Alexander Elgart

Curriculum Vitae

Contact

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Research Interests

Mathematical Physics, Analysis

Education

Ph.D. in Physics, 2000
Technion - Israel Institute of Technology
Field: Mathematical physics
Thesis: *Adiabatic theorems and their applications*
Adviser: Prof. J. E. Avron

M.S.in Physics, 1998
Technion - Israel Institute of Technology
Field: Mathematical physics
Thesis: *Adiabatic theorems without a gap condition*
Adviser: Prof. J. E. Avron

B.A. in Physics, 1994
Technion - Israel Institute of Technology

Research appointments

2019 – Present	Professor, Department of Mathematics Virginia Tech
2013 – 2019	Associate Professor, Department of Mathematics Virginia Tech
9/2014 – 3/2015	Visiting Associate Professor, Department of Mathematics University of California Irvine
2007 – 2013	Assistant Professor, Department of Mathematics Virginia Tech
2006 – 2007	Senior Lecturer, Department of Mathematics Ben Gurion University at Negev
2003 – 2005	Instructor, Department of Mathematics, Stanford University
2002 – 2003	Assistant Professor \ Courant Instructor, CIMS New York University

06/07 2003	Visiting Professor, Department of Mathematics, Université de Lille
2000 – 2002	Instructor, Department of Physics Princeton University

Awards and Prizes

2019	*US National Science Foundation Grant # 1907435, PI (w/ M. Fraas), $ 323,642*
2018	*US National Science Foundation Early Career and Student Support Grant # 1841860, PI (w/ M. Fraas), $ 18,000*
2017	*The Simons Foundation Grant # 443529, $ 42,000*
2012	*US National Science Foundation Grant # 1210982, Co-PI (w/ G. Hagedorn), $ 344,188*
2009	*US National Science Foundation Grant # 0907165, Co-PI (w/ G. Hagedorn), $ 337,000*
2007	*Israel Science Foundation Grant, sole PI, $170,000*
2007	*US-Israel Binational Science Foundation Grant, # 2006021, Co-PI (w/ D. Cohen and T. Kottos), $ 96,650*
2007	*Zvi and Zahava Friedenberg award for the advancement of science and education, awarded by Israel Science Foundation.*
2003	Invited Speaker at International Congress in Mathematical Physics, International Association of Mathematical Physics.

Services

Referee for:

Annales Henri Poincaré
Communications in Mathematical Physics
Journal of Functional Analysis
Journal of Spectral Theory
Journal of Mathematical Physics
Journal of Physics A
Journal of Statistical Physics
Letters in Mathematical Physics
Mathematical Physics, Analysis and Geometry
Operators and Matrices
Quantum Information Processing
Probability Theory and Related Fields
Proceedings of the Royal Society A
Transactions of the American Mathematical Society
Waves in Random Media

Teaching Experience

Spring 2018	Linear Algebra II
Spring 2017	Invitation to Analysis
Fall 2014	Introduction to Linear Algebra, UC Irvine

Spring 2014	Matrix Analysis, Virginia Tech
Spring 2014	Multivariable Calculus, Virginia Tech
Spring 2013	Mathematical Foundations of Quantum Mechanics, Virginia Tech
2011, 2016	Linear Algebra I, Virginia Tech
2011 – 2012	Calculus of Several Variables, Virginia Tech
Fall 2010	Intermediate Differential Equations, Virginia Tech
2009 – 2018	Functional analysis, Virginia Tech
2007 – 2010	Introduction to Differential Equations, Virginia Tech
2009, 2016, 2018	Real analysis, part II, Virginia Tech
2008, 2015, 2017	Real analysis, part I, Virginia Tech
Fall 2006	Ordinary differential equations, Ben Gurion University
Fall 2006	Functional Analysis, Ben Gurion University
Spring 2006	Linear Algebra, Ben Gurion University
Fall 2005	Partial differential equations, Stanford University
2004 – 2005	Elementary Functional Analysis, Stanford University
Fall 2003	Complex Variables, Stanford University
2003 – 2004	Calculus I and II, New York University
Fall 2002	Algebra and Calculus with Applications, New York University
2000 – 2001	General Physics courses, Princeton University

