Yuhai Tu, IBM Research (914)-945-2762; yuhai@us.ibm.com

Work Experience

IBM T. J. Watson Research Center, Yorktown Heights, NY
Research Staff Member 1994-Present
(Head of the Theory Group, 2003-2015)

California Institute of Technology, Pasadena, CA
Division Prize Research Fellow 1991-1994

Education

- Undergraduate Education : 1983-1987, B.S., Physics, University of Science and Technology of China (the Gifted Young Class '83).
- Graduate Education : 1987-1991, Ph. D., Physics , University of California, San Diego (via the CUSPEA program).
- Postgraduate Training : 1991-1994, Division Prize Fellow, California Institute of Technology.

Honors and Awards

APS Lars Onsager Prize 2020
AAAS Fellow 2020
APS Fellow 2004
Division Prize Research Fellowship (California Institute of Technology) 1991-1994

Research Interests

Yuhai Tu has a diverse range of research interests from Physics, Biology, Material Science, to Machine Learning. His PhD and Postdoc work were on nonlinear dynamics and pattern formation in nonequilibrium systems. After joining IBM Research in 1994, he did pioneering work on collective phenomena in active systems (flocking dynamics), surface physics (Si-SiO_2 interface), and nonequilibrium phase transitions. Since 2000, his research interests shift to biological physics. He has made seminal contributions in many areas of biological physics including algorithm development and statistical analysis for high throughput transcriptome data (microarray analysis); quantitative modeling of signal transduction and motility in bacterial chemotaxis; and thermodynamics of nonequilibrium biochemical networks. His recent work focuses on three directions: (1) dynamics of biological networks -- biochemical networks for signal transduction and neural networks for coding and computation; (2) thermodynamics of information processing in biological systems; (3) statistical physics of machine learning.

Professional Activities

- Vice-Chair/Chair, APS Division of Biological Physics (DBIO), 2016-2018.

- Vice-Chair/Chair, Gordon Research Conference (GRC) "Stochastic Physics in Biology", 2019/2021.

**Note: The 2021 GRC meeting on "Stochastic Physics in Biology" (Ventura, Oct. 10-15) I chaired was the first GRC meeting held in-person after the start of the covid pandemic.

- Associate editor for the Springer journal Quantitative Biology.
- Distinguished Visiting Chair Professor in Peking University (PKU) Department of Physics and Center for Quantitative Biology since 2007.
- Adjunct professor in the department of electrical engineering at Columbia University in the 2012 spring semester; visiting professor at École Polytechnique Fédérale de Lausanne (EPFL) in the 2013 spring semester.
- Invited speaker for colloquiums and seminars at many universities and research centers, e.g., Caltech, Yale, Harvard, Princeton, IAS, UCSF, Columbia, KITP, University of Chicago, etc.
- Invited speaker in major physics conferences, e.g., APS March meeting, and in major biology meetings, e.g., Signal Transduction in Microorganisms (STIM) GRC, Biophysical Society (BPS) meeting.
- Referee for Journals in Physics and Biophysics: Physical Review and Physical Review Letters and in Biology: Nature, Science, *PNAS*, etc.
- Review panelist for NSF and NIH.
- Organizer for symposium and special sessions in major conferences and workshops, e.g., APS March meeting, Aspen Center for Physics, KITP, KIPTC, ICBP, SIAM conference.

Publication List

1. **"Modeling Bacterial Flagellar Motor With New Structure Information: Rotational Dynamics of Two Interacting Protein Nano-Rings"**, Y. Cao, T. Li, Yuhai Tu, **Front. Microbiol.**, 25 May 2022. https://www.frontiersin.org/articles/10.3389/fmicb.2022.866141/full

2. **"State-space renormalization group theory of nonequilibrium reaction networks: Exact solutions for hypercubic lattices in arbitrary dimensions"**, Qiwei Yu and Y. Tu, **Phys. Rev. E** 105, 044140, 25 April 2022.

3. **"Protein Concentration Fluctuations in the High Expression Regime: Taylor's Law and Its Mechanistic Origin",** A. Sassi, M. Garcia-Alcala, M. Aldana, and Y. Tu, **PRX** 12, 011051, 2022. https://journals.aps.org/prx/abstract/10.1103/PhysRevX.12.011051

4. **"Short-Term Plasticity Regulates Both Divisive Normalization and Adaptive Responses in Drosophila Olfactory System**.", Y. Liu, Q. Li, C. Tang, S. Qin, Y. Tu, **Front. Comput. Neurosci.,** 15:730431, Oct. 22, 2021. doi: 10.3389/fncom.2021.730431.

