

# CURRICULUM VITAE

## Professor Eli Barkai

Passport: Israeli and British.

Marital status: Married, three children.

Current Address:

Department of Physics  
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## Academic Employment

2010 Professor, Department of Physics, Bar Ilan University.

Aug. 2008- Feb. 2009 Visiting scientist, Massachusetts Institute of Technology sabbatical with Prof. Silbey.

2007- Associate Prof. Department of Physics, Bar-Ilan University.

June-Aug. 2005 Visiting Professor, University of Notre Dame.

2004-2007 Senior Lecturer, Department of Physics, Bar-Ilan University.

2002-2005: Assistant Professor, Department of Chemistry and Biochemistry, University of Notre Dame.

1998-2002: Post-doctoral fellow at the School of Chemistry, Massachusetts Institute of Technology with Prof. Silbey.

## Higher Education

1995-1998: Ph.D. student, School of Physics and Astronomy, Dept. of Condensed Matter, Tel-Aviv University. Subject of thesis: “Generalized Collision Models Lévy Walk Approach”. Degree received *summa cum laude*.

1992-1994: M.Sc. student School of Physics and Astronomy, Dept. of Condensed Matter, Tel-Aviv University. Subject of thesis “From Mechanical Collisions To Brownian Motion”, Degree received *summa cum laude*.

1989-1991: B.Sc. in Physics, Tel Aviv University.

## Teaching Experience

1. Physics laboratory instructor for first year undergraduates, Tel-Aviv (1993 -1995).
2. Physics 1 (Mechanics) instructor for Chemistry undergraduates, Tel-Aviv (1995-1996).
3. Physics 2 (Electricity and Magnetism) instructor for Chemistry undergraduates, Tel-Aviv (1996).
4. Quantum Mechanics 1 and 2, instructor for Physics undergraduates, Tel-Aviv (1996-7).
5. Physics lab. coordinator for first year undergraduates, Tel-Aviv (1998).
6. Quantum Mechanics for Chemistry graduates, Notre Dame (2002,2003).
7. Statistical Mechanics for Chemistry graduates, Notre Dame (2004).
8. Stochastic Processes in Physics, Graduates Bar-Ilan (2004,2005,2008,2010).
9. Quantum Mechanics 1 and 2 for undergraduates, Physics Bar-Ilan (2004,2005,2006,2007).
10. Statistical Mechanics and Thermodynamics 1 and 2 for Physics under-graduates, Bar-Ilan (2009,2010).

## Experience and Skills

- Analytical: Modeling, non-linear analysis.
- Computational: Programming, symbolic programming (Mathematica), working in a Unix-environment.
- Managerial: As a reserve captain in the Israeli Defense Forces, I manage a group of 50 people coordinating and establishing working relations with internal and external parties.

- **Scientific referee** for *NSF (USA)*, *Israel Science Foundation*, *Phys. Rev. Lett.*, *Phys. Rev.*, *Proceeding of the National Academy of Science USA*, *Single Molecules*, *J. of Statistical Physics*, *Journal of Physics A: Mathematical and Theoretical*, *Chemical Physics*, *The Journal of Chemical Physics*, *The Journal of Physical Chemistry*, *Journal of Luminescence*, *physica status solidi*, *ChemPhysChem*, *Chemical Physics*, *Biophysical Journal*, *Europhysics Letters*, *J. of Computational Physics*, *New J. of Physics*, *Physica*, *Molecular Physics*, *Journal of Mathematical Physics*, *Journal of Statistical Mechanics: theory and experiment*, *Journal of the Royal Society Interface*, *Chaos, Fluctuation and Noise Letters*.

## Current and Pending Support

1. Start up package from Notre Dame university, 300000\$ (2002).
2. Petroleum Research Fund, Quantum Jump Approach to Single Molecule Spectroscopy, 35,000\$ (2004-5). PRF No. 40694-G6.
3. NSF Career: Theoretical Aspects of Single Molecule Spectroscopy: Control, Tracking, and Unraveling Dynamical Events in the Condensed Phase, 515000\$ (2004-2008) Award No. CHE-0344930.
4. Yeshiahu Horowitz Science of Complexity Fellowship (2004-2007).
5. Israel Science Foundation, Photon Statistics From a Single Molecule Source (10/2005-10/2008) 140000\$.
6. Joint research conference of the Institute of Advanced Studies (Hebrew University) and the Israel Science Foundation. Anomalous Diffusion and Relaxation: from single molecules to the flight of the Albatross, with I. Eliazar. (45000 \$) (2007).
7. Weak Ergodicity Breaking: Theory and Applications, Israel Science Foundation, grant 1239/08 (Oct. 2008-2012) 17400 Shekel (50000 \$) per year.
8. Workshop on anomalous diffusion and relaxation Office of Naval Research Global (15000 \$) (2008).
9. Bruno Memorial Award (120000 \$) (2009).
10. Workshop: Weak Chaos, Infinite Ergodic Theory, and Anomalous Dynamics. Max Planck Institute for complex systems, Dresden (July 2011) with R. Klages, H. Kantz and R. Zweimüller. 15000 euro + 800 persondays.
11. Partial support for workshop (see item [10] for details). Office of Naval Research Global (10000 \$) (2011).
12. From Lévy fluctuations to ergodicity breaking Israel Science Foundation with D. Kessler (submitted Oct. 2011).

## Awards and Academic Honors

1. Dean's list of distinguished M.Sc. students, 1994.
2. Receipt of M.Sc. *summa cum laude*.
3. Shenkar scholarship for excellence in graduate studies in, 1995.
4. The Salim and Rachel Bannin scholarship for excellence 1998.
5. Receipt of Ph.D. *summa cum laude*.
6. **Yeshiahu Horowitz Science of Complexity Fellowship** (2004).
7. **Krill prize for excellence in scientific research** selected by the Wolf Foundation (2006).
8. **The Michael Bruno Memorial Award** funded by Yad Hanadiv (2009).
9. **Friedrich Wilhelm Bessel Research Award** selected by the Alexander von Humboldt foundation (2011).
10. Ludwig Maximilians universität München Center for Nanoscience publication award (2011).