Invited seminars and colloquia

2019	April Mittag-Leffler Institute, Sweden
2016	March - *UAB Math Colloquium*, Birmingham September - *VT Applied analysis seminar*, Blacksburg
2015	May - *Technion PDE and Applied Mathematics Seminar*, Israel September - *VT Math Colloquium*, Blacksburg October - *VT Applied analysis seminar*, Blacksburg
2014	October - *UCI Mathematical Physics Seminar*, Irvine October - *UCI Mathematical Physics Seminar*, Irvine
2010	May - *Tufts Seminar*, Boston
2008	October *UAB Math Colloquium*, Birmingham
2007	January - *VT Math Colloquium*, Blacksburg October - *UVA Mathematical Physics Seminar*, Charlottesville June - *HUJI PDE Seminar*, Jerusalem June - *BGU Operator and System Theory Seminar*, Beer Sheva
2006	May - *BGU PDE and Applied Math Seminar*, Beer Sheva
2004	December - *Technion PDE and Applied Math Seminar*, Haifa December - *GAFA Seminar*, Tel Aviv December - *HUJI PDE Seminar*, Jerusalem November - *UCI Mathematical Physics Seminar*, Irvine January - *Joint Applied Math and Probability Seminar*, Stanford
2003	December - *Technion Mathematical Physics Seminar*, Haifa December - *U. of Chicago Computational and Applied Mathematics Seminar*, Chicago
2002	November - *UAB Math Colloquium*, Birmingham
1998	October - *TU Munich Mathematical Physics seminar*, Munich September - *TU Berlin Mathematical Physics seminar*, Berlin

Invited lectures at workshops and conferences

2019	August - *From Many Body Problems to Random Matrices*, Banff, Canada
2018	February 36th Western States meeting of Mathematical Physics, Irvine, CA November Spectral Theory of Quasi-Periodic and Random Operators, Montreal, Canada December Random Physical Systems, Patagonia, Chile
2017	March Fisher-Hartwig asymptotics, Szego expansions, and applications to statistical physics, San Jose, CA May Mathematical Aspects of Disordered Systems, Zurich, Switzerland
2016	October *QMath13: Mathematical Results in Quantum Physics*, Atlanta, GA June *Great Lakes Mathematical Physics Meeting*, East Lansing, MI

2015	February *33nd Annual Western States Mathematical Physics Meeting*, Pasadena, CA June *Random and other ergodic problems*, Cambridge, UK
2014	March *AMS Sectional Meeting*, Knoxville December *The Mathematics of Quantum Disordered Systems*, St. Petersburg, Russia
2013	March *Nonlinear Evolution Equations and Wave Phenomena*, Athens, GA July *Quantum Spectra and Transport*, Jerusalem
2012	October *AMS Sectional Meeting*, Tucson
2011	March *35th SIAM Southeastern Atlantic Section Conference*, Charlotte
2010	March - *AMS sectional meeting*, Lexington October - *SEARCDE-30*, Blacksburg
2009	December - *Modeling and Understanding Random Hamiltonians*, Oberwolfach April - *Random Schrödinger Operators*, Banff
2008	March - *Disordered Systems*, Oberwolfach
2007	February - *Partial Differential Equations and Spectral Theory*, Jerusalem
2006	February - *Mathematical Aspects of Quantum Adiabatic Approximation*, Waterloo
2005	January - *Quantum spectra and dynamics*, Rehovot *Open Quantum Systems*, Vienna
2004	September - *QMath9 International Conference*, Giens July - *Spectral Theory of Schrödinger Operators*, Montreal
2003	August - *XIV International Congress on Mathematical Physics*, Lisbon
2001	November - *AMS Sectional Meeting*, Irvine August - *Workshop on Mathematical Physics*, Mambucaba
1999	June - *Open Classical and Quantum Dynamical Systems*, Lille June - *Miniconference on Quantum Chaos, Dissipation and Adiabaticity*, Haifa May - *Spectral and Scattering Theory Workshop*, Jerusalem
1998	June - *Workshop in Mathematical Physics*, Haifa

