September 2019

Curriculum vitae

Name: Akkermans Eric Yasha

Date and place of birth: July 7, 1960, Nice, France.

Date of immigration in Israel: October 1991

Citizenship: Israeli (since 10/1991) + French

Status: Married +3
Yonathan (06/02/92), Daniel (09/05/95) and Noam (03/12/98)

Address:
Professional: Department of Physics, Technion, Israel Institute of Technology, 3200003, Haifa, Israel.
Tel. 972-4-8293521
Fax. 972-4-8295755 and 972-4-8292304
e-mail: eric@physics.technion.ac.il

Personal: Hakeshet st. 3, 34385, Haifa, Israel.

Academic degrees:

PhD of the Grenoble university (Joseph Fourier) in condensed matter physics (under the supervision of Prof. Roger Maynard):
Diploma cum laude (1986)

Academic positions:

1. Visiting professor, Yale University 2007-09

2. Directeur de recherches at the CNRS (University of Paris at Orsay): 1998-99 (Sabbatical year)

3. Professor at the department of physics (Technion): 2005-

4. Associate professor at the department of physics (Technion): 1996-2005

5. Senior Lecturer at the department of physics (Technion): 1991- 1995.

6. Charge de recherches (première classe) at the CNRS (centre de recherches sur les très basses températures) Grenoble: 1987- 1995.

7. Post-doctorate position at the Laue-Langevin institute : 1986-1987

Visiting academic positions:

1. Visiting Scientist at the Lyman laboratory of physics, Harvard university. Summer 1985

2. Visiting scientist, Technion Israel institute of technology: Summer 1987, Winter 1989

3. Research associate (Technion): 1990

4. Visiting scientist, Institute for theoretical physics, University of California, Santa Barbara, spring and summer 1991.

5. Visiting professor, University of Grenoble (France), summer 1992.

6. Visiting scientist, University of Paris (Orsay), september 1992.

7. Visiting professor, University of Amsterdam (Holland), summer 1993.

8. Visiting researcher, Institute for theoretical physics, University of Minnesota (Minnesota, USA), February 1994.

9. Visiting professor, University of Paris (Orsay), summer 1994.

10. Visiting researcher, Institute for nuclear physics (Department of theoretical physics), Orsay, France, september 1995.

11. Visiting scientist, Institute for theoretical physics, University of California, Santa Barbara (USA), spring 1996.

12. Visiting researcher, department of physics, University of Bologna (Italy), september 1996.

13. Professor at the École normale supérieure (Paris), spring 1998.

14. Visiting professor, University of Paris (Orsay), summer 2002.

15. Visiting researcher, Paris-Science Chair, ENSPCI (Paris), December-January 2007.

16. Visiting professor, Yale (USA), 2007-09.

17. Visiting scientist, Ecole Normale Superieure, Paris, France, March-April, 2015.

18. Visiting professor, Chaire d'Etat, College de France, May 2015.

19. Directeur de recherches at the CNRS, University of Nice, September 2016.

20. Professeur at Ecole Polytechnique, France, September 2017.

21. Professor at the Maths Dept. Cornell University (Julia and Joshua Ruch Exchange Program), October 2018.

Research interests:

Theoretical condensed matter physics (keywords):

- Mesoscopic quantum physics of electrons and photons
- Wave propagation in disordered systems
- Quantum fluids (superconductivity and superfluidity) - Bose-Einstein condensation in atomic systems
- Vortex matter - Non-linear classical field equations
- Anderson localization of photons- sub-radiance and super-radiance.
- Quantum field theory on fractals
- Static and dynamical Casimir effects- Unruh effect-Non equilibrium quantum field theory
- Non-equilibrium statistical mechanics
- Efimov Physics
- Topological properties of quasicrystals
- Anomalies in Graphene

Teaching experience:

At Grenoble University :

1. Undergraduate course in Thermodynamics (1987-89)

At École normale superieure de Lyon:

2. Graduate course in electrodynamics of continuous media (1987-89)

At Technion:

3. Graduate course: Charge transport and coherence in condensed matter physics
4. Graduate course: Advanced condensed matter physics, (1992-1994)
5. Graduate course: Magnetism (1994-1995; 1996-1997; 2000-2001).
6. Undergraduate course : Modern physics (1995-1998, 1999, 2001,2003)
7. Graduate course: Superconductivity (1995-1996).
8. Graduate course: Random walk, brownian motion and quantum mechanics (1997).

9. Undergraduate course : Electromagnetism, special relativity and waves

10. Graduate course: Quantum mechanics 3 (quantum electrodynamics, Dirac and Klein-Gordon equations)

11. Quantum Mechanics 1

12. Quantum Mechanics 2

13. Graduate course: Interactions between atoms and photons (2007-2010-11-13-17)

14. Classical and Quantum systems out of equilibrium : basic phenomena and functional methods (fall 2011)

15. Statistical Mechanics and Thermodynamics (Undergraduate course 115211) 2014

16. History of Modern Physics - Newly created course at Technion 2017

At École normale superieure (Paris):

17. Quantum transport and multiple scattering for electrons and electromagnetic waves (spring 1998).

At Orsay university (Paris):

18. Quantum mesoscopic physics (spring 1999).

At Yale university:

19. Quantum mesoscopic physics of electrons and photons (spring 2008)

20. Atom-Photon interactions (spring 2009-spring 2013)

Professional activities

1. Scientific consultant at the department of physics, Weizmann Institute (1992)

2. International editor of the Journal de Physique (France),1993-1997.

3. Member of the Technion committee for undergraduate and graduate studies (2001-2003)

4. Member of the ISF grant committee (3 years)

5. Member (elected) of the Senate Technion committee for promotion and tenure of faculty members (2006-07; 2010-)

6. Member of the European Research Council (ERC) scientific committee 2007-2011, 2012, 2013, 2019-21

7. Member of the Fulbright committee (2014)

8. Vice Chairman of the Physics Department in charge of the graduate studies (2016-)

9. Chairman of the ISF grant committee (2017, 2018)

Awards and Honors

1. Lady Davies postdoctoral fellowship (1990)

2. Rachi fellowship (1991)

3. Outstanding Technion teacher for the academic years 2003 and 2006.

4. Chair "Paris-Science" attributed by the city of Paris for the year 2007.
This chair is awarded once a year for recognition in the field of exact sciences.