## Research Personnel and Visitors

Yong He (post-doc, research associate), Igor Rozhkuv (post-doc), Gennady Margolin (post-doc), Ren Yongqiang (graduate), Vladimir Protasenko (with Prof. Kuno), Golan Bel (research associate), Tzahi Peleg (graduate), Adi Rebenshtok (graduate, PhD), Stanislav Burov (PhD), Faina Shikerman (graduate), Tzvi Shemer (PhD), Adrain Budini (research associate), Michael Lomholt (visitor), Lior Turgeman (graduate) Nikolay Korabel (post-doc), Weihua Deng (research associate) Shai Carmi (research associate) Guy Milshtain (physics project), Nava Leibovish (graduate) Roberto Venegeroles (research associate), Andreas Dechant (visitor), Shimon Yudovich (summer undergraduate, graduate), Elad Bar (summer undergraduate) Daniela Froemberg (post-doc), Johannes Schulz (visitor), Erez Aghion (graduate), Lukasz Machura (visitor) Idan Niv (summer undergraduate).

## List of Publications

1. E. Barkai and V. Fleurov, *Simulating Brownian Type of Motion — The Rescaling Velocity Approach vs Langevin Approach* **Phys. Rev. E** 52, 137, (1995).
2. E. Barkai and V. Fleurov, *Brownian Type of Motion of a Randomly Kicked Particle Far and Close to the Diffusion Limit* **Phys. Rev. E** 52, 1558, (1995).
3. E. Barkai, R.S. Eisenberg and Z. Schuss, *Bi-Directional Shot Noise in a Singly Occupied Channel* **Phys. Rev. E** 54, 1161, (1996).
4. E. Barkai and V. Fleurov, *Dissipation and Fluctuation for a Randomly Kicked Particle: Normal and Anomalous Diffusion* **Journal of Chemical Physics** 212, 69-89, (1996).

5. E. Barkai and J. Klafter, *Crossover From Dispersive to Regular Transport in Biased Maps* **Phys. Rev. Lett.** *79*, 2245, (1997).
6. E. Barkai and V. Fleurov, *Lévy Walks and Generalized Stochastic Collision Models* **Phys. Rev. E.** *56*, 6355, (1997).
7. E. Barkai and J. Klafter, *Chaotic Biased Motion* **Physica A** *249*, 156, (1998).
8. E. Barkai and J. Klafter, *Deterministic Transport in Biased Maps: Crossover From Dispersive to Regular Transport* **Phys. Rev. E.** *57*, 5237, (1998).
9. E. Barkai and V. Fleurov, *Generalized Einstein Relation:- a Stochastic Modeling Approach* **Phys. Rev. E.** *58* 1296, (1998).
10. E. Barkai and J. Klafter, *Anomalous Diffusion in the Strong Scattering Limit - A Lévy Walk Approach* **Lecture Notes in Physics** S. Benkadda and G. M. Zaslavsky Ed. Chaos, Kinetics and Non-linear Dynamics in Fluids and Plasmas (Springer-Verlag, Berlin 1998) 373.
11. E. Barkai and J. Klafter, *Comment on: Sub diffusion and Anomalous Local Viscoelasticity in Actin Networks* **Phys. Rev. Lett.** *81*, 1134, (1998).
12. E. Barkai and V. Fleurov, *Stochastic one Dimensional Lorentz Gas on a Lattice* **Journal of Statistical Physics** *96*, 325 (1999).
13. R. Metzler, E. Barkai, and J. Klafter, *Anomalous Diffusion and Relaxation Close to Thermal Equilibrium: A Fractional Fokker-Planck Equation Approach* **Phys. Rev. Lett.** *82*, 3563 (1999).
14. R. Metzler, E. Barkai and J. Klafter, *Deriving fractional Fokker-Planck equations from a generalized master equation* **Europhys. Lett.** *46* (4) 431 (1999).
15. E. Barkai and R. Silbey *Distribution of Single Molecules Line Widths* **Chem. Phys. Lett.**, *310* 287 (1999).
16. R. Metzler, E. Barkai and J. Klafter, *Anomalous Transport in Disordered Systems Under the Influence of External Fields* **Physica A**, *266*, no.1-4, 343 (1999).
17. E. Barkai, V. Fleurov and J. Klafter *One-dimensional Lévy-Lorentz Gas* **Phys. Rev. E** *61* 1164 (2000).
18. E. Barkai and R. Silbey *Distribution of Variances of Single Molecules in a Disordered Lattice* **J. Phys. Chem. B** *104* 342 (2000).
19. E. Barkai, R. Metzler and J. Klafter, *From Continuous Time Random Walks to Fractional Fokker-Planck Equation* **Phys. Rev. E** *61* 132 (2000).
20. E. Barkai and R. Silbey *Fractional Kramers Equation* **J. Phys. Chem. B** *104* 3866 (2000). Part of the special issue "Harvey Scher Festschrift"

