Tsvi Tlusty – C.V. 06/11

PERSONAL DETAILS

Physics of Complex Systems, Weizmann Institute of Science, Rehovot 76100, Israel.
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homepage: www.weizmann.ac.il/complex/tlusty. Citizenship: Israeli.

EDUCATION AND EMPLOYMENT

2005–	Senior researcher, Physics of Complex Systems, Weizmann Institute.
2000–2003	*Fellow*, Center for Physics and Biology, Rockefeller University, New York.
1995–2000	*Ph.D. in Physics*, Weizmann Institute of Science, "Universality in Microemulsions", Supervisor: Prof. Samuel A. Safran.
1991–1995	*M.Sc. in Physics*, Weizmann Institute of Science, "Self-similar solutions for Ablation flow", Supervisors: Profs. E. Waxman, Z. Zinamon and D. Shvarts.
1988–1990	*B.Sc. in Physics and Mathematics*, Hebrew University, Jerusalem.
1987–1995	Military Service.

Teaching experience: *Landmark Experiments in Biology* (2006), *Statistical Physics* (2007).

INTERNATIONAL RECOGNITION

Awards and competitive fellowships

2008	*M. Levinson prize in physics*, Weizmann Institute of Science.
2006	*Senior young investigator fellowship*, Center for Complexity Science.
2000–2003	*Fellowship*, Center for Physics and Biology, Rockefeller University.
2000	*Rothschild fellowship*, Rothschild foundation, Yad Hanadiv, Jerusalem.
2000	*J. F. Kennedy prize*, Weizmann Institute of Science, Rehovot, Israel.
1999	*Israeli parliament citation* for outstanding graduate students, Jerusalem.
1996	*Fellowship of distinction*, Feinberg graduate school, Weizmann Inst.
1988–1990	*Rector's fellowship of distinction*, Hebrew University, Jerusalem.

Organizing committees: *Physics 2 Biology school (*2010), Weizmann Institute.

Review Board: *SystemsX.ch* – Systems Biology in Switzerland, Swiss Fonds National.

Invited talks in international conferences

4th Curie - Weizmann Symposium: Interfacing Physics and Biology, Paris 2011.
Breaking Barriers: from Physics to Biology, NCBS Bangalore, 2010.
1st von Neumann-Lederberg Symposium, Inst. Advanced Study, Princeton, 2009.
43rd Conference on Information Sciences and Systems (*CISS*) *Johns Hopkins* 2009.
Symposium on Nanotechnology, Karlsruhe 2008.
3rd Curie - Weizmann Symposium: Interfacing Physics and Biology, 2008.
International Symposium on Non-Equilibrium Soft Matter (Plenary), Kyoto, 2008.
International Workshop on Bio-Soft Matter, Tokyo, 2008.
Bathsheba Seminar on Information Processing in Living Cells, 2008.
21st Pasteur-Weizmann Symposium, 2008.
Safed Summer Workshop on Biological Physics, Safed 2007.
NDCOS - New Directions in Complex Systems, Istanbul 2006.
TIFR-Weizmann conference, Bombay and Bangalore, India 2006.
Nodal Days, Weizmann Inst., 2006.
ILASOL meeting, Weizmann Inst., 2004.
Applied Statistical Physics (ASTATPHYS-2003), Puerto-Vallarta, Mexico, 2003.
From Solid State to Biophysics organized by Ecole Polytechnique de Lausanne (EPFL), and Institute of Physics, Zagreb, Dubrovnik 2002.
Israel Physical Society 46th Annual Meeting, Technion, Haifa 2000.
MRS Fall Meeting, organized by Materials Research Society, Boston 1999.

SCIENTIFIC PRODUCTIVITY

Competitive grants

2008 *Israel Science Foundation*: Statistical Mechanics Approach to Molecular Coding as an Information Channel, 50,000$/yr .
2007 *Clore Center for Biophysics:* Molecular Recognition as a Signal Detection Problem, 30,000$/yr.
2006 *Minerva Foundation*: Aspects of Biological Coding Systems, 25,000 Eur/yr.