5. Muriel and David Jacknow Award for excellence in teaching (2008)

6. Recipient of the ELOP chair in Electro-Optics (2013)

Graduate Students:

1. Dominique Bicout: PhD thesis (University of Grenoble 1992); Multiple scattering of light in hydrodynamic flows.

2. Romanas Narevich: PhD Student (Technion,1997); Some properties of the magnetic response of mesoscopic quantum systems.

3. Yehuda Roth: PhD thesis (Technion, 1995); Induced currents in thin samples in the quantum Hall regime.

4. Nir Gov: PhD thesis (Technion,1998); Superfluidity in constrained systems . Superfluid transition in the presence of disorder.

5. Dimitri Gangardt: M.Sc (Technion, 1995); Semiclassical description of the excitations of a Fermi liquid within the random phase approximation.

6. Dominique Spehner (french cooperation, 1997-98): Distribution function of Chern numbers on fractal structures. Semiclassical description of edge states in quantum Hall systems.

7. Dimitri Gangardt PhD (Technion, 2001);
Effects of interactions in mesoscopic systems.

8. Maria Kouchnir, M.Sc. (Technion, 2005);
Mesoscopic transport of spin s particles.

9. Amos Schtalheim, M.Sc. (Technion, 2006);
Topological defects in the Cholesteric-Nematic transition in liquid crystals.

10. Ohad Assaf, PhD (Technion, 2007);
Intensity correlations in the multiple scattering of light by cold atomic gases.

11. Aharon Gero, PhD, (Technion, February 2008);
Atom-photon interactions in dense cold atomic gases.
Localization transition of photons and super- and sub-radiance.

12. Moshe Diamant, M.Sc. (Technion), May 2010;
Energy corrections in coherent backscattering for electromagnetic waves.

13. Ariane Soret, M.Sc. project (Ecole Normale Superieure de Cachan), 2015,
Wavepacket dynamics in fractal structures.

14. Eli Levy, PhD (Technion), July 2016;
Topological properties of quasi-periodic chains : structural and spectral analysis.

15. Ohad Spielberg PhD (Technion), July 2016
Non Equilibrium Statistical Mechanics: Electric Networks, Energy Forms and the Additivity Principle.

16. Tal Goren, PhD (Technion) , August 2016
Study of the Dynamics of Quantum Vacuum using Ramsey Interference.

17. Dor Gitelman, PhD (Technion), May 2017
Physical properties of self-similar systems - Applications to fractals and quasiperiodic tilings.

18. Omrie Ovdat PhD (Technion), July 2019
Efimov physics in condensed matter (graphene)

19. Ariane Soret, PhD (Ecole Polytechnique, France) co-advisor Prof. Karyn le Hur, September 2019,
Forces induced by coherent effects

Theses in progress

20. Yaroslav Don PhD (Technion), expected 2020
Topological Properties of Quasi-Periodic Tilings

21. Boris Timchenko, PhD (Technion), expected 2021
Energy fluctuations in boundary driven atomic and radiative systems

22. Amit Goft, MSc (Technion), expected 2019
Spin properties of vacancies in Graphene

23. Yuval Abulafia, MSc (Technion), expected 2020
Influence of STM measurement on graphene

24. Tom Shindelman, MSc (Technion), expected 2020
Space-time at the Plank scale as a non-Pisot quasi-periodic structure

Post Doctorate assistants

1. Kirone Mallick (Saclay, France), Mesoscopic superconductors (1997-99)

2. Sankalpa Gosh (Indian Institute of Technology), Vortices in Bose-Einstein condensates and localization of matter waves (2002-2005)

3. Venketeswara Pai, Zeno effect in quantum mesoscopic systems (2004-07)

4. Evgeni Gurevich, Quantum field theory in fractal systems (2011-2014)

Research grants

1. Relation between transport and spectral properties of mesoscopic quantum systems. ISF-Israel Academy for Sciences and Humanities (1994-1997)

2. Transport and thermodynamics in mesoscopic graphs- France-Israel "Arc en ciel" fellowship (2000)

3. Quantum mesoscopic physics on networks, France-Israel "Arc en ciel" fellowship (2001-2002)

4. Instability of vortices in mesoscopic superconductors- Poznanski fellowship (Technion) (2001-2002)

5. Vortices in mesoscopic superconductors and dynamical properties- ISF-Israel Academy for Sciences and Humanities (2001-2004)

6. Mesoscopic physics of photons in cold atomic gases. ISF-Israel Academy for Sciences and Humanities (2004-2007)

7. Mesoscopic physics of photons in cold atomic gases : enhanced photon correlations-Anderson localization and Dicke superradiance. ISF-Israel Academy for Sciences and Humanities (2007-2010)

8. Scattering description of entropy and information in quantum mesoscopic systems. ISF-Israel Academy for Sciences and Humanities (2010-2013)

9. QED with a fractal quantum vacuum : In- and Out- of equilibrium properties ISF-Israel Academy for Sciences and Humanities (2013-2017)

10. Topological Properties of Quasi-periodic Chains and Quasicrystals, Eric Akkermans and Eli Levy, PAZY foundation research grant (2017-2021)