5. **"Phases of learning dynamics in artificial neural networks: in the absence and presence of mislabeled data"**, Y. Feng and Y. Tu, Machine Learning: Science and Technology **(MLST)**, July 19, 2021. https://iopscience.iop.org/article/10.1088/2632-2153/abf5b9/pdf

6. **"Cell assembly formation and structure in a piriform cortex model"**, Roger Traub, Yuhai Tu, and Miles Whittington Y. Feng and Y. Tu, **Rev. Neurosci**., July 15, 2021. https://iopscience.iop.org/article/10.1088/2632-2153/abf5b9/pdf

7. **"Finding gene network topologies for given biological function with recurrent neural network"**, J. Shen, F. Liu, Y. Tu, and C. Tang, **Nature Communications**, **12,** 3125 (2021). https://www.nature.com/articles/s41467-021-23420-5#citeas

8. **"Mechanosensitive remodeling of the bacterial flagellar motor is independent of direction of rotation",** Navish Wadhwa, Yuhai Tu, and Howard C. Berg**, PNAS,** 118 (15), e2024608118, 2021.

9. **"The inverse variance-flatness relation in Stochastic-Gradient-Descent is critical for finding flat minima"**, Y. Feng and Y. Tu, **PNAS**, 118 (9), 2021.

10. **"Scaling of Energy Dissipation in Nonequilibrium Reaction Networks",** Qiwei Yu, D. Zhang, Y. Tu, **Phys. Rev. Lett. (PRL)**,126, 080601, 2021.

11. **"Filtering input fluctuations in intensity and in time underlies stochastic transcriptional pulses without feedback",** A.S. Sassi, M. Garcia-Alcala, M. J. Kim, P. Cluzel, Y. Tu, **PNAS**, 117 (43), 26608-26615, 2020.

12. **"Sequential modification of bacterial chemoreceptors is key for achieving both accurate adaptation and high gain",** B. A. Mello, A.B. Anderson, Y. Tu, **Nature Communications**, 11(1), 1-10, 2020.

13. **"The energy cost and optimal design for synchronization of coupled molecular oscillators"**, D. Zhang, Y. Cao, Q. Ouyang, Y. Tu, **Nature Physics 16,** 95-100 (2020).

14. **"Optimal compressed sensing strategies for an array of nonlinear olfactory receptor neurons with and without spontaneous activity"**, S. Qin, Q. Li, C. Tang, Y. Tu, **PNAS**, 116(41), 20286-20295 (2019).

15. **"Error-Speed correlations in biochemical synthesis"**, D. Chiuchiu, Y. Tu, S. Pigolotti, **Phys. Rev. Lett. (PRL)**, 2019.

16. **"Learning to Learn without Forgetting by Maximizing Transfer and Minimizing Interference"**, Matthew Riemer, Ignacio Cases, Robert Ajemian, Miao Liu, Irina Rish, Yuhai Tu, Gerald Tesauro, **ICLR,** 2019.

17. **"The escape band in *Escherichia coli* chemotaxis in opposing attractant and nutrient gradients**", X. Zhang, G. Si, Y. Dong, K. Chen, Q. Ouyang, C. Luo, Y. Tu, **PNAS**, 2019.

18. **"Swarming in the dirt: ordered flock with quenched disorder",** N. Guttenberg, J. Toner, Yuhai Tu, **Phys. Rev. Lett. (PRL)**, 2018.

19. **"Hydrodynamic Theory of Flocking in the Presence of Quenched Disorder",** N. Guttenberg, J. Toner, Yuhai Tu, **Phys. Rev. E**, 2018.

20. **"A dual regulation mechanism of histidine kinase CheA identified by combining network-dynamics modeling and system-level input-output data"**, Bernardo A. Mello , Wenlin Pan, Gerald L. Hazelbauer, and Yuhai Tu, **Plos Comp. Bio.**, 2018.

21. **"Design principles for enhancing phase sensitivity and suppressing phase fluctuations simultaneously in biochemical oscillatory systems"**, C. Fei, Y. Cao, O. Qi, and Yuhai Tu, **Nature Communications**, doi:10.1038/s41467-018-03826-4, 2018.

22. **"Adaptation in Living Systems"**, Yuhai Tu and Wouter-Jan Rappel, **Annu. Rev. Condens. Matter Phys.** 2018.9:183-205, 2018.

23. **"Design principles and thermodynamic limits for irreversible molecular motors",** Yuhai Tu and Yuansheng Cao, **PRE** 97 (2): 022403, 2018.