Students and post-doctoral fellows

Yoni Savir (Ph.D., 2005-)
Adam Lampert (Ph.D., 2008-)
Arbel Tadmor (M.Sc., 2006-2008, currently Ph.D.. in Caltech)
Maria Rodriguez Martinez (Postdoc, 2007-2009, currently postdoc in Columbia U.)
Tamar Friedlander (Postdoc, 2009 -)
Rami Pugatch (Postdoc, 2010-)

National and Insternational Colloaborators

Albert Libchaber (Rockefeller University)
Jean-Pierre Eckmann (Geneva University)
G.V. Shivashankar (Singapore National University and NCBS Bangalore)
Jordi Soriano-Fradera (Barcelona University)
Elisha Moses (Physics, Weizmann Inst.)
Uri Alon (Molecular Cell Biology, Weizmann Inst.)
Roy Bar-Ziv (Materials and Interfaces, Weizmann Inst.)
Ron Milo (Plant Biology, Weizmann Inst.)
Tzachi Pilpel (Molecular Genetics, Weizmann Inst.)
Nir Friedman (Immunology, Weizmann Inst.)
Joel Stavans (Physics, Weizmann Inst.)

PATENTS

System and method for differentiating between cells wih normal and pathologically altered cytoskeleton (WO/2003/058192).

LANGUAGES

Hebrew: reading 3, writing 3, speaking 3
English: reading 3, writing 3, speaking 3

Tsvi Tlusty

LIST OF PUBLICATIONS

Refereed Articles

1. Tlusty T & Berger J (1992) A Simple Maximization Technique for Statistical-Mechanics Expressions. *Am J Phys* 60(4):379-380.
2. Safran SA & Tlusty T (1996) Curvature elasticity models of microemulsions. *Ber Bunsen Phys Chem* 100(3):252-263.
3. Bar-Ziv R, *et al.* (1997) Localized dynamic light scattering: Probing single particle dynamics at the nanoscale. *Phys Rev Lett* 78(1):154-157.
4. Bar-Ziv R, Tlusty T, & Moses E (1997) Critical dynamics in the pearling instability of membranes. *Phys Rev Lett* 79(6):1158-1161.
5. Tlusty T, Safran SA, Menes R, & Strey R (1997) Scaling laws for microemulsions governed by spontaneous curvature. *Phys Rev Lett* 78(13):2616-2619.
6. Meller A, *et al.* (1998) Localized dynamic light scattering: A new approach to dynamic measurements in optical microscopy. *Biophys J* 74(3):1541-1548.
7. Tlusty T, Meller A, & Bar-Ziv R (1998) Optical gradient forces of strongly localized fields. *Phys Rev Lett* 81(8):1738-1741.
8. Bar-Ziv R, Tlusty T, Moses E, Safran SA, & Bershadsky A (1999) Pearling in cells: A clue to understanding cell shape. *Proc Nat Acad Sci USA* 96(18):10140-10145.
9. Bernheim-Groswasser A, Tlusty T, Safran SA, & Talmon Y (1999) Direct observation of phase separation in microemulsion networks. *Langmuir* 15(17):5448-5453.
10. Tlusty T & Safran SA (2000) Defect-induced phase separation in dipolar fluids. *Science* 290(5495):1328-1331.
11. Tlusty T & Safran SA (2000) Microemulsion networks: the onset of bicontinuity. *J Phys-Condens Mat* 12(8A):A253-A262.
12. Tlusty T, Safran SA, & Strey R (2000) Topology, phase instabilities, and wetting of microemulsion networks. *Phys Rev Lett* 84(6):1244-1247.
13. Tlusty T & Safran SA (2001) Entropic networks in colloidal self-assembly. *Philos T Roy Soc A* 359(1782):879-881.
14. Bar-Ziv R, Tlusty T, & Libchaber A (2002) Protein-DNA computation by stochastic assembly cascade. *Proc Nat Acad Sci USA* 99(18):11589-11592.

