Gershon Wolansky

April 2008

Date and place of birth: November 13, 1952, Jerusalem
Marital status: Married, two children

Academic degrees

- 1985: Ph.D. in Mathematics, The Courant Institute, New York University, USA
- 1980: M.Sc. in Mathematics, The Hebrew University, Jerusalem, Israel
- 1976: B.Sc. in Mathematics and Physics, The Hebrew University, Jerusalem, Israel

Academic Appointments

- 2003-4: Visiting professor, Department of Mathematics, Indiana University
- 1997 - : Associate Professor, Department of Mathematics, Technion, Haifa, Israel
- 1994-1995: - Visiting Scientist, The Institute of Geophysics and Planetary Science, UCLA, Los Angeles, CA, USA
- 1989- 1997: Senior Lecturer, Department of Mathematics, Technion, Haifa, Israel
- 1988-1989: Researcher, Department of Theoretical Mathematics, The Weizmann Institute of Science, Rehovot, Israel
- 1986-1988: Research Associate, Department of Theoretical Mathematics, The Weizmann Institute of Science, Rehovot, Israel
- 1985-1986: Research Associate, Department of Atmospheric Sciences, UCLA, Los Angeles, CA, USA

Professional Experience

- Student advisor in Applied Mathematics, 1991-1993, 2000-
- Member of Post-Doc and Visitors Committee, 1998-99
- Member of the library committee, 1996-97
- Member of the Technion Interdisciplinary Committee for Graduate Studies in Applied Mathematics, 1995 -96
- Member in the committee of the Institute of Mathematics, Technion, 1995-1996
- Member in the committee of the faculty group on research fields, 1992-1994

Research Interests

- Dynamical Systems
- Stochastic Dynamics
- Semilinear Parabolic and Elliptic Equations
- Geophysical Fluid Dynamics
- Celestial Mechanics and Astrophysics
- Mathematical Biology (Chemotaxis)
- Learning models in Neural Networks
- Optics and Vision

Teaching Experience

- Calculus and Pre-Calculus
- Linear Algebra

- Stochastic Methods
- Special topics in Applied Mathematics (Dynamical systems and Chaos, Hamiltonian Dynamics)
- Ordinary Differential equations
- Partial Differential Equations
- Complex Functions
- Student seminars
- Introductory courses in Applied Mathematics

Membership in Professional Societies

- American Mathematical Society
- HYKE (Hyperbolic and Kinetic Equation- European Organization)

Honors

- 1986-1987, The Wolf Foundation- A Post Doctoral Scholarship 1987
- The Sara Leedy Award in Mathematics 1994-1995
- GFAT Academic Lectureship- France, 2000
- The Sanford Kaplan Creative Management Prize (awarded by the American Technion Society), 2000 (shared with Porf. J. Rubinstein)
- The H. Rich Innovation Prize (awarded by the Technion president for innovative scientific work leading to commercial products, 2000

Graduate Students

- Shahar Mendelson, (Ph.D, 1999), *Mathematical aspects of learning in neural networks*, Primary supervisor. Additional supervisors: E. Nelkene and J. Rubinstein
- Gorbonos Dan, (M.Sc-2003), *Singularities in wave systems induced by Einstein equations*, Primary supervisor. Additional supervisor: Amos Ori
- Paz Polak, (M.Sc-2003), *The lazy travelling salesman problem*, Primary supervisor
- Kluzner Vladimir, (Ph.D-2006), *Minimal surfaces, measure based distance functions and image segmentation*, Primary supervisor. Additional supervisor: S. Zeevi
- Zelig, Daphne, (Ph.D-2006). *Properties of solutions of PDE defined on human lung-shaped domains*, Primary supervisor. Additional supervisors: Y. Pinchover, M. Israeli

Post-Doctoral students

- Andrzej Raczynski, 2006
- Juan Mayorga, 2008-

Research Grants

- 1996- 98: U.S-Israel BSF grant (with M. Ghil and D. Holm)
- 1996-98: Keshet- Arc en Ciel: France-Israel Scientific Cooperation (with J. Rubinstein, M. Schatzman and I. Volpert)
- 2001-2003 : Israel Science Foundation, grant (with I. Shafrir)
- 2005-2009 : Israel Science Foundation, grant (with K. Rubinstein)