24. **"Odor-evoked inhibition of olfactory sensory neurons drives olfactory perception in Drosophila"**, Cao et al, **Nature Communications**, 8:1357, 2017.

25. **"Molecular mechanism of bacterium flagellum growth",** Thibaud T. Renault, Anthony O. Abraham, Tobias Bergmiller, Guillaume Paradis, Simon Rainville, Călin C. Guet, Keiichi Namba, Yuhai Tu, James P. Keener, Tohru Minamino, and Marc Erhardt, **eLife** 2017; 10.7554/eLife.23136.

26. **"Barrier Crossing in *Escherichia coli* Chemotaxis",** Zhaojun Li, Qiuxian Cai, Xuanqi Zhang, Guangwei Si, Qi Ouyang, Chunxiong Luo, and Yuhai Tu, **Phys. Rev. Lett. (PRL)** 2017. 118: 098101.

27. **"A framework towards understanding mesoscopic phenomena: Emergent unpredictability, symmetry breaking and dynamics across scales",** Hong Qian, Ping Ao, Yuhai Tu, Jin Wang, **Chemical Physics Letters**, 665, pp. 153-161, 2016.

28. **"Information Processing in Bacteria: Memory, Computation, and Statistical Physics: A Key Issues Review",** Ganhui Lan, Yuhai Tu, **Reports on Progress in Physics**, 79(5), pp. 52601-52617, 2016.

29. **"Distinct Signaling of Drosophila Chemoreceptors in Olfactory Sensory Neurons",** Li-Hui Cao, Bi-Yang Jing, Xiankun Zeng, Dong Yang, Yuhai Tu, Dong-Gen Luo, **PNAS**, 113(7), E902-911, 2016. (doi: 10.1073/pnas.1518329113)

30. **"The free-energy cost of accurate biochemical oscillations",** Yuansheng Cao, Hongli Wang, Qi Ouyang, and Yuhai Tu**, Nature Physics,** 11, 772, 2015.

31. **"Free Energy Cost of Reducing Noise while Maintaining a High Sensitivity",** Pablo Sartori and Yuhai Tu, **Phys. Rev. Lett. (PRL)** 2015. 115: 118102.

32. **"Both piston-like and rotational motions are present in bacterial chemoreceptor signaling"**, D. Yu, X. Ma, Yuhai Tu, and L. Lai, **Scientific Reports**, 5 : 8640, DOI: 10.1038/srep08640, 2015.

33. **"Molecular Interactions of Bacterial Chemoreceptor Assemblies"**, Da-Qi Yu, Yuhai Tu, Lu-Hua Lai, **Acta Physico-Chimica Sinica**, 30 (7), 1347-1353, 2014.

34. **"Behaviors and Strategies of Bacterial Navigation in Chemical and Nonchemical Gradients",** B. Hu, Yuhai Tu**, PLoS Computational Biology** 10 (6), e1003672, 2014.

35. **"Macroscopic traveling packet and soliton states of quasi-one-dimensional flocks",** N. Guttenberg, J. Toner, Yuhai Tu, **Physical Review E** 89 (5), 052711, 2014.

36. **"Angle sensing in magnetotaxis of Magnetospirillum magneticum AMB-1"**, X. Zhu, X. Ge, N. Li, LF Wu, C. Luo, Q. Ouyang, Yuhai Tu, G. Chen, **Integrative Biology**, 2014, DOI: 10.1039/c3ib40259b.

37. **"Discovery of Novel Chemoeffectors and Rational Design of *E. coli* Chemoreceptor Specificity"**, S. Bi, D. Yu, G. Si, C. Luo, T. Li, Q. Ouyang, V. Jakovljevic, V. Sourjik, Yuhai Tu, and L. Lai, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 2013, *doi:10.1073/pnas.1306811110*.

38. **"Synaptic gating at axonal branches, and sharp-wave ripples with replay: a simulation study",** N. Vladimirov, R. Traub, and Yuhai Tu, **Euro. J. Neuroscience,** 2013.

39. **"The cost of sensitive response and accurate adaptation in networks with incoherent type-1 feed-forward loop"**, Ganhui Lan and Yuhai Tu, **J. R. Soc. Interface,** 10(87), 2013.

40. **"Precision sensing by two opposing gradient sensors: How does Escherichia coli find its preferred pH level?",** Bo Hu and Yuhai Tu, **Biophysical Journal**, 2013.

41. **"Quantitative Modeling of Bacterial Chemotaxis: Signal Amplification and Accurate Adaptation",** Yuhai Tu, **Annu. Rev. Biophys.** 2013. 42: 337-59.