11. 2018 Ruch Exchange Grant from the Jacobs Technion-Cornell Institute (together with Prof. Robert Strichartz, Maths, Cornell)

Publications

A. PhD thesis:
Contribution to the propagation of waves in disordered systems.

Papers in professional journals :

Published papers:

1. E.Akkermans and R.Maynard, Chains of random impedances; J. Physique (France) **45** (1984), 1549-1557

2. R. Maynard and E. Akkermans, Thermal conductance and giant fluctuations in one-dimensional disordered systems, Phys. Rev. **B32** (1985), 5440-5442

3. E. Akkermans and R. Maynard, Weak localization and anharmonicity of phonons; Phys. Rev. **B32** (1985), 7850-7862

4. E. Akkermans, O. Laborde and J.C. Villegier, Superconducting properties and phase locking transition in NbN films; Solid State Comm. **56** (1985), 87-89

5. M.J. Stephen and E. Akkermans, Transport properties of an incommensurate system; Phys. Rev. **B33** (1986), 3837-3843

6. E. Akkermans and R. Maynard, Weak localization of waves;
J. Physique Lett. (France), **46** (1985),L-1045-1053

7. E. Akkermans, P.E. Wolf, and R. Maynard, Coherent backscattering of light by disordered media: Analysis of the peak line shape,
Phys. Rev. Lett. **56** (1986), 1471-1474

8. E. Akkermans, G. Maret, R. Maynard and P.E. Wolf, Retrodiffusion coherente de la lumiere par un milieu desordonne; Images de la Physique,
Editions du CNRS (1987), 7-11

9. P.E. Wolf, E. Akkermans, G. Maret and R. Maynard, L'art subtil de pieger la lumiere; La Recherche **193** (1987), 1396-1398

10. P.E. Wolf, G. Maret, E. Akkermans and R. Maynard, Optical coherent backscattering by random media: An experimental study,
J. de Physique (France), **49** (1988), 63-75

11. E. Akkermans, P.E. Wolf, R. Maynard and G. Maret, Theoretical study of the coherent backscattering of light by disordered media,
J. de Physique (France), **49** (1988), 77-98

12. P.A. Mello, E. Akkermans and B. Shapiro, Macroscopic approach to correlations in the electronic transmission and reflection from disordered conductors,
Phys. Rev. Lett. **61** (1988), 459-462

13. E. Akkermans, Universal fluctuations and long range correlations for wave propagation in random media; Physica **A157** (1989), 101-110

14. E. Akkermans and B. Shapiro, Fluctuations in the diamagnetic response of disordered metals; Europhys. Lett. **11** (1990), 467-472

15. E. Akkermans, A. Auerbach, J.E. Avron and B. Shapiro, A relation between persistent currents and the scattering matrix, Phys.Rev.Lett.**66** (1991),76-79

16. D. Bicout, E. Akkermans and R. Maynard , Dynamical correlations for multiple light scattering in laminar flows, J. de Physique (France), **I1** (1991) 471-491

17. E. Akkermans, Scattering phase shift analysis of persistent currents in mesoscopic Aharonov-Bohm geometries, Europhys.Lett. **15** (1991) 709-714

18. E. Akkermans and G.Montambaux, Conductance and statistical properties of metallic spectra, Phys.Rev.Lett.**68** (1992) 642

19. E. Akkermans, The Thouless formula: from disordered to chaotic spectra, Physica **A200** (1993), 530-537.

20. H. Shechter, E. Akkermans and E. Tsidilkovski, Can polyatomic molecules behave as nanostructured materials ?, Nanostructured Materials vol.6 (1995), 369-372.

21. E. Akkermans, Twisted boundary conditions and transport in disordered systems, J. Math. Phys. **38** (1997) 1781-1793

22. E. Akkermans, J. Avron, R. Narevich and R. Seiler, Boundary conditions for bulk and edge states in Quantum Hall systems, cond-mat/9612063, Eur.Phys.J.**B1**, (1998), 117-121

23. E. Akkermans and Jean Louis Pichard, Level curvatures, spectral statistics and scaling for interacting particles, cond-mat/9706267, Eur.Phys.J.**B1**, (1998) 223-227

24. D. Spehner, R. Narevich and E. Akkermans, Semi-classical spectrum of integrable systems in a magnetic field, cond-mat/9708206, J. Phys. **A 31**, (1998) 6531-6545

25. E.Akkermans and R. Narevich, chiral boundary conditions for quantum Hall systems, Philosophical Magazine **B 77**, cond-mat/9709322, (1998) 1203-1211

26. R. Narevich, D. Spehner and E. Akkermans, Heat kernel of integrable billiards in a magnetic field, cond-mat/9708209, J. Phys. **A 31**, (1998), 4277-4287

27. N.Gov and E.Akkermans, Hybridization scheme for the quasi-particle spectrum of superfluid ^{4}He, Physica **B 263-264** (1999) 367-369

28. E. Akkermans and K. Mallick, Vortices in Ginzburg-Landau billiards, cond-mat/9812275, J.Phys.**A 32**, (1999) 7133-7143

29. E.Akkermans and K. Mallick, Magnetization of mesoscopic superconducting disks, cond-mat/0001219, Physica **C 332**, (2000) 250-254

30. E. Akkermans, A. Comtet, J. Desbois, G. Montambaux and C. Texier, Spectral determinant on quantum graphs, cond-mat/9911183,
Annals of Physics **284**, (2000) 10-51

31. E.Akkermans, D. Gangardt and K. Mallick, A dual point description of mesoscopic superconductors, cond-mat/0005542, Phys. Rev.**B62**, (2000) 12427-12439

32. E.Akkermans, D. Gangardt and K. Mallick, Mesoscopic superconductors in the London limit: equilibrium properties and metastability, cond-mat/0008289,
Phys. Rev.**B63**, (2001) 064523

33. E. Akkermans and G. Montambaux, Coherent effects in the multiple scattering of light in random media, Advanced study institute on "Wave in complex media",
B. van Tiggelen and S. Skipetrov eds., Kluwer (2003).

