Curriculum Vitae

Dr. Lei-Han Tang
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Personal Information

Name:	Lei-Han Tang
Date of Birth:	July 15, 1961
Nationality:	Chinese
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Qualifications and Development

(a) Education

	Institution	Degree Awarded
01.02.83 — 31.07.87	Carnegie Mellon University (supervisor: Prof. R. B. Griffiths)	PhD
01.09.81 — 31.01.83	Carnegie Mellon University	MSc
01.03.78 — 31.07.81	Univ. of Science&Technology of China	BSc

(b) Professional Membership

- Member of the American Physical Society (since 1984)
- Member of the Hong Kong Physical Society (since 1997)

Work Experience and Affiliation

Period	Institution	Position
13.01.97 — present	Hong Kong Baptist University	Assoc. Professor
11.08.04 — 15.01.05	UC San Francisco	Visiting Asso. Prof.
15.07.02 — 25.08.02	UC San Diego	Visitor
15.01.01 — 15.07.01	ITP/UCSB, Harvard University and NEC Research, Princeton	Program Participant and Visitor
01.01.96 — 10.01.97	Imperial College	Lecturer
01.09.91 — 31.12.95	Universität zu Köln	Research Associate
01.03.94 — 30.06.94	Issac Newton Institute University of Cambridge	Program Participant
01.01.90 — 31.08.91	Ruhr-Universität Bochum	Research Associate
01.01.89 — 31.12.89	Institut für Festkörperforschung der Kernforschungsanlage Jülich	Guest Scientist
01.09.87 — 31.12.88	Texas A&M University	Postdoctoral Fellow
01.08.87 — 31.12.87	Institute for Theoretical Physics, UCSB	Visitor

Teaching

(a) Lecture Course

Subject	Level	Institution	No. times taught
Collective Phenomena in Solids	4th yr MSci course	IC	1
General Physics I	1st yr BSc course	HKBU	4
Mechanics II	2nd yr BSc course	HKBU	1
Thermodynamics	2nd yr BSc course	HKBU	1
Statistical Mechanics	2nd yr BSc course	HKBU	5
Quantum Mechanics II	3rd yr BSc course	HKBU	1
Computational Physics	3rd yr BSc course	HKBU	6
Solid State Physics II	PG course	HKBU	1
States of Matter	3rd yr BSc & PG	HKBU	1

(b) MPhil Student Supervision

Mr. Chan Tak Sum, *Statistical modelling and analysis of financial markets* (completed September, 2002).

Mr. Liang Shenghua, *Transcription regulation of gene expression* (completed August, 2004)
Mr. Hui Sheng, *Simulation and analysis of the metabolic network of S. cerevisiae*
Mr. Wang Chao, *Regulatory mechanisms in metabolic networks*

Scholarship/Publications

I have (co)authored 46 papers that have been published in refereed journals. Sixteen of these are in the *Physical Review Letters*. I have written two review articles on the subject of quasicrystals and kinetic surface roughening, respectively. I have also published 14 articles in conference proceedings, most resulted from invited talks given at these conferences, and some contain original work not published elsewhere. I am a co-editor of a special volume of *Physica B*. A detailed publication list is appended.

ISI citation check as of October, 2004
first author/sole author: 863
coauthor: 987
total: 1850

Awards

HKBU Presidential award for outstanding performance in scholarly work, 2003

Professional Service and External Appointments

Panel Member, Research Grants Council, UGC/HKSAR (2002-2006)
Member, Advisory Committee, Laboratory of Soft Matter Physics, Institute of Physics, Academy of Sciences, China
Adjunct Professor, Center for Theoretical Biology, Peking University (2002-2005)
Visiting Professor and PhD Student Supervisor, Zhong Shan University (2001-2005)

Scholarly/Research-related Activities

Research in my group focuses on theoretical and computational aspects of condensed matter and biological systems, particularly from a statistical mechanics view point. We are interested in quantitative modeling and analysis of large scale properties of these systems, such as ordering and fluctuations, from a given set of interactions at the microscopic/molecular level. Increasingly, our attention is shifting towards living organisms, where complexity rules and intelligent organization holds the key to fitness maximization. By combining genome-wide, high-throughput data with quantitative modeling that implements the relevant biophysical and biochemical constraints, we hope to gradually develop an appreciation of Nature's design plan for life forms, starting from unicellular organisms *E. coli* and *S. cerevisiae*.