42. **"Coordinated switching of bacterial flagellar motors: evidence for direct motor-motor coupling?"**, Bo Hu and Yuhai Tu, **Phys. Rev. Lett. (PRL)** 2013. 110: 158703-07.

43. **"Anomalous smoothing in Preceding Island Formation During Growth on Patterned Substrates"**, B. Bergamaschini, T. Tersoff, Yuhai Tu, J. Zhang, G. Bauer, and F. Montalenti, **Phys. Rev. Lett. (PRL)** 109, 156101-156105, 2012.

44. **"Tandem adaptation with a common design in Escherichia coli Chemotaxis",** Yuhai Tu, Howard C. Berg, **J. Mol. Bio.** 423, 782-788, 2012.

45. **"A Pathway-based Mean-field Model for Escherichia coli Chemotaxis"**, G. Si, T. Wu, Q. Ouyang, Yuhai Tu, **Phys. Rev. Lett. (PRL)**, 109, 048101-048105, 2012.

46. **"The energy-speed-accuracy trade-off in sensory adaptation"**, G. Lan, P. Sartori, S. Neumann, V. Sourjik, and Yuhai Tu, **Nature Physics 8**, 422–428, 2012.

47. **"Frequency-dependent *Escherichia coli* chemotaxis behavior"**, X. Zhu, G. Si, N. Deng, Q. Ouyang, T. Wu, Z. He, L. Jiang, C. Lou, and Yuhai Tu, **Phys. Rev. Lett.(PRL)**, 108, 128101, 2012.

48. **"Shortest loops are pacemakers in random networks of electrically coupled axons"**, N. Vladimirov, Yuhai Tu, R. D. Traub, **Frontiers in Computational Neuroscience**, 6, April 3, 2012. (doi: 10.3389/fncom.2012.00017)

49. **"Wave Speed in Excitable Random Network with Spatially Constrained Connections"**, N. Vladimirov, R. D. Traub, and Yuhai Tu, **Plos ONE** 6(6): e20536.6 doi:10.1371/journal.pone.0020536, 2011.

50. **"Noise Filtering Strategies in Adaptive Biochemical Signaling Networks"**, P. Satori and Yuhai Tu, **J. Stat. Phys.**, 142 (6), 1206-1217, 2011.

51. **"Dynamics of the Bacterial Flagellar Motor: The Effects of Stator Complaince, Back Steps, Temperature, and Rotational Asymmetry"**, G. Meacci, G. Lan, and Yuhai Tu, **Biophysical Journal**, 100 (8), 1986-1995, 2011.

52. **"Lateral density of receptor arrays in the membrane plane influences sensitivity of the E. coli chemotaxis response"**, C. M. Khursigara, G. lan, S. Neumann, X. Wu, S. Ravindran, M. J. Borgnia, V. Sourjik, J. Milne, Yuhai Tu, and S. Subramaniam, **The European Molecular Biology Organization (EMBO) Journal**, 25 March 2011; doi:10.1038/emboj.2011.77.

53. **"Adapt locally and act globally: strategy to maintain high chemoreceptor sensitivity in complex environments"**, G. Lan, S. Schulmeister, V. Sourjik, Yuhai Tu, **Molecular Systems Biology** 7:475, 2011.

54. **"A modular gradient-sensing network for chemotaxis in E. coli revealed by responses to time-varying stimuli"**, T. S. Shimizu, Yuhai Tu, and Howard C. Berg, **Molecular Systems Biology** 6: 382, 2010.

55. **"Quantitative Modeling of E. coli Chemotaxis Motion in Environments Varying in Space and Time"**, L. Jiang, Q. Ouyang, Yuhai Tu, **PLoS Comp. Bio.**, 6(4), e100735, 2010.

56. **"Spatiotemporal patterns of electrocorticographic very fast oscillations (>80 Hz) consistent with a network model based on electrical coupling between principal neurons"**, Roger D. Traub, Roderick Duncan, Aline J.C. Russell, Torsten Baldeweg, Yuhai Tu, Mark O. Cunningham, Miles A. Whittington, **Eplepsia**, Published Online: Feb 3 2010 3:27PM DOI: 10.1111/j.1528-1167.2009.02515.x.

57. **"Dislocation-interaction-based model of strained-layer relaxation"**, K. Schwarz and Yuhai Tu, **J. Appl. Phys.** 106, 083510 (2009); doi:10.1063/1.3243285.