21. E. Barkai, R. Silbey and G. Zumofen *Lévy Distribution of Single Molecule Line Shape Cumulants in Glasses* **Phys. Rev. Lett.** *84* 5339 (2000).
22. E. Barkai, R. Silbey and G. Zumofen *Transition from Simple to Complex Behavior of Single Molecule Line Shapes in Disordered Condensed Phase* **J. Chem. Phys.** *113* 5853 (2000).
23. E. Barkai, R. J. Silbey and G. Zumofen *Lévy Statistics for Single Molecule Spectroscopy in Low Temperature Glass* AIP conference proceeding Vol. *553*, **Disordered And Complex Systems**, p. 3, P. Sollich, A. C. C. Coolen, L. P. Hughston and R. F. Streater Editors, (2001).
24. E. Barkai *Fractional Fokker–Planck Equation, Solution and Application* **Phys. Rev. E** *63*, 046118 (2001).
25. E. Barkai, Y. Jung, and R. Silbey *Time-Dependent Fluctuations in Single Molecule Spectroscopy: A Generalized Wiener–Khinchine Approach* **Phys. Rev. Lett.** *87*, 207403 (2001).
26. J. Sung, E. Barkai, R. Silbey, and S. Lee *A Fractional Dynamics Approach to Diffusion-Assisted Reactions in Disordered Media* **Journal of Chemical Physics** *116* 2338 (2002).
27. Y. Jung, E. Barkai and R. Silbey *A Stochastic Theory of Single Molecule Spectroscopy* **Adv. in Chem. Phys** *123* 199 (2002), and cond-mat/0311428.
28. Y. Jung, E. Barkai, and R. Silbey, *Lineshape Theory and Photon Counting Statistics for Blinking Quantum Dots: a Lévy Walk Process* **Chemical Physics** *284* 181 (2002).
29. E. Barkai, *CTRW Pathways to the Fractional Diffusion Equation*, **Chemical Physics** *284* 13 (2002).
30. Y. Jung, E. Barkai, and R. Silbey *Current Status of Single Molecule Spectroscopy: Theoretical Aspects* **J. of Chemical Physics** *117* 10980 (2002).
31. E. Barkai, Y. C. Cheng *Aging Continuous Time Random Walks* **J. of Chemical Physics** *118* 6167 (2003).
32. E. Barkai *Aging in Subdiffusion Generated by a Deterministic Dynamical System* **Phys. Rev. Lett.** **90** 104101 (2003).
33. E. Barkai *Stable Equilibrium Based on Lévy Statistics: Stochastic Collision Models Approach* **Phys. Rev. E. Rapid Communication**, **68**, 055104(R) (2003).
34. E. Barkai, A. V. Naumov, Yu. G. Vainer, M. Bauer, L. Kador *Lévy Statistics for Random Single–Molecule Line Shapes in a Glass* **Phys. Rev. Lett.** **91** 075502 (2003).

35. E. Barkai, Y. Jung and R. Silbey *Theory of Single Molecule Spectroscopy: Beyond the ensemble Average* **Annual Review of Physical Chemistry** **55**, 457 (2004).
36. E. Barkai, A. V. Naumov, Yu. G. Vainer, M. Bauer, L. Kador *Experimental Evidence for Lévy Statistics in Single Molecule Fluorescence in a Low Temperature Glass:- Manifestation of Long Range Interactions.* **J. of Luminescence** **107** 21 (2004)
37. E. Barkai *Stable Equilibrium Based on Lévy Statistics: a Linear Boltzmann Equation Approach* **J. of Statistical Mechanics** **115** 1537 (2004). see also cond-mat/0303255.
38. G. Margolin, E. Barkai, *Aging Correlation Functions for Blinking Nano-Crystals, and Other On - Off Stochastic Processes* **J. of Chem. Phys** **121** 1566 (2004).
39. Y. He, E. Barkai *Influence of Spectral Diffusion on Single-Molecule Photon-Statistics* **Phys. Rev. Lett.** **93** 068302 (2004).
40. E. Barkai, G. Margolin *Aging, Non-ergodicity, and Lévy Statistics for Blinking Nano-Crystals* **Israel Journal of Chemistry** **44** 353 (2004). Special Issue on Single Molecule Spectroscopy.
41. I. Rozhkov, E. Barkai *Photon Emission From a Single Molecule Source Driven by an RF Field* **Phys. Rev. A** **71** 033810 (2005).
42. G. Margolin, E. Barkai *Non-ergodicity of Blinking Nano Crystals and Other Lévy Walk Processes* **Phys. Rev. Letters** **94** 080601 (2005).
43. Y. He, E. Barkai *Super and sub-Poissonian Photon Statistics for Single Molecule Spectroscopy* **J. of Chemical Physics** **122**, 184703 (2005)
44. I. Rozhkov, E. Barkai *Coherent Destruction of Photon Emission from a Single Molecule Source: A Renormalization Group Approach* **J. of Chem. Phys.** **123** 074703 (2005).
45. G. Bel, E. Barkai *Weak Ergodicity Breaking in the Continuous-Time Random Walk* **Phys. Rev. Lett.** **94** 240602 (2005).
46. G. Margolin, E. Barkai *Single Molecule Chemical Reaction: Reexamination of the Kramers Approach* **Phys. Rev. E Rapid Communication** **72** 025101(R) (2005).
47. Y. G. Vainer, A. V. Naumov, M. Bauer, L. Kador, E. Barkai *Statistical analysis of spectra of single impurity molecules and dynamics of disordered solids: I. Distributions of line-widths, moments, and cumulants* **Optics and Spectroscopy** **98** 740-746 (2005)
48. G. Bel, E. Barkai, *Occupation Times and Ergodicity Breaking in Biased Continuous Time Random Walk* **J. Phys.: Condens. Matter** **17** (2005) S4287-S4304.
49. G. Margolin, E. Barkai *Non-ergodicity of a Time Series Obeying Lévy Statistics* **J. of Statistical Physics** **122** 137 (2006).