Conferences

Invited talks

- Interdisciplinary Workshop on Applied Mathematics, The Weizmann Institute, Rehovot, Israel, 1989
- Conference on Partial Differential Equations in Honor of S. Agmon, The Hebrew University, Jerusalem, Israel, 1990
- Joint Germany-Israel Workshop on Dynamical Systems, Institute of Mathematics, The Hebrew University, Jerusalem, 1992
- Joint France-Israel Conference on Partial Differential Equations, Eco. Nor. Sup., Paris, France, 1992
- The Second Gentner Symposium on Mathematical Sciences, Applied and Applicable Analysis, Goshen, Germany, 1992
- Nonlinear Equations in Many-Particle Systems, Oberwolfach, Germany, 1993
- Calculus of Variation, Applications and Computations, Pont-a' Mousson, France, 1994
- Workshop on Applications of Dynamical Systems to Biology, Technion, 1995.
- International Federation of Nonlinear Analysis WCNA-96, Athens, Greece, 1996
- Workshop on Fluid Dynamics, The Newton Institute, Cambridge, U.K., 1996
- Workshop on applied mathematics, Sde-Boker, BGU, 1997
- Workshop on applied mathematics, Sde-Boker, BGU, 1998
- UAB-GIT Conference on Differential Equations and Analysis, Alabama, 1999
- Oberwolfach, Workshop on Many Particle Systems, Germany, 1999

- Workshoop on nonlinear analysis, U. Rome II, 2000
- Fourth European Conference on Elliptic and Parabolic Problems, Gaeta, Italy 2001
- Asymptotoc methods and applications in kinetic and quantum kinetic theory, Granada, Spain, 2001
- General Relativity, Oberwolfach, Germany, 2003
- Workshop on applied mathematics, Sde-Boker, BGU, 2003
- Nonlocal parabolic and elliptic equations, Bedlevo, Poland, 2003.
- Workshop on nonlinear stability and instability for kinetic and fluid models in Astrophysics and Plasmaphysics, Bayrouth, Germany, 2004
- Abstarct and applied analysis, Qui-Nhon University, Vietnam , 2005
- Self-Similar solutions in nonlinear partial differential equations, Bedlewo, Poland, 2005
- Workshop on Variational problems, RIMS, Kyoto, Japan, 2006
- Workshop on kinetic equations, Cartagena, Columbia, 2006
- Workshop on applied mathematics, Sde-Boker, Israel, 2007

Other talks

- Equadiff 91, International Conference on Differential Equations, Barcelona, Spain, 1991
- Workshop on Geometry and Mechanics, Arkansas, USA, 1995:
- Third European Conference on Elliptic and Parabolic P.D.E, Pont-a-Musson, France, 1996
- International Conference on Differential Equations with applications to Biology, Dalhousie Univ., Nova Scotia, 1997
- The Second International Conference on Optical Design and Fabrication, Tokyo, Japan, 2000:

Participation in organizing conferences

- Co-organizer of an international Workshop on Applications of Dynamical Systems in Biology, Technion, 1995
- Co-organizer of an international Workshop on Kinetic Equations, Technion, 1999

Special professional activity

- Reviewer for Mathematical Reviews
- Referee for various mathematics and physics journals, (SIAM, Nonlinearity, Indiana Univ. Math. Journal, J. Atmos. Fluid Dynamics and others)
- Referee for proposals for the Israel Science Foundation and for the Binational Science Foundation
- Consultant for the Tech-Sat Project, Technion, 1992-3
- Cofounder and chief consultant, Inray (a start-up company initiated by Dimotech-Technion), 1998-
- Consultant for Inray L.T.D, Shamir Optical Group, on optical design of progressive lenses, 1998-