15. Zilman A, Tlusty T, & Safran SA (2003) Entropic networks in colloidal, polymeric and amphiphilic systems. *J Phys-Condens Mat* 15(1):S57-S64.
16. Tlusty T, Bar-Ziv R, & Libchaber A (2004) High-Fidelity DNA Sensing by Protein Binding Fluctuations. *Phys Rev Lett* 93(25):258103-258104.
17. Biron D, Alvarez-Lacalle E, Tlusty T, & Moses E (2005) Molecular Model of the Contractile Ring. *Phys Rev Lett* 95(9):098102-098104.
18. Beatus T, Tlusty T, & Bar-Ziv R (2006) Phonons in a one-dimensional microfluidic crystal. *Nature Phys* 2(11):743-748.
19. Breskin I, Soriano J, Moses E, & Tlusty T (2006) Percolation in Living Neural Networks. *Phys Rev Lett* 97(18):188102-188104.
20. Itzkovitz S, Tlusty T, & Alon U (2006) Coding limits on the number of transcription factors. *Bmc Genomics* 7(1):239.
21. Sagi D, Tlusty T, & Stavans J (2006) High fidelity of RecA-catalyzed recombination: a watchdog of genetic diversity. *Nucleic Acids Res* 34(18):5021-5031.
22. Shinar G, Dekel E, Tlusty T, & Alon U (2006) Rules for biological regulation based on error minimization. *Proc Nat Acad Sci USA* 103(11):3999-4004.
23. Tlusty T (2006) Screening by symmetry of long-range hydrodynamic interactions of polymers confined in sheets. *Macromolecules* 39(11):3927-3930.
24. Beatus T, Bar-Ziv R, & Tlusty T (2007) Anomalous Microfluidic Phonons Induced by the Interplay of Hydrodynamic Screening and Incompressibility. *Phys Rev Lett* 99(12):124502-124504.
25. Savir Y & Tlusty T (2007) Conformational Proofreading: The Impact of Conformational Changes on the Specificity of Molecular Recognition. *PLoS ONE* 2(5):e468.
26. Tlusty T (2007) A model for the emergence of the genetic code as a transition in a noisy information channel. *J Theo Bio* 249(2):331-342.
27. Tlusty T (2007) A relation between the multiplicity of the second eigenvalue of a graph Laplacian, Courant's nodal line theorem and the substantial dimension of tight polyhedral surfaces. *Elec J Linear Algebra* 16:315-324.
28. Beatus T, Bar-Ziv R, & Tlusty T (2008) One-Dimensional Microfluidic Crystals Far From Equilibrium. *Prog Theor Phys* 175:123-130.
29. Savir Y & Tlusty T (2008) Optimal Design of a Molecular Recognizer: Molecular Recognition as a Bayesian Signal Detection Problem. *IEEE J Select Topics Sign Proc* 2(3):390-399.
30. Soriano J, Rodriguez Martinez M, Tlusty T, & Moses E (2008) Development of input connections in neural cultures. *Proc Nat Acad Sci USA* 105(37):13758-13763.