50. G. Margolin, V. Protasenko, M. Kuno, E. Barkai *Power Law Blinking Quantum Dots: Stochastic and Physical Models*. **Advances in Chemical Physics** **133** 327 and cond-mat/0506512 (2006).
51. G. Bel, E. Barkai *Random Walk to a Non-ergodic Equilibrium Concept* **Phys. Rev. E** **73** 016125 (2006).
52. G. Bel, E. Barkai, *Weak Ergodicity Breaking with Deterministic Dynamics* **Europhysics Letters** **74** 15 (2006).
53. Y. He, E. Barkai *Theory of Single Photon Control from a Two Level System Source* **Phys. Rev. A. Rapid Communications** **74**, 011803 (2006).
54. E. Barkai *Residence Time Statistics for Normal and Fractional Diffusion in a Force Field* **J. of Statistical Physics** **123** 883 (2006).
55. Y. He, E. Barkai *Theory of Photons on Demand From a Single Molecule Source* **Phys. Chem. Chem. Phys.** **8** 5056 (2006).
56. G. Margolin, V. Protasenko M. Kuno, and E. Barkai *Photon Counting Statistics For Blinking CdSe-ZnS Quantum Dots: A Lévy Walk Process* **J. of Physical Chemistry B** **110** 19053 (2006).
57. E. Barkai, I. Sokolov *On Hilfer's Objection to the Fractional Time Diffusion Equation* **Physica A** **373** 231 (2007)
58. S. Burov, E. Barkai, *Occupation Time Statistics in the Quenched Trap Model*. **Phys. Rev. Lett.** **98** 250601 (2007).
59. E. Barkai, *Strong Correlations between fluctuations and response in aging transport* **Phys. Rev. E Rapid Communication** **75**, 060104(R) (2007).
60. E. Barkai, I. Sokolov *Multi-point Distribution Function for the Continuous Time Random Walk* **J. of Stat. Mech: Theory and Experiment** P08001 (2007).
61. A. Rebenshtok, E. Barkai *Distribution of Time Averaged Observables for Weak Ergodicity Breaking*. **Phys. Rev. Lett.** **99**, 210601 (2007).
62. F. Shikerman, E. Barkai *Photon Statistics For Single Molecule Non-Linear Spectroscopy* **Phys. Rev. Lett.** **99**, 208302 (2007).
63. F. Shikerman, Y. He, E. Barkai *Photon Statistics for a Two Level System Interacting with a Sequence of Two Laser Pulses* **Physical Review A** **77** 063819 (2008).
64. S. Burov, E. Barkai, *Critical Exponent of the Fractional Langevin Equation* **Phys. Rev. Lett.** **100** 070601 (2008).
65. A. Rebenshtok, E. Barkai, *Weakly non-Ergodic Statistical Physics* **Journal of Statistical Physics** **133** 565 (2008).

66. S. Burov, E. Barkai, *Fractional Langevin Equation: Over-Damped, Under-Damped and Critical Behaviors* **Physical Review E** **78** 031112 (2008).
67. Y. He, S. Burov, R. Metzler, E. Barkai *Random Time-Scale Invariant Diffusion and Transport Coefficients* **Physical Review Letters** **101**, 058101 (2008). See viewpoint in Igor M. Sokolov, *Physics* **1**, 8 (2008).
68. F. Shikerman, E. Barkai *Probing Dynamics of Single Molecules: Nonlinear Spectroscopy Approach* **J. Chem. Phys.** **129** 244702 (2008).
69. W. Deng, E. Barkai *Ergodic Properties of Fractional Brownian-Langevin Motion* **Phys. Rev. E.** **79** 011112 (2009).
70. E. Barkai, R. Silbey *Theory of Single File Diffusion in a Force Field* **Phys. Rev. Lett.** **102** 050602 (2009).
71. N. Korabel, E. Barkai *Pesin-Type Identity for Intermittent Dynamics with a Zero Lyapunov Exponent* **Phys. Rev. Lett.** **102**, 050601 (2009).
72. F. D. Stefani, J. P. Hoogenboom, and E. Barkai *Beyond Quantum Jumps: Blinking Nano-scale Light Emitters* **Physics Today** **62** nu. 2, p. 34 (February 2009).
73. R. Metzler, V. Tejedor, J.-H. Jeon, Y. He, W. Deng, S. Burov, E. Barkai. *Analysis of single particle trajectories: from normal to anomalous diffusion* **Acta Phys. Polonica B** **40** 1315 (2009).
74. Z. Shemer, E. Barkai *Einstein Relation and Effective Temperature for Systems with Quenched Disorder* **Phys. Rev. E** **80**, 031108 (2009).
75. I. Peleg, E. Barkai *Multiplicative Noise Induces Zero Critical Frequency* **Phys. Rev. E Rapid Communications** **80**, 030104(R) (2009).
76. I. Bronstein, Y. Israel, E. Kepten, S. Mai, Y. Shav-Tal, E. Barkai, Y. Garini *Transient Anomalous Diffusion of Telomeres in the Nucleus of Mammalian Cells* **Physical Review Letters** **103**, 018102 (2009).
77. L. Turgeman, S. Carmi, E. Barkai *Fractional Feynman-Kac Equation for non-Brownian Functionals* **Phys. Rev. Lett.** **103**, 190201 (2009).
78. E. Barkai, R. Silbey *Diffusion of Tagged Particle in an Exclusion Process* **Physical Review E** **81**, 041129 (2010).
79. L. Lizana, T. Ambjörnsson, A. Taloni, E. Barkai, M. A. Lomholt *Foundation of fractional Langevin equation: Harmonization of a many-body problem* **Physical Review E** **81**, 051118 (2010).
80. N. Korabel, E. Barkai *Separation of Trajectories and its Relation to Entropy for Intermittent Systems With a Zero Lyapunov Exponent* **Physical Review E** **82**, 016209 (2010).