58. **"A mechanism for precision-sensing via a gradient sensing pathway: a model of *Escherichia coli* thermotaxis"**, L. Jiang, Q. Ouyang, and Yuhai Tu, **Biophysical Journal**, 97, 74-82 (2009).

59. **"Dynamics of the bacterial flagellar motor with multiple stators"**, G. Meacci and Yuhai Tu, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 106(10), 3746-3751 (2009).

60. **"Logarithmic sensing in *Escherichia coli* bacterial chemotaxis"**, Yevgeniy V Kalinin, Lili Jiang, Yuhai Tu, and Mingming Wu, **Biophysical Journal**, 96(6), 2439-2448 (2009).

61. **"Modeling the chemotactic response of *Escherichia coli* to time-varying stimuli"**, Yuhai Tu, T. S. Shimizu and H. Berg, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 105(39), 14855-14860 (2008)

62. **"The nonequilibrium mechanism for ultrasensitivity in a biological switch: Sensing by Maxwell's demons"**, Yuhai Tu, **Proc. Natl. Acad. Sci. USA (*PNAS*)** , 105(33), 11737-11741 (2008).

63. **"Spatially compressed cardiac filament model generates hysteresis that is not observed in real muscle"**, J. Rice, Yuhai Tu, C. Pogessi and P. De Tombe, **PSB proceedings**, (2008).

64. **"Effects of adaptation in maintaining high sensitivity over a wide range of backgrounds for *Escherichia coli* chemotaxis"**, B. Mello and Yuhai Tu, **Biophysical Journals**, 92(4), 2329-2337 (2007).

65. **"Coarsening, Mixing and Motion: The complex evolution of epitaxial islands"**, Yuhai Tu and J. Tersoff, **Phys. Rev. Lett. (PRL)** 98, 096103-096106 (2007).

66. **"Relation between gene expression and observed intensities in DNA microarrays-a modeling study"**, G. Held, G. Grinstein and Yuhai Tu, **Nucleic Acids Research**, 34(9), (2006).

67. **"An allosteric model for heterogeneous receptor complexes: Understanding bacterial chemotaxis responses to multiple stimuli"**, B. Mello and Yuhai Tu, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 102(48), 17354-17359 (2005).

68. **"Excitation-Contraction Coupling Gain and Cooperativity of the Cardiac Ryanodine Receptor: A Modeling Approach**", Kai Wang, Yuhai Tu, W.J. Rappel, H. Levine, **Biophysical Journal**, 89(11), 3017-3025 (2005).

69. **"Hydrodynamics and phases of flocks"**, John Toner, Yuhai Tu, Sriram Ramaswamy, **Annals of Physics** 318(1):170-244 (2005).

70. **"How white noise generates power-law switching in bacterial motors"**, Yuhai Tu and G. Grinstein, **Phys. Rev. Lett. (PRL)**, 94, 208101(2005)

71. **"Reconstructing biological networks using conditional correlation analysis"**, J. Rice, Yuhai Tu, and G. Stolovitzky, **Bioinformatics**, October 14, (2005).

72. **"Origin of apparent critical thickness for island formation in heteroepitaxy"**, Yuhai Tu and J. Tersoff, **Phys. Rev. Lett. (PRL)**, 93, 21610(2004).

73. **"Effects of receptor interaction in bacterial chemotaxis"**, B. Mello, L. Shaw, and Yuhai, Tu, **Biophysical Journal**, 87(3), 1578-1595(2004).

74. **"Genes@Work: An efficient algorithm for pattern discovery and multivariate feature selection in gene expression data"**, J. Lepre, J. Rice, Yuhai Tu and G. Stolovitzky, **Bioinformatics**, 20(7), 1033-1044 (2004).

75. "**Tracking CD40 signaling during germinal center development**" Basso, K., U. Klein, et al. Blood **104**(13): 4088-4096. (2004).

76. **"Modeling of DNA Microarray Data by Using Physical Properties of Hybridization"**, G. Held, G. Grinstein, Yuhai Tu, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 100(13), 7575-7580 (2003).

77. **"Quantitative Modeling of Sensitivity in Bacterial Chemotaxis: The Role of Coupling among Different Chemoreceptor Species"**, B. Mello and Yuhai Tu, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 100(14), 8223-8228 (2003).

78. **"Perfect and near perfect adaptation in a model of bacterial chemotaxis"**, B. Mello and Yuhai Tu, **Biophysical Journal**, 84(5), 2843-2856 (2003).