LIST OF PUBLICATIONS

Thesis
Dissipative Perturbations of Completely Integrable Hamiltonian Systems with Applications to Celestial Mechanics and Geophysical Fluid Dynamics, 192p., October 1985; Thesis adviser: Prof. M. Ghil

Refereed papers in professional journals

Published papers:

1. G. Wolansky: *Existence, uniqueness and stability of stationary barotropic flow with forcing and dissipations*, Comm. Pure. Appl. Math., **41**, 19-46, 1988

2. G.Wolansky: *Stochastic perturbations to conservative dynamical systems on the plane I: Convergence of invariant distributions*, Trans. Amer. Math. Soc., **309**, 621-639, 1988

3. G. Wolansky: *Stochastic perturbations to conservative dynamical systems on the plane II: Recurrency conditions*, Trans. Amer. Math. Soc., **309**, 641-657, 1988

4. G. Wolansky: *Elliptic perturbations of nonlinear oscillations in the presence of resonances*, Indiana U. Math. J., **37**, 481-504, 1988

5. G. Wolansky: *The barotropic vorticity equation under friction and dissipation: Bifurcations of non-symmetric responses and multiplicity of solutions*, SIAM J. Appl. Math., **49**, 1585-1607, 1989

6. G. Wolansky: *Limit theorem for a dynamical system in the presence of resonances and homoclinic orbits*, J. Diff. Eq., **83**, 300-335, 1990

7. G. Wolansky: *Quasi-stationary shock waves for the modified Burger's equation*, in EQUADIFF, Int. Conf. on Diff. Eq., Barcelona, Spain 976-982, 1991[1]

8. M. Ghil and G. Wolansky: *Non-Hamiltonian perturbations of integrable systems and resonance trapping*, SIAM J. Appl. Math, **52**, 1148-1171, 1992

9. G. Wolansky: *Resonance trapping in dissipative and anti-dissipative systems; an ergodic approach*, J. Stat. Phys., **67**, 33-65, 1992

10. G. Wolansky: *Stationary and quasi-stationary shock waves for non-spatially homogeneous Burger's equation in the limit of small dissipation*, Indiana U. Math. J., **41**, 43-69, 1992

11. G. Wolansky: *On the evolution of self-interacting clusters and applications to semi-linear equations with exponential nonlinearity*, J. D'Anal. Math., **59**, 251-271, 1992

12. G. Wolansky: *On steady distributions of self-interacting clusters under friction and fluctuations*, Arch. Rat. Mech.Anal., **119**, 355-391, 1992

[1]Refereed paper, did not appear elsewhere

13. J. Rubinstein and G.Wolansky: *Instability results for reaction diffusion equations over surface of revolutions*, J. Math. Anal. Appl., **187**, 485-489, 1994

14. G. Wolansky: *On the slow evolution of quasi-stationary shock waves*, J. Dyn. and Diff. Eq., **6**, 247-267, 1994

15. G. Wolansky: *A Gamma-limit approach for viscosity stationary solutions of a model convection equation*, In Calculus of variations, applications and computations, Proc. Europe Conf. Ellip & Parab. PDE, 266-281, 1994[2]

16. G. Wolansky: *Neural networks as set-valued dynamical systems and the universality of the windowed Fourier Transform*, J. Nonlin. Science, **5/4**, 287-316, 1995

17. G. Wolansky and M. Ghil: *Stability of quasi-geostrophical flows in periodic channels*, Phys. Lett. A , **202**, 111-116, 1995

18. G. Wolansky: *Comparison between two models of self- gravitating clusters: Conditions for gravitational collapse*, Nonlin. Anal., **24**, 1119-1129, 1995

19. G. Wolansky: *Critical behavior of semi-linear elliptic equations with sub-critical exponents*, Nonlin. Anal., **26** , 971-995, 1996

20. G. Wolansky and M. Ghil: *An extension of Arnold's second stability theorem for the Euler equation*, Physica D, **1300**, 1-7, 1996

21. R. Kinney, J.C. McWilliams and G. Wolansky: *Stability of magnetic vortices with flow in an unbounded domain*, Phys. Plasmas, **3**, 3583-3590, 1996