81. N. Korabel, E. Barkai *Paradoxes of Subdiffusive Infiltration in Disordered Systems* **Phys. Rev. Lett.** *104*, 170603 (2010).
82. S. Burov, R. Metzler, E. Barkai, *Aging and non-ergodicity beyond the Khinchin theorem* 13228-13233 **Proceedings of the National Academy of Sciences** *107* (2010).
83. S. Carmi, L. Turgeman, E. Barkai *On Distributions of Functionals of Anomalous Diffusion Paths* **Journal of Statistical Physics** *141* 1071 (2010).
84. D. Kessler, E. Barkai *Infinite covariant density for diffusion in logarithmic potentials and optical lattices* **Phys. Rev. Lett.** *105*, 120602 (2010).
85. S. Burov, J.-H. Jeon, R. Metzler, E. Barkai *Single Particle Tracking in Systems Showing Anomalous diffusion: the Role of Weak Ergodicity Breaking.* **Physical Chemistry Chemical Physics** themed issue: Single-Molecule Optical Studies of Soft and Complex Matter **13** (5), 1800 - 1812 (2011).
86. J.-H. Jeon, V. Tejedor, S. Burov, E. Barkai, C. Selhuber-Unkel, K. Berg-Sorensen, L. Oddershede, and R. Metzler *In vivo anomalous diffusion and weak ergodicity breaking of lipid granules* **Phys. Rev. Lett.** **106**, 048103 (2011).
87. N. Korabel, E. Barkai *Boundary Conditions of Normal and Anomalous Diffusion from Thermal Equilibrium* **Phys. Rev. E** **83**, 051113 (2011).
88. N. Korabel, E. Barkai *Anomalous Infiltration* **Journal of Statistical Mechanics** P05022 (2011).
89. S. Burov, E. Barkai *Time transformation for random walks in the quenched trap model* **Phys. Rev. Lett.** **106**, 140602 (2011).
90. A. Dechant, E. Lutz, E. Barkai, D. A. Kessler *Solution of the Fokker-Planck equation with a logarithmic potential* **Journal of Statistical Physics** **145** 1524 (2011).
91. S. Burov, E. Barkai *Residence time statistics for  $N$  renewal processes* **Phys. Rev. Lett.** **107** 170601 (2011).
92. S. Carmi, and E. Barkai *A fractional Feynman-Kac equation for weak ergodicity breaking* **Phys. Rev. E** **84** 061104 (2011).
93. A. Dechant, E. Lutz, D. Kessler, E. Barkai *Fluctuations of time averages for Langevin dynamics in a binding force field* **Phys. Rev. Lett.** **107**, 240603 (2011).
94. N. Korabel, E. Barkai *Infinite invariant density determines statistics of time averages for weak chaos* **Phys. Rev. Lett.** **108**, 060604 (2012).
95. A. Dechant, E. Lutz, D. Kessler, E. Barkai *Super aging correlation function and ergodicity breaking for Brownian motion in logarithmic potentials* arXiv:1202.6250v1 [cond-mat.stat-mech] **Phys. Rev. E** (accepted).

96. D. A. Kessler, and E. Barkai *Theory of fractional-Lévy kinetics for cold atoms diffusing in optical lattices* **Phys. Rev. Lett.** (accepted) arXiv:1202.0701v2 [cond-mat.stat-mech].

## Journal Impact Factor (IF) from WOS (2009)

Annual Review of Physical Chemistry 14.688, PNAS 9.432, Physical Review Letters 7.180, Journal of Physical Chemistry B 4.189, Physical Chemistry Chemical Physics 4.064, Physics Today 3.674, Journal of Chemical Physics 3.149, Physical Review A 2.908, J. of Statistical Mechanics, Theory and Experiment 2.758, Physical Review E 2.508, Europhysics Letters 2.237, J. of Physics Condensed Matter 2.145, Journal of Statistical Physics 1.621, J. of Luminescence 1.628, Acta Physica Pol. B 0.767.

## Unpublished Papers

1. E. Barkai, Y. Garini and R. Metzler *Strange Kinetics of Single Molecules in the Cell* **Physics Today** (invited review, submitted).
2. S. Burov, E. Barkai *Weak subordination breaking for the quenched trap model* (final preparation)
3. A. Rebenshtok, E. Barkai, *Occupation times on Fractal Structures*
4. J. Schultz, E. Barkai, R. Metzler *Ageing effects in single particle trajectory averages* (submitted) arXiv:1204.0878v1 [cond-mat.stat-mech]
5. N. Korabel, and E. Barkai *Numerical estimate of infinite invariant density: application to Pesin-type identity* (final preparation).

## Book Editor

1. Theory and Evaluation of Single-Molecule Signals E. Barkai, F. Brown, M. Orrit, H. Yang Editors, World Scientific (2008).

## Chapters in Books

1. E. Barkai, *Deterministic Aging* p. 128-134 in Complexity, Metastability, and Nonextensivity edited by C. Beck, G. Benedek, A. Rapisarda and C. Tsallis The Science and Culture Series Physics (World Scientific) (2004).
2. E. Barkai, *Weak Ergodicity Breaking in Single Particle Dynamics* p. 365-391 in Theory and Evaluation of Single-Molecule Signals E. Barkai, F. Brown, Y. Haw and M. Orrit Editors. World Scientific (2008).
3. E. Barkai, *Anomalous Kinetics Leads to Weak Ergodicity Breaking* p. 213-239 in Anomalous Transport: Foundations and Applications by Wiley, VCH (Berlin) R. Klages, G. Radons and I. M. Sokolov Editors (2008).

4. S. Carmi, E. Barkai *Fractional Feynman-Kac equation for anomalous diffusion functionals* in Fractional Dynamics, World Scientific Singapore. R. Metzler, S. C. Lim and J. Klafter Editors (2011).

## Conference Organizer

1. Challenges in Chemical Physics: Complex Structures, Anomalous Statistics, Single Molecules, Workshop in honor of Yossi Klafter's 60th birthday Tel Aviv (2006), with Ralf Metzler and Michael Urbakh.
2. Theory, Modeling and Evaluation of Single-Molecule Measurements, Lorentz Center, Leiden (2007), with F. Brown, H. Yang, and M. Orrit.
3. Models of Anomalous Diffusion: From Single Molecules to the Flight of the Albatross Center of Advanced Studies Jerusalem (March 2008), with I. Eliazar, and R. Metzler.
4. Weak Chaos, Infinite Ergodic Theory, and Anomalous Dynamics. Max Planck Institute for complex systems, Dresden (July 2011) with R. Klages, H. Kantz and R. Zweimüller.