(a) Research Grants (external)

Investigator(s)	Project Title	Grant and Source(s) (HK$)	Starting Date
L.-H. Tang	Nanostructures and Dislocations in Strained-layer Epitaxy	416,000 RGC	1/9/97
L.-H. Tang L. F. Cohen D. Vvedensky	Magnetic Behaviour of Metal Oxides	87,100 RGC/British Council	1/3/98
L.-H. Tang Hugues Chate	Nonlinear Surface Evolution of Strained Epitaxial Thin Films	52,000 FR/HK JRS	15/2/00
L.-H. Tang	Current-Voltage Characteristics of Mesoscopic Superconducting Networks	403,817 RGC	1/9/00
L.-H. Tang	Theoretical investigation of RNA secondary structures	327,401 RGC	1/9/01
L.-H. Tang	Conformational density of states of peptide chains	300,000 RGC	1/9/02
L.-H. Tang	Possible normal liquid behavior in 2D bosonic systems at zero temperature	411,000 RGC	1/9/03
L.-H. Tang	Structures and phase changes of hard-sphere clusters	233,000 RGC	1/1/05

(b) On-going Research Projects

Superconducting Networks and Quantum Phase Transitions

The I-V characteristics of 2D superconducting films and Josephson-junction arrays are extremely rich and susceptible to various finite-size and disorder effects. Although the basic mechanism for current dissipation in the classical regime has long been understood, various quantitative details relevant to a correct interpretation of simulation and experimental results are often missing in the literature. One of our recent work in this direction addresses a peculiar finite-size effect for an array under periodic boundary conditions that had previously led to an incorrect interpretation of simulation data. To construct the equilibrium phase diagram with random frustration, we have extended the multi-canonical Monte Carlo scheme developed by Berg to systems with continuous degrees of freedom, and have also improved the iterative determination of the sampling function. These improvements allow us to perform efficient sampling down to very low temperatures. Combined with analysis of the classical ground state, we have been able to provide a microscopic picture of the zero-temperature criticality in the 2D gauge-glass model, a controversial topic in the recent literature.

More recently, we have devoted our attention to theoretical and simulation studies of a JJ array in the quantum regime. By introducing a suitable form of random frustration, such a system may afford a "metallic phase" at zero temperature as characterized by short-range spatial order and gapless quasi-particle excitations. As such, it makes a good candidate for the observed low-temperature metallic behavior of thin superconducting films and, according to a recent suggestion by A. Paramekanti, L. Balents and M. P. A. Fisher, the peculiar "normal state" of cuprate superconductors. Starting from the classical limit of the model, we are currently exploring spectral properties and correlation functions so as to reach a better understanding of the state.

Conformational Transformations of Biopolymers

The folding/denaturation transformations of DNA, RNA and protein molecules have been a subject of lasting interest in structural biology. The physical interactions involved in the process are relatively well-characterized, and hence such systems are more amenable to traditional methods of statistical mechanics. For a random DNA sequence, we have been able to provide a renormalization group description of the melting transition. In collaboration with Terry Hwa at UCSD and others, we have also investigated the formation of bubbles in the DNA double helix due to either under-twisting or heating. On the RNA secondary structure formation, we have developed Monte Carlo methods to search minimum energy base pairings where pseudoknot formation is allowed. RNA's without pseudoknots have been shown to undergo a transition from specific to non-specific pairing, but the precise nature of the low temperature glass state and the mechanism of the transition have not been completely characterized. Our recent work on this problem indicates a novel $\log^2 L$ energy for "droplet" excitations and possibly a phase transition of infinite order. We are working on a renormalization group theory to explain these observations.

The bigger issue, however, is how to uncover the mystery hidden in protein (and to a lesser extent, RNA) sequences that allow them to fold into a unique shape and in a cooperative manner. In addition to studying simple models (such as the HP model on a lattice) for extracting generic behavior, we are also examining interactions (such as secondary structure propensities) in stabilizing real proteins.

Metabolic network

Enzyme-assisted metabolic flow is one of the best characterized molecular systems in cell biology. Its backbone is universal among nearly all living organisms while, through evolution, many add-on features have been developed to enhance the fitness of a given organism. A large percentage of cell's transcriptional regulatory circuit is devoted to the efficient channelling of resources under steady-state and change of external environments. Therefore analysis of the system-wide metabolic flow pattern under various stress conditions offers the possibility of deciphering the genetic circuit from a functional perspective. The metabolic network itself involves around a thousand reactions with a similar number of compounds and protein types, and hence is very complex. On the other hand, there exists now a large body of genome scale experimental data, including microarray gene expression and ChIP on chip TF binding data, that can be used to help reconstruct the flux pattern under different growth conditions. We have recently implemented the *in silico* growth models iJR904 for *E. coli* and iND750 for yeast (*S. cerevisiae*) developed by Palsson's group at UCSD, which allow for calculation of biomass production under a given nutrient condition. One of our immediate goals is to corroborate the simulated flux pattern with microarray data and to identify regulators that are responsible for activation of alternative pathways. More importantly, such simulations will bring up various design issues whose resolution will deepen our understanding of biological organization.