22. G. Wolansky: *Mathematical justification of the grandmother cell hypothesis in Neurobiology*, Nonlin. Anal, TMA, **30**, 3917-3926, 1997

23. M. Chipot, I. Shafrir and G. Wolansky: *On the solutions of some elliptic systems of Liouville type*, J. Diff. Eq, **140**, 59-105, 1997

24. G. Wolansky: *A critical parabolic estimate and application to nonlocal equations arising in chemotaxis*, Applicable Anal., **66**, 291-321, 1997

[2]Refereed paper, did not appear elsewhere

25. G. Wolansky and M. Ghil: *Nonlinear stability of fluid equilibria for saddle solutions and symmetry breaking*, Comm. Math. Phys., **193**, 713-736, 1998

26. G. Wolansky, F. Varadi and M. Ghil: *The Combined Effects of Cold-Nebula Drag and Mean-Motion Resonances* , Icaros, **132**, 137-150, 1998

27. G. Wolansky, A. Marmur: *The actual contact angle on a Heterogeneous rough surface in three dimensions*, Langmuir, **14**, 5292-5297, 1998

28. G. Wolansky, A. Marmur: *Apparent contact angles on rough surfaces: the Wenzel equation revisited*, Coll & Surf A. **156**, 381-388, 1999

29. G. Wolansky: *On nonlinear stability of polytropic galaxies*, Ann. Inst. Poinc. Nonlin. Anal. , **16**, 15-48, 1999

30. G. Wolansky:*Stationary states of Vlasov systems*, Studies in Adv. Math., **16**, 449-461, 2000

31. G. Wolansky: *Static solutions of the Vlasov-Einstein System*, Arch. Rational Mech. Anal., **156**, 205-230, 2001

32. G. Wolansky: *A concentration theorem for the heat equation*, Monatsh. Math., **132**, 255-261, 2001

33. I. Shafrir and G. Wolansky: *Moser-Trudinger type inequality for systems in two dimensions*, C.R. Acad. Sci., **333**, 439-443, 2001

34. J. Rubinstein and G. Wolansky: *'Designing a perfect cornea: computational aspects*, Proceeding of the International Optical Design Conference, Jose Sasian and Paul K. Manhart Eds, SPIE Proceeding 4832, 2002 [3]

35. G. Wolansky: *Multi-components chemotactic systems in the absence of conflicts*, Eur. J. Appl. Math. **13**, 641-661, 2002

36. J. Rubinstein and G. Wolansky: *Two theorems in catoptrics*, J. Opt. Soc. Amer., **19**, 129-131, 2002

[3]Refereed paper, did not appear elsewhere

37. J. Rubinstein and G. Wolansky: *A class of elliptic differential equations related to optical design*, Math. Res. Lett, **9**, 537-548, 2002

38. P. Markowich, G. Rein and G. Wolansky: *Existence and nonlinear stability of stationary states of the Schrödinger-Poisson system*, J. Stat. Phys., **106**, 1221-1239, 2002

39. J. Rubinstein and G. Wolansky: *Differential relations for the imaging coefficients of asymmetric optical systems*, J. Opt. Soc. Amer. A **20**, 2365-2369, 2003

40. G. Wolansky: *On the equation* $U_t = \Delta U + Me^u / \int e^U$ *in planar domains*, in *Nonlocal Elliptic and Parabolic Equations*, Banach Center Publications, **66**, P. Biler, S, Jackowski, J. Kaczorowski and L. Stettner, Eds., 2003[4]

41. J. Rubinstein and G. Wolansky: *A variational principle in optics*, J. Opt. Soc. Amer. A **21** , #11, 2164–2172, 2004

42. J. Rubinstein and G. Wolansky: *A weighted least action principle for dispersive waves*, Ann. Physics. **316**, #2, 271-284, 2005

43. I. Shafrir and G. Wolansky: *The logarithmic HLS inequality for systems on compact manifolds* in J. Func. Anal. **227**, #1, 200-226, 2005