## Advisory Committees

1. Advisory Committee of International Conference on Statistical Physics. Orthodox Academy of Crete, Greece (2008), Larnaka Cyprus (2011).
2. Scientific committee the seventh International Workshop on Applied Probability IWAP Jerusalem (2012).

## Invited Talks and Oral Contributions

1. **[1-39] Before Last Promotion**  
*Bi-Directional Shot Noise in a Singly Occupied Channel* Annual Mathematical Meeting of Israel's Mathematical Union, Weizmann Institute (1996).
2. *Motion of a Randomly Kicked Particle* VII Symposium on Dynamical Processes in Condensed Molecular Systems, Czech Republic (1996).
3. *Response of Anomalous Diffusion Processes to an External Field* The 20th IUPAP International Conference on Statistical Physics, Statphys 20, Paris, July 20 - 24, (1998)
4. *Distribution of Single Molecule Line Shape Cumulants in Glasses* International conference on Disordered and Complex Systems, London (2000).
5. *The Fractional Fokker-Planck Equation, Theory and Application* Fractal Aspects of Complex Systems FACS 2000, Maceio, Brazil (2000).
6. *Lévy Distribution of Single Molecule Line Shape Cumulants in Glasses* Fractal Aspects of Complex Systems FACS 2000, Maceio, Brazil (2000).

7. *Single Molecule Spectroscopy in Low Temperature Glass* MRS Boston (2000).
8. *Photon Counting Statistics For Single Molecule Spectroscopy* American Chemistry Society Meeting, San-Diego (2001).
9. *Time Dependent Line Shape Fluctuations For Single Molecule Spectroscopy* 7th International Meeting on Hole Burning, Single Molecule, and Related Spectroscopy, Taipei, Taiwan (2001).
10. *Theory of Time Dependent Fluctuations in Single Molecule Spectroscopy*, The 18th Symposium on Chemical Physics, Waterloo, Canada (2002).
11. *Aging Continuous Time Random Walks* AGU 2002 Fall Meeting, San Fransisco (2002).
12. *Theory of Time Dependent Fluctuations in Single Molecule Spectroscopy* The American Chemistry Society 225th National Meeting, New Orleans (2003).
13. *Parameter Distributions of Single Molecule Spectra, and Low temperature Dynamics of Disordered Solids* HBSM Bozeman, Montana (2003).
14. *From Sub-Poissonian photon statistics in two level molecules, to Lévy photon statistics in Blinking quantum dots.* HBSM Bozeman, Montana (2003) (Invited).
15. *Lévy Photon Statistics in Blinking Quantum Dots* International Symposium on Molecular Spectroscopy, Ohio (2003)
16. *Theory of Time Dependent Fluctuations in Single Molecule Spectroscopy* International Symposium on Molecular Spectroscopy, Ohio (2003)
17. *Aging Continuous Time Random Walks and Diffusion Equation* Modern Mathematical/Physical Tools for Subsurface Hydrology, Purdue (2003) (Invited).
18. *L'evy Distribution of Single Molecule Line Shape Cumulants in Glasses* The American Chemistry Society 225th National Meeting, New York NY (2003).
19. *Exact Solution for the Influence of Spectral Diffusion on Single Molecule Photon Statistics* Statphys 22 Bangalore India (2004)
20. *Aging in Subdiffusion Generated by a Deterministic Dynamical System* Statphys 22 Bangalore India (2004).
21. *Single Molecule Line Spectroscopy in Low Temperature Glass* The 49th International Symposium on Optical Science and Technology Denver (2004) (invited).
22. *Aging in Subdiffusion Generated by a Deterministic Dynamical System* Complexity, Metastability, and Non-Extensivity Erice Sicily (2004).
23. *Aging in Subdiffusion Generated by a Deterministic Dynamical System* Fractional Differentiation and its Application, Bordeaux, (2004).

24. *Sub and Super Photon Statistics for Single Molecule Spectroscopy* Israel Physical Society annual meeting, TECHNION, (2004).
25. *Photon Statistics for Single Molecule Spectroscopy* Israel Chemistry Society annual meeting, Tel-Aviv (2005) (invited).
26. *Sub and Super Photon Statistics for Single Molecule Spectroscopy* Frisno 8, Ein-Bokek (2005) .
27. *Stochastic Ergodicity Breaking* Complexity and Nonextensivity, Kyoto Japan (2005).
28. *Stochastic Ergodicity Breaking in Condensed Phase Spectroscopy* Stochastic Processes and Condensed Phase Spectroscopy, Zurich (2005) (invited).
29. *Ergodicity Breaking in Single Molecule Spectroscopy* Theory for Experimentalists: A Symposium in Celebrating Robert J. Silbey's 65th Birthday Boston (2005) (invited).
30. In Search of a Theory of Complexity, Denton (2005) (invited)
31. Single molecule measurements: Theory and experiment, Telluride Research Workshop, Colorado (2005) (invited)
32. Theory of single photon control from a two level system source, 51st Annual Meeting of the Israel Physical Society, Carmiel (2005).
33. Weak Ergodicity Breaking in blinking quantum dots and other fractal time systems. 51st Annual Meeting of the Israel Physical Society Carmiel (2005).
34. Non-Ergodicity of Blinking Nano Crystals, The Laser Atomic Molecular Physics (LAMP) seminar, Winter College on Quantum and Classical Aspects of Information Optics, the Abdus Salam Centre for Theoretical Physics Trieste Italy (2006).
35. Control of Single Photon on Demand from an Atom Source. LAMP seminar, the Abdus Salam Centre for Theoretical Physics, Trieste Italy (2006).
36. Theory of Single Photon on Demand HBSM2006 Centre Paul Langevin, Aussois France (2006).
37. Weak Ergodicity Breaking in Single Molecule Tracking American Chemical Society single-molecule symposium San-Fransisco (2006) (invited).
38. Weak Ergodicity Breaking in Nonlinear Dynamical System. Wilhelm und Else Heraeus Conference on Anomalous Transport: Experimental Results and Theoretical Challenges Bonn (2006) (invited).
39. Weak Ergodicity Breaking: From CTRW to Blinking Dots. Challenges in Chemical Physics: Complex Structures, Anomalous Statistics, Single Molecules Tel Aviv (2006) (invited).