79. **"Identification of a Global Gene Expression Signature of B-Chronic Lymphocytic Leukemia"**, Diane F. Jelinek, Renee C. Tschumper, Gustavo A. Stolovitzky, Stephen J. Iturria, Yuhai Tu, Jorge Lepre, Nigam Shah, and Neil E. Kay, **Molecular Cancer Research**, 1(5), 346-361 (2003).

80. **"Transcriptional analysis of the B cell germinal center reaction"**, Klein U, Tu Y, Stolovitzky GA,Jeffrey Keller, Joseph Haddad Jr., Vladan Miljkovic, Giorgio Cattoretti, Andrea Califano, and Riccardo Dalla-Favera, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 100(5), 2639-2644(2003).

81. **"Indentification of Hodgkin and Reed-Sternberg cell-specific genes by gene expression profiling"**, Ralf Kuppers, Ulf Klein, Ines Schwering, Verena Distler, Andreas Brauninger, Giorgio Cattoretti, Yuhai Tu, Gustavo Stolovitzky, Andrea Califano, Martin-Leo Hansmann, and Riccardo Dalla-Favera, **The Journal of Clinical Investigation**, 111(4), 529-537 (2003).

82. **"Gene Expression dynamics during germinal center transition in B cells"**, Klein U, Tu Y, Stolovitzky GA, Keller JL, Haddad J Jr, Miljkovic V, Cattoretti G, Califano A, Dalla-Favera R., **Ann. New York Acad. Sci.**, 987, 166-172 (2003).

83. **"Tracking CD40 Signaling during Normal Germinal Center Development by Gene Expression Profiling"**, Basso K, Klein U, Niu H, Stolovitzky GA, Tu Y, Califano A, Cattoretti G, Dalla-Favera R.. **Ann N Y Acad Sci.** 2003 Apr; 987:288-290 (2003).

84. **"Can we identify cellular pathways implicated in cancer using gene expression data?"**, Shah N, Lepre J, Tu Y, Stolovitzky GA, **Proceedings of the 2nd IEEE Computational Systems Bioinformatics Conference**, pp. 94-103, (2003).

85. **"Ising Model of Cardiac thin filament activity with nearest-neighbor cooperative interactions"**, John Jeremy Rice, G. Stolovitzky, Yuhai Tu, and Pieter P. de Tombe, **Biophysical Journal**, 84, 897-909 (2003).

86. **"Dynamics of Coalition Formation in Combinatorial Trading"**, Yiming Ye, Yuhai Tu, **Proceedings of the Eighteenth International Joint Conference on Artificial Intelligence** (IJCAI-03), Acapulco, Mexico, 625-632, August 9-15, 2003.

87. **"Moving and Staying together without a leader"**, G. Gregoire, H. Chate and Yuhai Tu, **Physica D**, 181, 157-171 (2003).

88. **"Quantitative noise analysis in microarray experiments"**, Yuhai Tu, G. Stolovitzky and U. Klein, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 99(22), 14031-14036, (2002).

89. **"Systematic learning of gene functional classes from DNA array expression data by using multilayer perceptrons"**, Alvaro Mateos, Joaquín Dopazo, Ronald Jansen, Yuhai Tu, Mark Gerstein and Gustavo Stolovitzky, **Genome Research**, 12:1703-1715 (2002).

90. **"Microscopic dynamics of silicon oxidation"**, Yuhai Tu and J. Tersoff, **Phys. Rev. Lett. (PRL)** 89(8), 086102(2002).

91. **"Gene Expression Profiling of B cell Chronic Lymphocytic Leakemia Reveals a Homogeneous Phenotype Related to Memory B Cells"**, U. Klein, Yuhai Tu, G. Stolovitzky, M. Mattioli, G. Cattoretti, H. Husson, A. Freedman, G. Inghirami, L. Cro, L. Baldini, A. Neri, A. Califano and R. Dalla-Favera, **Journal of Experimental Medicine,** 194, 1625 (2001).

92. **"Active boids and passive beads: modeling particles in a bacteria bath"**, G. Gregoire, H. Chate and Yuhai Tu, **Phys. Rev. E**, 64, 11902(2001).

93. **"Weighted Evolving Networks"**, S. H. Yook, H. Jeong, A. L. Barabasi and Yuhai Tu, **Phys. Rev. Lett. (PRL)**, 86, 5835 (2001).

94. **Comment on "Particle Diffusion in a Quasi-two-dimensional bacteria bath"**, G. Gregoire, H. Chate and Yuhai Tu, **Phys. Rev. Lett. (PRL)**,86, 556(2001).

