the Bifurcation Analysis of Dynamical Systems CRM Montreal, June 30 - July 1 and July 2-6 2007.
- "Cl_matcontL: an extension of Cl_matcont to Bifurcation analysis of large equilibrium systems in Matlab", AMS Southeastern Meeting, University of Alabama in Huntsville, October 24-26, 2008.

b) Contributed Talks:

- "On the coupled formulation of the magnetostatic problem". Finite Element Circus 1980, Cornell University, Ithaca, New York.
- "On the coupled differential-integral equations for the solution of general magnetostatic problems", (with J. S. Colonias). Compumag 1981 Conf., Argonne National Laboratory, Chicago, Illinois.
- "On some properties of single layer potential for Lipschitz boundaries". Finite Element Circus 1982, University of Illinois, Chicago, Illinois.
- "On application of topological techniques to the analysis of asymptotic behavior of finite element solutions of a reaction-diffusion equation". Finite Element Spring Circus 1985, Duke University, Durham, North Carolina.
- "Application of topological techniques to the analysis of asymptotic behavior of the finite element solutions of a reaction-diffusion equation", SIAM Fall 1985 meeting, Arizona State University, Temple, Arizona.
- "On L_∞ error estimates for finite element method with "product integration" for semilinear elliptic problems". Finite Element Fall Circus 1985, Brookhaven National Laboratory, Long Island, New York.
- "Numerical analysis of large time behavior of semilinear parabolic equations with non-smooth initial data". Finite Element Spring Circus 1986, Rutgers University, New Brunswick, New Jersey.
- "Finite element approximation of a reaction-diffusion equation". Fourth Army Conference on Applied Mathematics and Computing, Cornell University, Ithaca, New York, May 1986.

- "Finite element approximation of wave fronts for a reaction-diffusion equation". Finite element Spring Circus, Brookhaven Nat. Lab., Long Island, New York, 1987.
- "Numerical analysis of wave-fronts for a reaction-diffusion equation" (with E. J. Doedel). 90th Summer meeting of the AMS, Session on nonlinear evolution equations, August 1987.
- "Numerical computation and continuation of invariant manifolds connecting fixed points" (with E. J. Doedel). 90th Summer meeting of the AMS, Session on nonlinear evolution equations, August 1987.
- "Numerical analysis of heteroclinic orbits", Finite element Fall Circus, Cornell University, Ithaca, New York, November 1987.
- "On numerical computation and continuation of invariant manifolds connecting fixed points" (with E. J. Doedel), SIAM Annual meeting, Minneapolis, MN, July 1988.
- "Numerical analysis of heteroclinic orbits", South Eastern Atlantic Dif. Equations Conf., University of Georgia, Athens, GA. November 1988.
- "Numerical Analysis of heteroclinic orbits", Finite element Fall Circus, Purdue University, West Lafayette, Indiana, April 1989.
- "Numerical analysis and computation of invariant manifolds connecting fixed points", Program on Mathematical Physiology and Differential Delay Equations, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis, MN, April 1990.
- "Numerical analysis and accurate computation of heteroclinic orbits in the case of center manifolds", Workshop on Mathematics of Computation in PDEs, Mathematics Science Institute, Cornell University, Ithaca, N.Y., January 1991.
- "On development of a mathematical model for acupuncture meridians", Meeting on Mathematical Ecology, University of Tennessee, Knoxville, TN, March 1991.
- "Numerical analysis and accurate computation of heteroclinic orbtis", SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, October 1992.
- "On locating homoclinic and heteroclinic orbits", Annual conference on differential equations and computational simulations, Mississippi State University, MS, April 1993.
- "On Computing Connecting Orbits in the Sine-Gordon and Hodgkin-Huxley equations", 1993 Int. Symp. On Nonlinear Theory and its Applications, Hawaii, U.S.A., December 1993.
- "On computing connecting orbits", SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 1995.
- "On computing connecting orbits", Conference on Dynamical Numerical Analysis, Georgia Institute of Technology, Atlanta, GA, December 1995.
- "Numerical study of bifurcations of traveling wave solutions in a reaction-diffusion system", SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 1997.
- "An improved detection of bifurcations in large nonlinear systems via the Continuation of Invariant Subspaces algorithm", Pacific Rim Dynamical Systems Conference, Maui, Hawaii, August, 2000.
- "Continuation of Invariant Subspaces for Large and Sparse bifurcations problems", SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 2003.
- "Bifurcation analysis for large problems via subspace reduction", SIAM annual meeting, Portland, Oregon, July 2004.
- "Bifurcation analysis of large equilibrium systems in Matlab", Workshop on Qualitative Numerical Analysis of High-Dimensional Nonlinear Systems, the University of Bristol, UK, March 2005, a poster.
- "Bifurcation analysis of large equilibrium systems in Matlab", The International Conference on Computational Science ICCS 2005, Atlanta, GA, USA, May 22-25, 2005.

Graduate students.
1) C. Monteiro, "Algorithms for computing heteroclinic orbits", MA Thesis, 1992.
2) X. Z. Shi, "Numerical investigation of the stable nocturnal boundary layer", Ph.D. Thesis, 1997.
3) J. Hughes, "Hermite continuation and numerical bifurcation analysis", Ph.D. Thesis, 2010.
4) D. Veldman "Degenerate Bogdanov-Takens Bifurcations in Fusion Plasma Models", M.A. Thesis, Utrecht University Department of Mathematics, Yu.A. Kuznetsov (Supervisor), M.J. Pekker (Coach), 2015
5) C.J.H. Jonkhout, "Numerical Continuation of Periodic Orbits in Large Systems of ODEs", M.A. Thesis, Mathematical Institute, University of Leiden, Yu.A. Kuznetsov (Supervisor), M.J. Pekker (Supervisor), 2019.

Editorial Board Membership.
Member, Journal of Nonlocality. (August 27, 2012 - Present).
Member, Electromechanics Journal. (January 24, 2014 - Present).
Member, Chinese Journal of Mathematics. (August 28, 2013 - Present).
liaison, MAA. (September 5, 2012 - Present).
Member, Mathematical Biosciences and Engineering (MBE) (August 2018 - Present).