34. E. Akkermans and G. Montambaux, Mesoscopic physics of photons,
J. of Opt. Soc. of America B **21**, (2004) 101-112

35. E. Akkermans and S. Ghosh, Vortex nucleation through edge states in finite Bose-Einstein condensates, J. Phys. **B** 37, (2004) 127-139

37. S. Roche, E. Akkermans, O. Chauvet, F. Hekking, J-P. Issi, R. Martel,
G. Montambaux and P. Poncharal, Quantum transport in disordered conductors,
"Nanotubes: Science and Applications ", Eds. A. Loiseau, P. Launois,
P. Petit, S. Roche, J.P. Salvetat (Springer Verlag-Frontiers in Physics, 2004)

38. G. Montambaux and E. Akkermans, Non exponential quasiparticle decay and phase relaxation in low dimensional conductors, cond-mat/040436,
Phys. Rev. Lett. **95**, (2005) 016403

39. C.A. Müller, Ch. Miniatura, E. Akkermans and G. Montambaux, Mesoscopic scattering of spin s particles, cond-mat/0504175, J.Phys.**A 38**, (2005) 7807-7830

40. A. Gero and E. Akkermans, Effect of superradiance on transport of diffusing photons in cold atomic gases, Phys. Rev. Lett. **96**, (2006) 093601

41. O. Assaf and E. Akkermans, Intensity correlations and mesoscopic fluctuations of diffusing photons in cold atoms, arXiv:cond-mat/0610804,
Phys. Rev. Lett. **98**, (2007) 083601-1

42. A. Gero and E. Akkermans, Superradiance and multiple scattering of photons in atomic gases, arXiv:0704.3522, Phys. Rev. A **75**, (2007) 053413

43. E. Akkermans and O. Assaf, Multiple scattering of photons by a cold atomic gas, J. Mod. Opt. **54**, (2007) 2541-2550

44. E. Akkermans and O. Assaf, Correlation of diffusing photons and level crossing spectroscopy, Europhys.Lett. **81** 24002 (2008)

45. E. Akkermans, S. Ghosh and Z. Musslimani, Numerical study of one-dimensional and interacting Bose-Einstein condensates in a random potential, arXiv:cond-mat/0610579, J.Phys. B: At. Mol. Opt. Phys. **41**, 045302 (2008)
Selected as highlights in europhysicsnews, vol 39, no. 3, page 20 (2008)

46. E. Akkermans and O. Assaf, Reply to Comment, Phys. Rev. Lett. **100**, 199302 (2008)

47. S. Fiebig, C.M. Aegerter, W. Bührer, M. Störzer, E. Akkermans, G. Montambaux and G. Maret, Conservation of energy in coherent backscattering of light, Europhys.Lett. **81**, 64004 (2008)

48. E. Akkermans, S. Ghosh and Z. Musslimani, A new algorithm to study solitons in disordered quantum systems, Europhysics news, vol 39, no. 3, 20 (2008)

49. E. Akkermans, A. Gero and R. Kaiser, Photon localization and Dicke superradiance in atomic gases, Phys. Rev. Lett. **101**, 103602 (2008)

50. E. Akkermans, Transmission of information through mesoscopic scattering systems, Eur. Phys. J. E **28**, 199-204 (2009)

51. E. Akkermans, G.V. Dunne and A. Teplyaev, Physical consequences of complex dimensions of fractals, Europhys.Lett. **88**, 40007 (2009)

52. E. Akkermans, G.V. Dunne and A. Teplyaev, Thermodynamics of photons on fractals, Phys. Rev. Lett. **105**, 230407 (2010)

53. E. Akkermans and G.V. Dunne, Ramsey Fringes and Time-domain Multiple-Slit Interference from Vacuum, Phys. Rev. Lett. **108**, 030401 (2012), Editor's choice

54. E. Akkermans, O. Benichou, G. Dunne, A. Teplyaev and R. Voituriez, Spatial Log Periodic Oscillations of First-Passage Observables in Fractals, arXiv:1207.3298, Phys. Rev. E **86**, 061125 (2012)

55. E. Akkermans, Statistical Mechanics and Quantum Fields on Fractals, in "Applications of Fractals and Dynamical Systems in Science and Economics", Contemporary Mathematics
Volume 601, 2013, http://dx.doi.org/10.1090/conm/601/11962

56. E. Akkermans and A. Gero, Cooperative effects in one-dimensional random atomic gases: Absence of the single atom limit, Europhys. Lett. **101**, 54003 (2013)

57. Eric Akkermans, Thierry Bodineau, Bernard Derrida and Ohad Shpielberg, Universal current fluctuations in the symmetric exclusion process and other diffusive systems, Europhys. Lett. **103**, 20001 (2013), Editor's choice

58. E. Akkermans, E. Gurevich, Spontaneous Emission from a Fractal Vacuum, Europhys. Lett. **103**, 30009 (2013), Editor's choice

59. A. Gero and E. Akkermans, Cooperative effects and photon localization in atomic gases:

The two-dimensional case, Phys. Rev. A **88**, 023839 (2013)

60. D. Tanese, E. Gurevich, F. Baboux, T. Jacqmin, A. Lematre, E. Galopin, I. Sagnes, A. Amo, J. Bloch and E. Akkermans,
Fractal Energy Spectrum of a Polariton Gas in a Fibonacci Quasiperiodic Potential,
Phys. Rev. Lett. **112**, 146404 (2014)