95. "**Structure of the silicon-oxide interface**" Tu, Y. H. and J. Tersoff , **Thin Solid Films 400**(1-2): 95-100 (2001).

96. **"How Robust Is the Internet"**, Yuhai Tu, **Nature**, 406, 353-354 (2000).

97. **"Structure and energetics of the Si-SiO2 interface",** Yuhai Tu and J. Tersoff, **Phys. Rev. Lett. (PRL)**, 84(19), 4393 (2000).

98. **"Analysis of Gene Expression Microarrays for Phenotype Classification"**, A. Califano, G. Stolovitzky and Yuhai Tu, **Proceeding of Intelligent System for Molecular Biology** (2000)

99. **"Phases and phase transitions in flocking systems"**, Yuhai Tu, **Physica A**, 281, 30-40 (2000).

100. **"Clustering Kinetics of Granular Media in Three Dimensions"**, S. Chen, Y. Deng, X. Nie and Yuhai Tu, **Physics Letters**, 269, 218 (2000).

101. **“Sound Waves and the Absence of Galilean Invariance in Flocks”**, Yuhai Tu, J. Toner and M. Ulm. **Phys. Rev. Lett. (PRL)**, 80(21), 4819 (1998).

102. **“Flocks, herds, and schools: A quantitative theory of flocking”**, J. Toner, Yuhai Tu, **Phys. Rev. E**, 58(4), 4828(1998).

103. **“Stability of Solid State Reaction Fronts”**, G. Grinstein, J. Tersoff and Yuhai Tu, **Phys. Rev. Lett. (PRL)**, 81(12), 2490(1998).

104. **“Effect of curvature and stress on reaction rates at solid interfaces”**, J. Tersoff, Yuhai Tu and G. Grinstein, **Appl. Phys. Lett.**, 73(16), 2328(1998).

105. **“Properties of a Continuous-Random-Network Model for Amorphous Systems”**, Yuhai Tu, J. Tersoff, D. Vanderbilt and G. Grinstein, **Phys. Rev. Lett. (PRL)**, 81(22), 4899(1998).

106. **"Systems with Multiplicative Noise: Critical Behavior From KPZ Equation and Numerics"**, Yuhai Tu, G. Grinstein and M. Munoz, **Phys. Rev. Lett. (PRL)**, 78 (2), 274 (1997) .

107. **"Worm Structure in Modified Swift-Hohenberg Equation for Electroconvection"**, Yuhai Tu, **Phys. Rev. E**, 56(4), R3765 (1997).

108. **“Survival probability and field theory in systems with absorbing states”**, M. Munoz, G. Grinstein and Yuhai Tu, **Phys. Rev. E**, 56(5), 5101 (1997).

109. **"Phase Structure of Systems with Multiplicative Noise"**, G. Grinstein, M. Munoz and Yuhai Tu, **Phys. Rev. Lett. (PRL)**, 76(23), 4376 (1996).

110. **"Front Stability in Mean-Field Models of Diffusion-Limited Growth"**, D. Ridgway, H. Levine and Yuhai Tu, **Phys. Rev. E**, 53(1), 861 (1996).

111. **"Long Range Order in a 2-dimensional Dynamical XY Model: How Birds Fly Together"**, J. Toner and Yuhai Tu, **Phys. Rev. Lett. (PRL)**, 75(23), 4326 (1995).

112. **"Mean Field Theory of the Morphology Transition in Stochastic Diffusion Limited Growth**", Yuhai Tu and H. Levine, **Phys. Rev. E**, 52(5), 5134 (1995).

113. **"Defect Dynamics for Spiral Chaos in Rayleigh-Benard Convection"**, M. C. Cross and Yuhai Tu, **Phys. Rev. Lett. (PRL)**, 75(5), 834 (1995).

114. **"Absence of Finite Upper Critical Dimension in the Spherical Kardar-Parisi-Zhang Model"**, Yuhai Tu, **Phys. Rev. Lett. (PRL)**, 73(23), 3109 (1994).

115. **"Quantum Spherical-Models for Dirty Phase Transitions"**, Yuhai Tu and P. B. Weichman, **Phys. Rev. Lett. (PRL)**, 73(1), 6 (1994).

116. **"Passive Scalar Fluctuations with and without a Mean Gradient: A Numerical Study"**, E.S.C. Ching and Yuhai Tu, **Phys. Rev. E**, 49(2), 1278 (1994).

117. **"Chaotic Domains: A Numerical Investigation",** M.C. Cross, Yuhai Tu and D. Meiron, **Chaos**, **4(4),** 607 (1994).