Graduate advising

Zhenwei Cao, Ph.D. student, 2009 - 2013

Daniel Schmidt, Ph.D. student, 2011 - 2015

List of Publications and Preprints

Publications in peer-reviewed journals

1. J. E. Avron and A. Elgart, "An Adiabatic Theorem without a Gap Condition: Two level system coupled to quantized radiation field" *Phys. Rev. A.,* **58**, 4300-4306, (1998).
2. J. E. Avron and A. Elgart, "Smooth adiabatic evolutions with leaky power tails" *J. Phys. A: Math. Gen.,* **32**, L537 (1999).
3. J. E. Avron and A. Elgart, "Adiabatic Theorem without a Gap Condition" *Comm. Math. Phys.,* **203**, 445, (1999).
4. J.E. Avron, A. Elgart, G.M. Graf, and L. Sadun, "Geometry, Statistics and Asymptotics of Quantum Pumps" *Phys. Rev. B,* **62**, R10618(R) (2000).
5. J.E. Avron, A. Elgart, G.M. Graf and L. Sadun, "Optimal Quantum Pumps" *Phys. Rev. Lett.,* **87**, 236601 (2001).
6. A. Elgart and J.H. Schenker "A strong operator topology adiabatic theorem" *Rev. Math. Phys.,* **14**, 569 (2002).
7. J.E. Avron, A. Elgart, G.M. Graf and L. Sadun, "Time-Energy coherent states and adiabatic scattering" *J. Math. Phys.,* **43**, 3415 (2002).
8. A. Elgart and B. Schlein, "Adiabatic Charge Transport and the Kubo Formula for Landau Type Hamiltonians" *Comm. Pure and Appl. Math.,* **57**, 590 (2004).
9. J.E. Avron, A. Elgart, G.M. Graf, L. Sadun and K. Schnee, "Adiabatic charge pumping in open quantum systems" *Comm. Pure and Appl. Math.,* **57**, 528 (2004).
10. J.E. Avron, A. Elgart, G.M. Graf and L. Sadun, "Transport and Dissipation in Quantum Pumps" *J. Stat. Phys.,* **116**, 425 (2004).
11. A. Elgart, L. Erdos, B. Schlein and H-T. Yau, "Nonlinear Hartree equation as the mean field limit of weakly coupled fermions" *J. Math. Pure Appl.,* **83**, 1241 (2004).
12. A. Elgart, G.M. Graf and J. H. Schenker, "Equality of the bulk and edge Hall conductances in a mobility gap" *Comm. Math. Phys.,* **259**, 185, (2005).
13. A. Elgart, L. Erdos, B. Schlein and H-T. Yau,"Gross-Pitaevskii Equation as the Mean Field Limit of Weakly Coupled Bosons" *Arch. Rat. Mech. Anal.,* **179**, 265, (2006).
14. M. Aizenman, A. Elgart, S. Naboko, J. H. Schenker and G. Stolz, "Moment Analysis for Localization in Random Schrödinger Operators" *Invent. Math.,* **163**, 343, (2006).
15. A. Elgart and B. Schlein, "Mean Field Dynamics of Boson Stars" *Comm. Pure and Appl. Math.* **60**, 500, (2007).
16. A. Elgart, "Lifshitz tails and localization in the three-dimensional Anderson model" *Duke Math. J.,* **146**, 331, (2009).
17. J. Aisenberg, I. Sela, T. Kottos, D. Cohen, and A. Elgart "Quantum decay into a non-flat continuum", *J. Phys. A: Math. Theor.* **43**, 095301, (2010).
18. J. Aisenberg, I. Sela, T. Kottos, D. Cohen, and A. Elgart "Anomalous decay of a prepared state due to non-Ohmic coupling to the continuum" *Phys. Rev. E* **81**, 036219 (2010).
19. A. Elgart, M. Tautenhahn, and I. Veselić "Localization via fractional moments for models on with single-site potentials of finite support", *J. Phys. A: Math. Theor.* **43**, 474021 (2010).
20. A. Elgart and G. Hagedorn, "An Adiabatic Theorem for Resonances", *Comm. Pure and Appl. Math.* **64**, 1029 (2011).
21. A. Elgart, M. Tautenhahn, and I. Veselić, "Anderson localization for a class of models with a sign–indefinite single–site potential via fractional moment method", *Ann. Henri Poincaré* **12**, 1571 (2011).
22. Z. Cao and A. Elgart, "On the efficiency of Hamiltonian–based quantum computation for low–rank matrices", *J. Math. Phys.* **53**, 032201 (2012).