61. L. Bellando, A. Gero, E. Akkermans and R. Kaiser, Cooperative effects and disorder:
A scaling analysis of the spectrum of the effective atomic Hamiltonian,
Phys. Rev. A **90**, 063822 (2014)

62. E. Levy, A. Barak, A. Fisher and E. Akkermans, Topological properties of Fibonacci quasicrystals : A scattering analysis of Chern numbers, arXiv:1509.04028v2,
submitted to Phys. Rev. Lett. (2016)

63. O. Shpielberg and E. Akkermans, Le Chatelier principle for out of equilibrium and boundary driven systems : application to dynamical phase transitions,
Phys. Rev. Lett. **116**, 240603 (2016)

64. A. Dareau, E. Levy, M. Bosch Aguilera, R. Bouganne, E. Akkermans, F. Gerbier and J. Beugnon, Revealing the Topology of Quasicrystals with a Diffraction Experiment,
Phys. Rev. Lett. **119**, 215304 (2017), Editor's suggestion

65, F. Baboux, E. Levy, A. Lemaître, E. Galopin, L. Le Gratiet, I. Sagnes, A. Amo, J. Bloch and E. Akkermans, Measuring topological invariants from generalized edge states in polaritonic quasicrystals, Phys. Rev. **B 95**, 161114(R) (2017)

66. E. Levy, E. Akkermans, Topological Boundary States in 1D: An Effective Fabry-Perot Model, Eur. Phys. J. Special Topics 226, 15631582 (2017)

67. Ohad Shpielberg, Yaroslav Don and Eric Akkermans, Numerical study of continuous and discontinuous dynamical phase transitions for boundary-driven systems,
Phys. Rev. E 95, 032137 (2017)

68. Tal Goren, Karyn Le Hur and Eric Akkermans, Ramsey Interferometry of Particle-Hole Pairs in Tunnel Junctions, arXiv:1611.06738, submitted to Phys. Rev. B. (2017)

69. O. Ovdat, Jinhai Mao, Yuhang Jiang, E. Y. Andrei and E. Akkermans,
Observing a Scale Anomaly And a Universal Quantum Phase Transition in Graphene,
Nature Communications DOI: 10.1038/s41467-017-00591-8, 8-507, 2017

70. Daniel K. Brattan, Omrie Ovdat, Eric Akkermans, Scale anomaly of a Lifshitz scalar:
a universal quantum phase transition to discrete scale invariance, arXiv:1706.00016,
Phys. Rev. **D 97**, 061701(R) (2018)

71. Daniel K Brattan, Omrie Ovdat, Eric Akkermans, J. Phys. A: Math. Theor. 51 435401,
https://doi.org/10.1088/1751-8121/aadfae (2018)

72. Omrie Ovdat, Yaroslav Don and Eric Akkermans,
Vacancies in Graphene : Dirac Physics and Fractional Vacuum Charges, arXiv:1807.10297
submitted for publication to Phys. Rev. Lett. (2018)

73. Ariane Soret, Karyn Le Hur and Eric Akkermans,
Fluctuating Forces induced by Non Equilibrium and Coherent Light Flow,
arXiv:1902.11096 , under review in Phys. Rev. Lett., 2019

74. L. Bellando, A. Gero, E. Akkermans and R. Kaiser,
Roles of cooperative effects and disorder in photon localization:
The case of a vector radiation field, arXiv:1906.06966, to be published in Phys. Rev. A, 2019

75. Omrie Ovdat and Eric Akkermans,
The breaking of continuous scale invariance to discrete scale invariance:
a universal quantum phase transition, arXiv:1909.05505,
Contribution to the conference 'Fractal Geometry and Stochastics 6' proceedings

Review papers and chapters in books:

76. R. Maynard, E. Akkermans and P.E. Wolf, Coherent backscattering and weak localization phenomena in optics and in metals: Analogies and differences, in "Chance and matter" Les Houches Summer School (session XLVI), North Holland (1986).

77. E. Akkermans and K. Mallick, Geometrical description of vortices in Ginzburg-Landau billiards, in " Topological Aspects of low dimensional systems." Les Houches Summer School (session LXIX), Springer (1999).

78. E. Akkermans and G. Montambaux, Coherent multiple scattering in disordered media, Advanced study institute on "Wave and Imaging
through Random Media", Kluwer (2001).

79. E.Akkermans and K. Mallick, Geometrical description and integrability of Ginzburg-Landau equations, Advanced study institute on
"Partial differential equations in models of superconductivity,
superfluidity and reactive flows ", Birkhauser (2001).

80. E. Akkermans, G. V. Dunne, and E. Levy, Wave propagation in one-dimension: Methods and applications to complex and fractal structures, to be published in "Optics of Aperiodic Structures: Fundamentals and Device Applications",
L. dal Negro ed., Pan Stanford Publishing, (2013)

Books:

81. E. Akkermans, G. Montambaux, J.L. Pichard and J. Zinn-Justin, (editors)
Quantum Mesoscopic Physics, Les Houches session LXI, North Holland (1995).

82. E.Akkermans and G. Montambaux, Physique mésoscopique des électrons et des photons, (628 pages) CNRS-Interéditions (2004)

83. E.Akkermans and G. Montambaux, Mesoscopic physics of electrons and photons, (653 pages), Cambridge University Press (2007)

Endorsements by recognized scientists working in the field and reproduced on the back cover of the book:

1. The many analogies as well as the differences between electrons and photons in random media are very instructive. The presentation is well balanced between the development of techniques and the building of intuition. This is the type of book from which one can learn the subject even without a teacher.

Carlo Beenakker, Leiden University.