118. **"Theory of Diffusion-Limited Growth"**, H. Levine and Yuhai Tu, **Phys. Rev. E**, 48(6), R4207 (1993).

119. **"Morphological Transitions in a Mean-Field Model of Diffusion-Limited Growth"**, Yuhai Tu, H. Levine and D. Ridgway, **Phys. Rev. Lett. (PRL)**, 71(23), 3838 (1993)

120. **"Chaotic Domain-Structure in Rotating Convection"**, Yuhai Tu and M.C. Cross, **Phys. Rev. Lett. (PRL)**, 69(17), 2515 (1992).

121. **"Instability in a Continuum Kinetic-Growth Model with Surface Relaxation"**, Yuhai Tu, **Phys. Rev. A**, 46(2), R729 (1992).

122. **" Mean-field diffusion-limited aggregation in radial geometries "**, H. Levine and Yuhai Tu, **Phys. Rev. A**, 45(2), 1053 (1992).

123. **"Mean-field diffusion-limited aggregation and the Saffman Taylor problem in three dimensions"**, H. Levine and Yuhai Tu, **Phys. Rev. A**, 45(2), 1044 (1992).

124. **"Saffman-Taylor Problem in Sector Geometry: Solution and Selection"**, Yuhai Tu, **Phys. Rev. A**, 44(2), 1203 (1991).

125. **"Interface Fluctuation in Random-Media"**, D. Kessler, H. Levine and Yuhai Tu, **Phys. Rev. A**, 43(8), R4551 (1991).

126. **"Mean-Field Theory for Diffusion-Limited Aggregation in Low Dimensions"**, E. Brener, H. Levine and Yuhai Tu, **Phys. Rev. Lett. (PRL),** 66(15), 1978 (1991).

127. **"Nonsymmetric Saffman-Taylor Fingers"**, E. Brener, H. Levine and Yuhai Tu, **Physics of Fluid A**, 3(4), 529 (1991).

128. **"Growth of Non-reflection Symmetric Patterns"**, E. Brener, H. Levine and Yuhai Tu, **Proceedings of NATO Advanced Study on Growth and Form**, Cargese, France (1990).

10 Most Influential Publications

1. **"Long Range Order in a 2-dimensional Dynamical XY Model: How Birds Fly Together"**, J. Toner and Yuhai Tu, **Phys. Rev. Lett. (PRL)**, 75(23), 4326 (1995).
2. **"Flocks, herds, and schools: A quantitative theory of flocking"**, J. Toner, Yuhai Tu, **Phys. Rev. E**, 58(4), 4828(1998).
3. **"Structure and energetics of the Si-SiO2 interface",** Yuhai Tu and J. Tersoff, **Phys. Rev. Lett. (PRL)**, 84(19), 4393 (2000).
4. **"Gene Expression Profiling of B Cell Chronic Lymphocytic Leakemia Reveals a Homogeneous Phenotype Related to Memory B Cells"**, U. Klein, Yuhai Tu, G. Stolovitzky, M. Mattioli, G. Cattoretti, H. Husson, A. Freedman, G. Inghirami, L. Cro, L. Baldini, A. Neri, A. Califano and R. Dalla-Favera, **Journal of Experimental Medicine,** 194, 1625 (2001).
5. **"Quantitative noise analysis in microarray experiments"**, Yuhai Tu, G. Stolovitzky and U. Klein, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 99(22), 14031-14036, (2002).
6. **"How white noise generates power-law switching in bacterial motors"**, Yuhai Tu and G. Grinstein, **Phys. Rev. Lett. (PRL)**, 94, 208101(2005).
7. **"An allosteric model for heterogeneous receptor complexes: Understanding bacterial chemotaxis responses to multiple stimuli"**, B. Mello and Yuhai Tu, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 102(48), 17354-17359 (2005).
8. **"Modeling the chemotactic response of *Escherichia coli* to time-varying stimuli"**, Yuhai Tu, T. S. Shimizu and H. Berg, **Proc. Natl. Acad. Sci. USA (*PNAS*)**, 105(39), 14855-14860 (2008)
9. **"The nonequilibrium mechanism for ultrasensitivity in a biological switch: Sensing by Maxwell's demons"**, Yuhai Tu, **Proc. Natl. Acad. Sci. USA (*PNAS*)** , 105(33), 11737-11741 (2008).
10. **"The energy-speed-accuracy trade-off in sensory adaptation"**, G. Lan, P. Sartori, S. Neumann, V. Sourjik, and Yuhai Tu, **Nature Physics 8**, 422–428 (2012).