23. A. Elgart and G, Hagedorn, "A note on the switching adiabatic theorem", *J. Math. Phys.* **53**, 102202 (2012).
24. Z. Cao and A. Elgart, "The weak localization for the alloy-type Anderson model on a cubic lattice", *J. Stat. Phys.* **148**, 1006 (2012).
25. A. Elgart and A. Klein, "Ground state energy of trimmed discrete Schrödinger operators and localization for trimmed Anderson models", *J. Spectr. Theory* **4**, 391 (2014).
26. A. Elgart, M. Shamis and S. Sodin, "Localisation for non-monotone Schrödinger operators", *JEMS* **16**, 909 (2014).
27. A. Elgart and D. Schmidt, "Eigenvalue counting inequalities, with applications to Schrödinger operators". *J. Spectr. Theory* **5**, 251–278 (2015).
28. A. Elgart and A. Klein, "An eigensystem approach to Anderson localization." *J. Funct. Anal.* **271**, 3465 (2016).
29. A. Elgart and S. Sodin, "The trimmed Anderson model at strong disorder: localization and its breakup." *J. Spectr. Theory* **7**, 87 (2017).
30. A. Elgart, L. Pastur and M. Shcherbina, "Large block properties of the entanglement entropy of free disordered fermions." *J. Stat. Phys.* **166**, 1092 (2017).
31. A. Elgart, A. Klein, and G. Stolz, "Droplet localization in the random XXZ model and its manifestations." *J. Phys. A: Math. Theor.* **51**, 01LT02 (2018). *** IOPselect paper**
32. A. Elgart, A. Klein, and G. Stolz, "Many-body localization in the droplet spectrum of the random XXZ quantum spin chain." *J. Funct. Anal.* **275**, 211 (2018).
33. A. Elgart, A. Klein, and G. Stolz, "Manifestations of dynamical localization in the disordered XXZ spin chain." *Comm. Math. Phys.* **361** 1083 (2018).
34. A. Elgart and A. Klein, "Eigensystem multiscale analysis for Anderson localization in energy intervals." *J. Spectr. Theory*, **9**, 711 (2019).
35. A. Elgart and A. Klein, "Eigensystem multiscale analysis for the Anderson model via the Wegner estimate." *Ann. Henri Poincaré*. doi 10.1007/s00023-020-00926-0.

Conference Proceedings

1. J. E. Avron and A.Elgart, "An adiabatic theorem without a gap condition" *Mathematical results in quantum mechanics* (Prague, 1998), 3, Oper. Theory Adv. Appl., **108**, Birkhäuser, Basel, (1999).
2. G. Stolz, M. Aizenman, A. Elgart, S. Naboko, and J. H. Schenker, "Fractional moment methods for Anderson localization in the continuum" *XIVth International Congress on Mathematical Physics*, 619, World Sci. Publ., Hackensack, NJ, (2005).
3. G. M. Graf, A. Elgart, L. Sadun, and K. Schnee, "Transport in adiabatic quantum pumps" *XIVth International Congress on Mathematical Physics*, 171, World Sci. Publ., Hackensack, NJ, (2005).
4. A. Elgart, "Adiabatic transport, Kubo formula and Anderson localization in some lattice and continuum models" *XIVth International Congress on Mathematical Physics*, 163, World Sci. Publ., Hackensack, NJ, (2005).
5. A. Elgart, "Equality of the bulk and edge Hall conductances in $2D$" *Mathematical physics of quantum mechanics*, 325, Lecture Notes in Phys., 690, Springer, Berlin, (2006).
6. A. Elgart, H. Krüger, M. Tautenhahn, and I. Veselić, "Discrete Schrödinger operators with random alloy-type potential", *Proceedings of Spectral Days 2010*, Santiago, Chile, (2011).

Submitted Papers and Preprints

1. A. Dietlein and A. Elgart, "Level spacing for continuum random Schrödinger operators with applications." arXiv:1712.03925.