2. Systems which exhibit quantum interference are of increasing interest. This book is probably the most extensive effort thus far to provide an introduction and overview of wave transmission through objects with many scattering centers. The authors treat both multiple scattering of electrons and photons. A unified approach to these wave phenomena takes the reader from an introductory graduate level up to the full command of multiple scattering theory. Among the many subjects which are treated, the chapters on dephasing, on the effect of weak interactions and on orbital magnetism will be especially appreciated.

Markus Buttiker, Geneva University

3. This is the first graduate level book on mesoscopic physics providing a thorough explanation of the link between classical Brownian motion and effects associated with the interference of quantum waves propagating in disordered media. By covering both the case of photon and electron waves, it offers a deep perspective on why and how mesoscopic interference effects can be robust to disorder, and how decoherence, on the other hand, is the killer of these phenomena. The book is also unique in equipping the reader with a powerful, complete, and yet very intuitive, diagrammatic tool box for computing all quantities of interest for mesoscopic physics problems dealing with diffusive, weakly-interacting particles.

Michel Devoret, Yale University

4. This treatise uses a unified treatment of wave propagation in disordered media, emphasizing the finite system, mesoscopic aspects. This is valid for both photons and electrons and the salient features for both cases are discussed. Thus the book will be useful to both opticians and researchers interested in nanoelectronic devices. Applications to cold-atom and BEC systems can also be visualized. This book is highly recommended to members of these communities.

Joe Imry, Weizmann Institute for sciences

5. I like the book very much. It is a complete introduction to the field of mesoscopic physics. Electrons and light, for the first time ever, are treated in a fully unified way. The book is not a mere introduction to this discipline but also treats a large number of valuable, advanced concepts. Through

all of the book a very pleasant and consistent notation has been maintained, which contributes greatly to its didactic value. Read the book and you know what is going in this important, modern branch of physics. It is clear that the author know the field, to which they both have made important contributions, very well. It is all there: conductance fluctuations, coherent backscattering, Hikami boxes, speckle correlations and much more. Some topics included necessarily only pertain to electrons (electron-electron interaction, for instance) or to light (diffusing wave spectroscopy, for instance) . Invaluable to anybody already working in the field, but also highly recommended for newcomers.

A. Lagendijk, University professor, Amsterdam

Invited Talks at Conferences and Workshops.

1. Waves localization in disordered media, Annual conference of the French Physical Society, Nice (1985)

2. Anharmonicity and Weak localisation of Phonons, 5th Int. Conference on phonon scattering in condensed matter, June 1986, Urbana (IL).

3. Coherent Backscattering and weak localisation phenomena in optics and in metals: Analogies and differences.Les Houches Summer School, Chance and Matter (1986) (see ref.40).

4. Coherent Backscattering of waves in disordered systems, Workshop on non-linear and disordered systems, Tucson (AZ), January 1987.

5. On the Anderson transition for electromagnetic waves in disordered systems. Workshop on disordered systems, Carry le Rouet (France), May 1987

6. Time dependent correlations for multiple scattering of waves, Int. Workshop on novel phenomena in mesoscopic systems, Rehovot, July 1988.

7. Universal fluctuations and long range correlations for wave propagation in random media, ETOPIM 2, Second International Conference on electrical transport and optical properties of Inhomogeneous media, August 29-September 2 (1988), Paris (see ref.13).

8. Fluctuations of the Landau diamagnetic susceptibility in disordered metals, The 3-d Bar Ilan conference on " Frontiers in condensed matter physics", January 8-11, 1990.

9. Scattering description of persistent currents, Workshop on Mesoscopic physics, Santa Barbara, University of California, April 1991.

10. Electrical conduction and statistical properties of metallic spectra, Annual conference of the Israel Physical Society, Rehovot, April 1992.

11. The Thouless formula: A relation between transport properties and persistent currents; The 4th international Bar Ilan conference on " Frontiers in condensed matter physics", March 1993 (see ref.19).

12. Universality in the spectra of disordered and chaotic systems submitted to Aharonov-Bohm boundary conditions; Workshop on quantum chaos, Como (Italy), July 1993.

13. Adiabatic description of longitudinal and Hall conductances in Mesoscopic systems; International Symposium Chaos and Mesoscopic Systems, Dresden (Germany), June 7-10, 1994.

14. Thouless description of disordered superfluid; European Research conference on Bose-Einstein condensation, Strasbourg (France), June 16-21,1995.

15. Semiclassical theory of interacting electrons, Conference Israel-France on Chaos and Mesoscopic physics, Paris (France), October 22-29, 1995.

16. Statistical properties of the spectrum of many body systems, XXXI rencontres de Moriond, France, January 20-27, 1996 (see ref.46).

17. Curvature description of transport in disordered and interacting mesoscopic systems, workshop on Quantum chaos and transport in mesoscopic systems, University of California at Santa Barbara, March 1996.

18. Curvature description of transport in disordered and interacting mesoscopic systems, Midwest Solid State Theory Symposium, University of Chicago, April 1996.

19. The Bose-Einstein condensation in condensed matter and atomic physics, Symposium on dark matter and atomic traps, Tel Aviv University, May 1996.

20. Chiral boundary conditions for bulk and edge states in Quantum Hall systems, Minerva workshop on Mesoscopics, fractals and neural networks, Eilat, Israel, March 1997 (see ref.25).

21. Twisted boundary conditions for interacting systems and Anderson insulators, Bi-National Japan-Israel workshop on Interaction and disorder in Low-Dimensional electronic systems, Beer Sheva, Israel, May 1997.

22. Chiral boundary conditions for confined Quantum systems in a magnetic field. Workshop on transport through electron condensates, Haifa, Israel, May 1997.

23. Chiral boundary conditions for bulk and edge states in Quantum Hall systems, Conference on Magnetic Schrodinger Operators, Berlin, September 1997.