31. Tadmor AD & Tlusty T (2008) A Coarse-Grained Biophysical Model of E. coli and Its Application to Perturbation of the rRNA Operon Copy Number. *PLoS Comp Bio* 4(5):e1000038.
32. Tlusty T (2008) Rate-Distortion Scenario for the Emergence and Evolution of Noisy Molecular Codes. *Phys Rev Lett* 100(4):048101-048104.
33. Tlusty T (2008) A simple model for the evolution of molecular codes driven by the interplay of accuracy, diversity and cost. *Phys Bio* 5(1):016001.
34. Tlusty T (2008) Casting polymer nets to optimize noisy molecular codes. *Proc Nat Acad Sci USA* 105(24):8238-8243.
35. Beatus T, Tlusty T, & Bar-Ziv R (2009) Burgers Shock Waves and Sound in a 2D Microfluidic Droplets Ensemble. *Phys Rev Lett* 103(11):114502-114504.
36. Lampert A & Tlusty T (2009) Mutability as an altruistic trait in finite asexual populations. *J Theo Bio* 261(3):414-422.
37. Savir Y & Tlusty T (2009) Molecular recognition as an information channel: The role of conformational changes. in *43rd Annual Conference on Information Sciences and Systems (CISS)* pp 835-840.
38. Tlusty T (2009) The physical language of molecular codes: A rate-distortion approach to the evolution and emergence of biological codes. in *43rd Annual Conference on Information Sciences and Systems (CISS)* pp 841-846.
49. Tlusty T & Eckmann JP (2009) Remarks on bootstrap percolation in metric networks. *J Phys A* 42(20):205004.
40. Cohen O, Kesselman A, Soriano J, Moses E, & Tlusty T (2010) Quorum percolation in living neural networks. *EuroPhys Lett* 89(1):18008.
41. Rodríguez Martínez M, Soriano J, Tlusty T, Pilpel Y, & Furman I (2010) Messenger RNA fluctuations and regulatory RNAs shape the dynamics of a negative feedback loop. *Phys Rev E* 81(3):031924.
42. Savir Y, Noor E, Milo R, & Tlusty T (2010) Cross-species analysis traces adaptation of Rubisco toward optimality in a low-dimensional landscape. *Proc Nat Acad Sci* USA 107(8):3475-3480.
43. Savir Y & Tlusty T (2010) RecA-Mediated Homology Search as a Nearly Optimal Signal Detection System. *Molecular Cell* 40(3):388-396.
44. Tlusty T (2010) A colorful origin for the genetic code: Information theory, statistical mechanics and the emergence of molecular codes. Phys Life Rev 7(3):362-376.
45. Eckmann J-P, Moses E, Stetter O, Tlusty T, & Zbinden C (2010) Leaders of neuronal cultures in a quorum percolation model. Frontiers in Computational Neuroscience 4:12.

46. Lampert A & Tlusty T (2011) Density Dependent Cooperation as a Mechanism for Persistence and Coexistence. *Evolution*, in press.

Invited Reviews

47. Safran SA, Gov N, Nicolas A, Schwarz US, & Tlusty T (2005) Physics of cell elasticity, shape and adhesion. *Physica A* 352(1):171-201.
48. Eckmann J-P, Feinerman O, Gruendlinger L, Moses E, Soriano J, & Tlusty T (2007) The physics of living neural networks. *Phys Rep* 449(1-3):54-76.

Book Chapters

49. Soriano J, Breskin I, Moses E, & Tlusty T (2006) Percolation approach to study connectivity living neural networks. *9th Granada Seminar - Cooperative Behavior in Neural Systems* AIP, eds Garrido PL, Marro J, & Torres JJ (AIP, Granada, SPAIN), Vol 887, pp 96-106.

Submitted Articles

50. Beatus T, Bar-Ziv R, & Tlusty T (2010) The physics of 2D microfluidic droplet ensembles. Submitted to *Phys. Rep.*
51. Iyer KV, Maharana S, Gupta S, Libchaber AJ , Tlusty T, Shivashankar GV, Spatial organization of chromosomes is linked to global gene expression program. *Submitted*
52. Savir Y, Waysbort N, Antebi Y, Tlusty T, & Friedman N. Extracellular feedback by IL-2 can mediate time dependent intercellular competition and cooperation between activated T cells. *submitted.*
53. Levary D, Eckmann J-P, Moses E & Tlusty T, Self reference in word definitions, *submitted.*

Prepared manuscripts

54. Savir Y & Tlusty T. Transcription factor binding sites maximize marginal information per base pair.
55. Savir Y & Tlusty T. The ribosome as an optimal conformational decoder.