- 40 Weak Ergodicity Breaking in Single Molecule Measurements. Theory, Modeling and Evaluation of Single-Molecule Measurements, Lorentz Center, Leiden (2007) (invited).
- 41 Statistical and Physical Models of Blinking Quantum Dots. Fluorescence Intermittency in molecules, quantum dots and quantum wire, University of Notre Dame, Indiana (2007) (invited).
- 42 Weak Ergodicity Breaking in the CTRW, StatPhys 23 Genoa Italy (talk delivered by Golan Bel) (2007).
- 43 Anomalous Diffusion Leads to Weak Ergodicity Breaking. The Fourteenth Applied Probability Society of INFORMS Conference Eindhoven (2007) (invited).
- 44 20th Marian Smoluchowski Symposium of Statistical Physics, Fundamentals and Applications Zakopane Poland (2007) (invited).
- 45 Probing Fast Dynamics of Single Molecules: a Non-linear Spectroscopy Approach. Tel Aviv Symposium on Theoretical Chemistry (2007) (invited).
- 46 Israel Physics Society Annual Meeting (IPS2007) (invited).
- 47 International Conference in Statistical Physics, Orthodox Academy of Crete, Sigma Phi 2008 (invited).
- 48 Statistical Mechanics Symposium, David Mukamel and Grisha Falkovich organizers Weizmann (2008) (invited).
- 49 5th International Conference on Unsolved Problems on Noise and Fluctuations in Physics, Biology & High Technology Ecole Normale Supérieure de Lyon France, June 26, (2008)
- 50 Noise in complex systems: From molecular dynamics to stochastic modeling (NCMDSM) Korea Advanced Institute of Science and Technology Daejeon, Korea (2008) (invited).
- 51 New paths for random walks, centro internacional de ciencias A.C. Cuernavaca, Mexico (2009) (invited).
- 52 Single Molecule Non linear spectroscopy, probing fast dynamics. Telluride conference titled: Single Molecule Dynamics, Colorado (2009) (invited).
- 53 Weak Ergodicity Breaking and its Relation to Weak Chaos. The XI Latin American Workshop on Nonlinear Phenomena (LAWNP09), Buzios Rio de Janeiro (2009) (invited).
- 54 Multi-scale dynamics in confining systems, Fall meeting of the Materials Research Society, Boston (2009) (invited).
- 55 Fractional Feynman-Kac Equation. Workshop: Anomalous Diffusion, Theory and Applications, Wroclaw Poland (2009) (invited).

- 56 Boston University, Harvard, MIT Students Theory Seminar (2009) (invited).
- 57 Monthly Common seminar of Statistical Physics and Condensed Matter, Paris (2010) (invited).
- 58 Photon Statistics for Non linear Spectroscopy. China-Israel Workshop on: dynamics and control of quantum systems Jerusalem (2010) (invited).
- 59 Development of the Teaching and Research Capacity of Young Academic Staff at Wrocklaw University of Technology Project. A mini course on normal and anomalous stochastic processes, Wrocklaw Poland (2010) (invited).
- 60 From Random to Quantum walks, the third Black Forest Focus on frontiers in dynamics, Breisach am Rhein Germany (2010) (invited).
- 61 Single File Diffusion. Statistical Mechanics Day III, David Mukamel and Grisha Falkovich organizers Weizmann (2010) (invited).
- 62 Weak Ergodicity Breaking, Dynamics Days in Asia Pacific 6 Sydney Australia Mini Symposium organizer + talk (2010) (invited).
- 63 Diffusion of Tagged Particle in an Exclusion Process Statistical Physics Conference 24 Cairns Australia (2010) (contributed).
- 64 Synchronization of Clocks at Armageddon Workshop on Archeological dating Megiddo Israel (2010) (participation).
- 65 Reaction Kinetics in Condensed Matter Moscow (2010) (invited).
- 66 Cargese Workshop on Search and Exploration Corsica (2011) (invited).
- 67 Workshop: Weak Chaos, Infinite Ergodic Theory, and Anomalous Dynamics. Max Planck Institute for complex systems, Dresden (2011) (invited).
- 68 Workshop: Waves and quantum fields on fractals. Technion (2011) (invited).
- 69 Time transformations for random walks in quenched random environment Israel Physics Society Meeting, Technion (2011) (contributed).
- 70 Strange Kinetics of Single Molecules invited talk in unsolved problems on noise 06 Kolkata (2012) (invited).
- 71 Fractional Feynman Kac equation semi-plenary talk in the 5th symposium on fractional differentiation and its application Nanjing (2012) (invited).
- 72 Non ergodic fluctuations on the nano-scale, Nanosciences: Soft, solid, alive and kicking CeNS Workshop Venice (2012) (invited).
- 73 Venice meeting on fluctuations in small complex systems, Venice (2012) (invited).