24. Topological features of the magnetic response in inhomogeneous magnetic fields, Workshop on Supersymmetry and Trace formulae, Newton Institute, Cambridge (UK), September 1997 (see ref. 47).

25. Hybridization of localized and density modes for the spectrum of superfluid ^{4}He, Annual conference of the Israel Physical Society, Rehovot, April 1998.

*26. Lecture series on "Geometrical description of vortices in mesoscopic superconductors", in " Topological Aspects of low dimensional systems." Les Houches Summer School, July 1998 (ref. 41).

27. Geometry and condensed matter physics, Topical presentation, Annual meeting of Statistical Physics (Paris), Paris, January 1999.

28. Duality in two-dimensional Ginzburg-Landau equations, workshop on non linear partial differential equations, Ecole Normale Supérieure, Paris, February 1999.

*29. Lecture series on "Geometrical description and integrability of Ginzburg-Landau equations", Advanced study institute on "Partial differential equations in models of super-conductivity, superfluidity and reactive flows ", Cargèse, June 1999 (ref.43).

*30. Lecture series on "Coherent diffusion in disordered media",
Advanced study institute on "Wave and Imaging through Random Media" ,
Cargèse, September 1999 (ref.42).

31. Geometrical description of Ginzburg-Landau vortices,
Annual conference of the Israel Physical Society, Technion, April 2000.

32. Spectral determinant on quantum graphs, Conference on "Spectral and transport properties of random networks models", Gottingen (Germany) December 2000.

33. Mesoscopic phenomena in wave physics, workshop on "Wave physics in cold atomic gases", Grasse (France) February 2001.

34. Spectral determinant on quantum graphs: a path-integral approach, The 7th Gentner Symposium on Quantum Chaos, Ein Gedi, Israel (March 2001)

35. Coherent multiple scattering of waves in random media, International Workshop on Coherent evolution in noisy environments, Dresden, Germany (May 2001)

36. Mesoscopic quantum graphs, INFMeeting 2001, Rome (June 2001)

*37. Lecture series on "Coherent effects in the multiple scattering of light in random media", Advanced study institute on "Wave in complex media", Cargèse, June 2002

*38. Lecture series on "Quantum mechanics for nanoobjects",
Nanosciences, Les Houches (Sept. 2003)

39. Mesoscopic effects in the propagation of photons in random media, PIERS 2004, Progress in electromagnetics research symposium, Pisa (Italy) March 2004.

40. Anderson localization of photons and mesoscopic effects in cold atomic gases, FRISNO Eilat February 2005.

41. Correlation in speckle patterns: from mesoscopic metals to cold atomic gases, International meeting on mesoscopic physics and cold atoms, Orsay March 2005.

42. Localization of light, Workshop on quantum mesoscopic physics,
Aussois, France September 2005.

43. Photon localization and mesoscopic effects in cold atoms, Annual meeting
of the Optical Society of America, Tucson October 2005.

44. Metamaterials I, Satellite conference of the Optical Society of America,
The Bahamas, June 2006.

45. 37th Winter Colloquium on the Physics of Quantum Electronics, PQE-2007
Snowbird, Utah, January 2007

46. Metamaterials II, Satellite conference of the Optical Society of America,
Jackson Hole, Wyoming, June 2007

47. 38th Winter Colloquium on the Physics of Quantum Electronics, PQE-2008,
Snowbird, Utah, January 2008 (Plenary talk).

48. New England Mesoscopic Systems Symposium, Wesleyan University (USA), October 2008.

49. 39th Winter Colloquium on the Physics of Quantum Electronics, PQE-2009,
Snowbird, Utah, January 2009 (Plenary talk).

50. Frontiers of Soft Condensed Matter 2009, Workshop of the International Research
Training Group "Soft Condensed Matter Physics of Model Systems"
Les Houches, February 2009

51. 40th Winter Colloquium on the Physics of Quantum Electronics, PQE-2010,
Snowbird, Utah, January 2010 (Plenary talk).

52. International workshop on "Casimir, van der Waals and nanoscale interactions",
Les Houches, April 2010

53. Research workshop on Statistical mechanics and quantum transport : from optics to biology.
Technion, May 2010

54. 41st Winter Colloquium on the Physics of Quantum Electronics, PQE-2011,
Snowbird, Utah, January 2011

55. Recent developments in wave physics of complex media, IESC-Cargese,
France, May 2d-7th, 2011

56. International workshop on dynamical Casimir effect, Padova,
Italy, 6-8 June 2011

57. Frontiers of Quantum and Mesoscopic Thermodynamics 2011(FQMT'11),
Prague, July 25 - 30, 2011

58. Analysis, Probability and Mathematical Physics on Fractals, Cornell, September 10-13, 2011,

AMS 2011 Fall Eastern Sectional Meeting

59. Optics of excitons in confined systems, OECS12 Conference, Paris, September 12th to 16th 2011

60. Special session "Fractal geometry in pure and applied mathematics (in memory of Benoit Mandelbrot) " at the 2012 Joint Mathematics Meetings, Boston January 2012

61. International workshop on "Fractal Geometry and Dynamical Systems: Applications to Physics and Biology" , UC Riverside (California, USA) June 19-22, 2012 (declined)

62. International Workshop on "Quantum transport and quantum effects in photosynthetic systems", Brescia, Italy September 2012 (declined)

63. American Physical Society March meeting, Baltimore March 18-22, 2013

64. International workshop on "Transport in Open Quantum Systems: Experiment and Theory" Porquerolles, France, May 2013.

65. Statistical Mechanics Day, Weizmann Institute of Sciences, Israel, June 2013.

66. Quantum Spectra and Transport, the Hebrew University of Jerusalem, Israel, July 2013.

67. Frontiers of Quantum and Mesoscopic Thermodynamics 2013 (FQMT'13), Prague, July 29 - August 3, 2013

68. "Frontiers in Mesoscopic Physics", Mont-Orford, Quebec, Canada, September 16-27, 2013