44. I. Shafrir and G. Wolansky: *Moser-Trudinger and logarithmic HLS inequalities for systems*, J. Eur. Math. Soc. **7**, #4, 413-448, 2005

45. G. Wolansky: *Rotation numbers for measure valued circle maps*, J. D'Anal. Math., **97**, 169-201, 2005

46. G. Wolansky: *Extended least action principle for steady flows under a prescribed flux,* Calculus of Variations and PDE, **31**, 277-296, 2008

47. P. Polak and G. Wolansky: *The lazy travelling salesman*, ESAIM Control Optim. Calc. Var. **13**, #3, 538-552, 2007

48. J. Rubinstein, P. Sternberg and G. Wolansky: *Elliptic problems on networks with constrictions,* Calculus of Variations and PDE, 26, 459-487, 2006.

[4]Refereed paper, did not appear elsewhere

49. A. Rubinstein, J. Rubinstein and G. Wolansky, *Determining sets for the discrete Laplacian*, SIAM Rev. **49**, #2, 315-324, 2007

50. J. Rubinstein and G. Wolansky, *Intensity control with a free-form lens, J. Opt. Soc. Amer.*, to appear.

51. G. Wolansky: *On the mobility and efficiency of mechanical systems*, ESAIM Control Optim. Calc. Var. **13**, #4 , 657-668, 2007

52. Y. Pinchover, G. Wolansky and D. Zellig: *Spectral properties of Scrodinger operators defined onn-dimensional infinite trees*, Israel J. Mathematics, to appear

53. J. Rubinstein, P. Sternberg and G. Wolasnky: *Supercurrents in networks with constricted junctions* , Physica C-Superconductivity, **452**, #1-2, 54-60, 2007

54. G. Wolansky: *On time reversible description of the process of coagulation and fragmentation*, to appear in Arch. Rat. Mech. Anal.

55. D. Gorbonos and G. Wolansky, *A Simplified Mathematical Model for the Formation of Null Singularities Inside Black Holes II.*, J. Math. Phys. **48**, #9, (18p), 2007

56. G. Wolansky, *Dynamics of a system of sticking particles of a finite size on the line*, Nonlinearity **20** , #9, 2175-2189, 2007

57. G. Wolansky *Minimizers of Dirichlet functionals on the $n-$torus and the weak KAM Theory*, to appear in Ann. Ins. Poincare Nonlin

58. V. Kluzner, , G¿ Wolansky and Y. Zeevi: *A Geometric-Functional-Based Image Segmentation and Inpainting*, SSVM[5] 2007, 165-177

Submitted

1. G. Wolansky *Incompressible, quasi-rigid deformations of 2-dimensional domains*

[5]Refereed paper, did not appear elsewhere

Chapters in books and conference proceedings:

1. J. Rubinstein and G. Wolansky: *Reconstruction of optical surfaces from ray data*, Optical Review **8**, 281-283, 2001

2. J. Rubinstein and G. Wolansky, *Eikonal functions: Old and new*, in Applied Mathematics Celebration - a volume in honor of the 80th birthday of Joseph B. Keller, Kluwer, 2004.

3. J. Rubinstein and G. Wolansky: *Imaging in asymmetric systems*, S. African Optomet. **62**, 178-181, 2004

Patents and technical reports:

1. J. Rubinstein and G. Wolansky: *Pattern formation in neural networks*, Technion Report, 1993.

2. J. Rubinstain and G. Wolansky: *Method for determining and designing optical elements*, US patent 6,256,098, 2001.

3. J. Rubinstein and G. Wolansky: "Wavefront methods for designing optical elements", US patent 6,655,803, 2003.

4. J. Rubinstein and G. Wolansky: *Method for determining and designing optical elements*, US patent 6,661,523, 2003.

5. J. Rubinstein and G. Wolansky: *Ophthalmic optical elements and method for the design thereof*, US patent 6,755,524, 2004.

6. J. Rubinstein and G. Wolansky: *A method for the design of ophthalmic optical elements*, US patent, 6,824,268, 2004.