## Abstracts Contributed to Conferences, Poster Sessions

1. *Brownian Type of Motion of a Randomly Kicked Particle Far and Close to the Diffusion Limit*, Israel Physical Society Annual Meeting, Bar Ilan University, (1995).
2. *Bi-Directional Shot Noise in a Singly Occupied Channel*, Austrian - Israeli - German Symposium on Dynamical Processes in Condensed Molecular Systems. Baden, Austria, (1995).
3. *Chaotic Biased Motion*, the V-th Bar-Ilan Conference on Frontiers in Condensed Matter Physics, Israel (1997).
4. *Crossover From Dispersive to Regular Transport in Biased Maps*, Workshop on Chaos, Kinetics and Non-linear Dynamics in Fluids and Plasmas, Carry Le Rouet, France, (1997).
5. *One Dimensional Stochastic Lévy Lorentz Gas*, NATO Advanced Study Institute: "Dynamics: Models and Kinetic Methods for Non-equilibrium Many-Body System" Leiden, the Netherlands (1998).
6. *Distribution of Single Molecules Line Widths*, American Conference on Theoretical Chemistry, Boulder Colorado (1999).
7. *Anomalous Diffusion and Relaxation Close to Thermal Equilibrium: A Fractional Fokker-Planck Equation Approach*, American Conference on Theoretical Chemistry, Boulder Colorado (1999).
8. *Distribution of Single Molecules Line Widths in Disordered Solids*, Hole Burning and Related Spectroscopies, HBRS 99, Hourtin France (1999).
9. *A Stochastic Theory of Single Molecule Spectroscopy*, StatPhys21, Cancun, Mexico (2001).
10. *Fluctuations in Single Molecule Spectroscopy*, Gordon Research Conference, Theoretical Physical Chemistry Summer School, Roger-Williams University Rhode Island (2002).
11. *Aging in Dispersive Transport* ACS meeting NYC (2003).
12. *Levy Statistics for Random Single-Molecule Line Shapes in a Glass* Statphys 22 Bangalore India (2004).
13. *Single-Molecule Spectroscopy in Low Temperature Glasses* Complexity, Metastability, and Non-Extensivity Erice Sicily (2004).

## Invited visits to institutions

1. Prof. Wild, and Dr. Zumofen Physical Chemistry department ETH Zurich (1999,2000).

2. Prof. Orrit, CNRS university of Bordeaux (2000)
4. Prof. Metzler, Niels Bohr Institute, Copenhagen, Physics Department (2005,2006).
5. Prof. Kuno Notre Dame University Chemistry Department (2005).
6. Dr. P. Degiovanni, and Ecole Normale Superiore Lyon (2006).
7. Prof. Sokolov, Humboldt University of Berlin (2007).
8. Prof. Freidrich Munster University (2007).
9. Prof. Ralf Metzler Munich (2007,2011).
10. Dr. Golan Bel Los-Alamos (2008,2009).
11. Prof. Peter Hanggi, Dr. Eric Lutz University of Augsburg (2010,2011).
12. Development of the Teaching and Research Capacity of Young Academic Staff at Wrocklaw University of Technology. A mini course on normal and anomalous stochastic processes. Host Prof. Karina Weron (2010).
13. Tampere University of Technology Finland Prof. Ralf Metzler (2011).
14. Potsdam University, Prof. Ralf Metzler (2012).
15. Max Planck Institute for complex systems, Dresded, Prof. Holger Kantz (2012).

## **Additional Employment**

1. Scientific programming for the Free Electron Laser Project - Engineering School, Tel-Aviv university (1995).

## **Seminar and Colloquium**

MIT - Physical Chemistry, MIT- Applied Math, Tel Aviv- Physics, Tel Aviv - Chemistry, Weizmann- Physical Chemistry, Hebrew- Physical Chemistry, CNRS Bordeaux, ETH Zurich- Physical Chemistry, Technion - Physical Chemistry, Bar Ilan - Physics, Ben Gurion University- Physical Chemistry, Washington University - Chemistry, Notre Dame- Chemistry, The University of Chicago - James Franck Institute, University of Arkansas- Physics, MIT-Physics Chez Pierre Seminar, Notre Dame- Phys. Chem. Seminar, Argonne- Notre Dame Collaborative Work Shop, Nordita–Niels Bohr institute Physics (Copenhagen), Ecole Normale Superiure Physics (Paris), Technion Physics, HIT Holon, Beer-Sheva Nanoscience seminar, University of Augsburg Physics, Hebrew Univ. nonlinear seminar, Ecole Normale Superiure Physics (Lyon), Boston University, Santa Barbara, University of Munster, Humboldt University of Berlin, Courant Institute of Mathematical Sciences, Columbia University, Munich Technical University, Los Alamos National lab, Seoul National University, Univ. of New Mexico Albuquerque, Boston University-Harvard-MIT theoretical Phys. Chem. student seminar, Institut de Physique Theorique in Saclay, the Laboratoire de Physique Theorique et Modeles Statistiques and Laboratoire de Physique Theorique both in Orsay, Bar Ilan Applied math, Tampere University of Technology, Weizmann stat-phys seminar.

## Research Achievements

Prof. Barkai received his B.Sc, M.Sc, and Ph.D in Physics from Tel-Aviv university. His M.Sc. and Ph.D degrees were received with summa cum laude. During his Ph.D studies he developed the now well known fractional kinetic framework describing anomalous transport in dynamical systems. In 1998, he joined the Chemistry department in Massachusetts Institute of Technology for his postdoctoral research. He there developed the theory of single molecule spectroscopy. He joined the faculty in Notre Dame University Indiana in 2002. In 2004 he returned to Israel to join the Physics Department at Bar-Ilan University. He now works on the theory of weak ergodicity breaking, proposing an extension of standard ergodic statistical mechanics. He also continues to develop theories of photon counting statistics for single molecule spectroscopy, in particular single photon spectroscopy. In his research he combined tools from quantum optics, statistical mechanics, chemical physics and condensed matter theory. His work on the theory of blinking quantum dots and single molecule spectroscopy, sheds light on the fundamental problem of noise in nano technology, and his work on single photon control is related to applications of quantum computation and cryptology. In 2006 he won the Krill prize for excellence in scientific research selected by the Wolf Foundation in 2009 the Bruno memorial award, and in 2011 the Friedrich Wilhelm Bessel research award.