69. Statistical Mechanics Conference, (the 110th), Rutgers University, USA December 2013

70. QBIT-symposium, Technion Haifa Israel, March 17-19, 2014, (http://events-tce.technion.ac.il/qubit-symposium/)

71. 5th Cornell Conference on Analysis, Probability, and Mathematical Physics on Fractals, Cornell, NY, USA June 11-15, 2014

72. "Nonequilibrium Statistical Physics of Complex Systems", 6th KIAS conference on statistical physics, Seoul (Korea) July 8-11, 2014

73. "ISF international Research Workshop on "Non-Hermitean Random Matrices: 50 Years After Ginibre" , Yad Hashmona (Judean Hills, Israel), October 22-27, 2014

74. Harvard University HQOC/ITAMP seminar, October 2015

75. "Geometry and dynamics of quasiperiodic structures" , Paris Nov.30-Dec.1 2015.

76. "Cooperative Scattering of Light: from Microsopic to Macroscopic Scales" Ubatuba, Sao Paulo state, Brazil, May 9-12 2016 (declined).

77. "Transversal Aspects of Tilings", Oleron (France), 30 May-24 Jun 2016.

78. "60 years of Interacting Electrons and Quantum Magnetism", Technion,Haifa, Israel, June 21-24, 2016.

79. "Strongly disordered optical systems: from the white paint to cold atoms" Institute of Scientific Studies Cargese (Corsica, France), Sept. 26-30, 2016

80. "Nobel Prize day", Nice, France, Dec. 2, 2016

81. Statistical Mechanics Day IX meeting, Weizmann Institute for Science, Israel, December 13, 2016

82. Statistical Mechanics Conference, the 116th, Rutgers University, (NJ, USA) December 18 - 20, 2016

83. Roger Maynard memorial workshop, Grenoble, France, March 10-11, 2016

84. 6th Conference on Analysis, Probability and Mathematical Physics on Fractals, Mathematics Department, Cornell University (NY, USA), June 13-17, 2017

85. Frontiers of Quantum and Mesoscopic Thermodynamics 2017 (FQMT'17), Prague, July 9-15, 2017

86. AMO Workshop, National Center for Theoretical Sciences (NCTS), Taiwan, Aug. 22-25, 2017

87. Spectral Structures and Topological Methods in Mathematical Quasicrystals, Oberwolfach Workshop ID 1740, October 1-7, 2017

88. Correlations, Fluctuations and anomalous transport in systems far from equilibrium, Weizmann Institute for Science, Israel, Dec. 31.2017 Jan.12.2018

89. First European Asymmetry Symposium, Nice, France, 15-16 March, 2018

90. Waves in Complex Photonics Media: Fundamentals and Device Applications Anacapri, Island of Capri, Italy, June 4 - 7, 2018

91. Fractal Geometry and Stochastics 6', Bad Herrenalb (Black Forest) Germany, 30 Sept. - 5 Oct., 2018

92. SCAM, Laboratoire d'Analyse et de Mathmatiques Appliques, CNRS UMR 8050, Paris, January 24, 2019

93. CECAM, Condensed Matter Analogies in Mechanics, Optics and Cold Atoms, Tel Aviv, April, 01-04, 2019

94. Interaction of Light with Cold Atoms, ICTP-SAIFR, So Paulo, Brazil, Sept.16-27, 2019

Contributed talks.

1. Chains of random impedances, Localisation, Interaction, and Transport

phenomena, Braunschweig (RFA), August 23-28 (1984).

2. Annual meeting of Statistical Physics (Paris):
January 1984: Chains of random impedances.
January 1985: Fluctuations of the thermal conductance
in disordered systems.
January 1988: Anderson transition for the propagation
of waves in disordered systems.

3. Fluctuations of the Landau diamagnetic susceptibility in disordered metals. NATO ASI Conference on coherence effects in condensed matter systems. Les Arcs (France) 1990.

Papers in conference proceedings.

61. E. Akkermans and D. Gangardt, Statistical properties of the spectrum of many body systems, Proceedings of the Rencontres de Moriond, Correlated fermions and transport in Mesoscopic systems, T. Martin, G. Montambaux and J. Tran Than Van editors (frontieres 1996).

62. E. Akkermans and R. Narevich, Topological features of the magnetic response in inhomogeneous magnetic field,
Proceedings of the Workshop on Supersymmetry and Trace Formulae : Chaos and disorder, Newton Institute, Cambridge (UK), Lerner, Keating and Khmelnitskii eds. Kluwer Academic, Plenum Publishers, 315-325, (1999).

Organization of conferences

1. Session organizer in the conference : Quantum Physics Electronics (QPE)-2008, Snowbird, Utah, January 2008

2. Scientific organizer of the conference in the honour of Roger Maynard for his 65th birthday with the participation of P. Nozieres, G. Deutscher, M. Fink, D. Esteve, A. Lagendijk and G. Maret, Grenoble, February 2003.

3. Scientific organizer of the workshop : " Topological defects and Ginzburg-Landau functionals." together with H. Brezis and F. Bethuel, Lorentz Center, Leiden university, March 2000.

4. Scientific director of the Condensed matter session of the Summer school of Les Houches (Summer 1994).

5. ISF Research workshop on "Statistical mechanics and quantum transport : from optics to biology", Technion, Haifa Israel, May 2010

6. ISF Research workshop on "Waves and quantum fields on fractals", Technion, Haifa Israel, 26-30, June 2011

7.JMC15 Minicolloquium, Topological Properties of Quasicrystalline Structures, Bordeaux, France, Aug. 27-31, 2016