(c) Invited Lectures

Date	Occasion	Place
December, 2003	Peking Normal U Lecture Series on Frontiers of Physics	Beijing
June, 1998	BICCP workshop: Computational Materials Science and Biology	Beijing
December, 1997	6th Workshop on Condensed Matter and Statistical Physics	Tainan
January, 1997	Dynamics of Fluctuating Interfaces and Related Phenomena	Seoul
August, 1993	CCAST workshop: Nonequilibrium Statistical Mechanics	Beijing
March, 1992	CCAST workshop: High-temperature Superconductivity	Beijing

(d) Partial list of talks/seminars in the Past Three Years

Date	Conference/Title	Place
June, 2004	Nonequilibrium Statistical Physics (invited speaker)	Seoul
June, 2004	Intra and inter pathway correlations from microarray data analysis, International Conference on Bio-networks	Lijiang
June, 2004	Probing the genetic network of bacteria — analysis of microarray gene expression data, Imperial College	London
May, 2004	Multicanonical Monte Carlo methods applied to low temperature simulations, ICCP6/CCP2003 (Plenary speaker)	Beijing
Oct., 2003	11th National Conference on Condensed Matter and Statistical Physics	Shanghai
August, 2003	1st Cross-strait conference on Statistical Physics	Yangzhou
July, 2003	Weihai conference on Condensed Matter Physics	Weihai
August, 2002	International Conference on Econophysics	Bali
July, 2002	3rd Cross-strait conference on BITS (invited)	Hualian
June, 2002	CUSPEA reunion, scientific program	Beijing
May, 2002	Centennial celebration, Nanjing University (invited)	Nanjing
March, 2002	APS March meeting	Indiapolis

(e) Conference Organisation

Member of the local organisation committee for

- *ETOPIM5*, June, 1999, Hong Kong (Chaired by Prof. Ping Sheng at HKUST)
- *Dynamics Days Asia Pacific*, July, 1999, Hong Kong (Chaired by Prof. Bambi Hu)
- *MCQMC*, Hong Kong, December, 2000 (Chaired by Prof. K-T Fang and Prof. Hickernell)
- *New Trends in Interdisciplinary Physics and Soft Science*, September, 2001, Shanghai (co-chair).

Appendix A: List of Publications

Journal articles (refereed)

1. D. E. Wolf and L. Tang, “Pressure and stress tensor in fluids in a periodic potential, ” Phys. Rev. A **36**, 5337 (1987).
2. C. S. O. Yokoi, L.-H. Tang, and W. Chou, “Ground state of the one-dimensional chiral XY model in a field,” Phys. Rev. B **37**, 2173 (1988).
3. L.-H. Tang and R. B. Griffiths, “Localized defects in classical one-dimensional models, ” J. Stat. Phys. **53**, 853 (1988).
4. K. J. Strandburg, L.-H. Tang and M. V. Jaric, “Phason elasticity in entropic quasicrystals,” Phys. Rev. Lett. **63**, 314 (1989).
5. L.-H. Tang and M. V. Jaric, “Equilibrium quasicrystal phase of a Penrose tiling model,” Phys. Rev. B **41**, 4524 (1990).
6. B. M. Forrest and L.-H. Tang, “Surface roughening in a hypercube-stacking model,” Phys. Rev. Lett. **64**, 1405 (1990).
7. L.-H. Tang, “Random tiling quasicrystal in three dimensions, ” Phys. Rev. Lett. **64**, 2390 (1990).
8. B. M. Forrest and L.-H. Tang, “Hypercube stacking: a Potts-spin model for surface growth,” J. Stat. Phys. **60**, 181 (1990).
9. D. E. Wolf and L.-H. Tang, “Inhomogeneous growth processes,” Phys. Rev. Lett. **65**, 1591 (1990).
10. L.-H. Tang, T. Nattermann, and B. M. Forrest, “Multicritical and crossover phenomena in surface growth,” Phys. Rev. Lett. **65**, 2422 (1990).
11. L.-H. Tang and T. Nattermann, “Kinetic roughening in molecular-beam epitaxy,” Phys. Rev. Lett. **66**, 2899 (1991).
12. L.-H. Tang, J. Kertész, and D. E. Wolf, “Kinetic roughening with power-law waiting time distribution,” J. Phys. A **24**, L1193 (1991).
13. T. Nattermann and L.-H. Tang, “Kinetic surface roughening. I. The Kardar-Parisi-Zhang equation in the weak-coupling regime,” Phys. Rev. A **45**, 7156 (1992).
14. L.-H. Tang, B. M. Forrest, and D. E. Wolf, “Kinetic surface roughening. II. the hypercube-stacking model, ” Phys. Rev. A **45**, 7162 (1992).
15. L.-H. Tang, “Steady-state scaling function of the (1+1)-dimensional single-step model, ” J. Stat. Phys. **67**, 819 (1992).
16. L.-H. Tang and H. Leschhorn, “Pinning by directed percolation, ” Phys. Rev. A **45**, R8309 (1992).
17. T. Nattermann, S. Stepanow, L.-H. Tang and H. Leschhorn, “Dynamics of interface depinning in a disordered medium, ” J. Phys. II France **2**, 1483 (1992).
18. J. Villain, A. Pimpinelli, L.-H. Tang and D. E. Wolf, “Terrace sizes in molecular beam epitaxy, ” J. Phys. I France **2**, 2107 (1992).
19. L.-H. Tang, “Island formation in submonolayer epitaxy, ” J. Phys. I France I, **3**, 935 (1993).
20. H. Leschhorn and L.-H. Tang, “Comment on ‘Elastic String in a Random Potential’,” Phys. Rev. Lett. **70**, 2973 (1993).
21. L.-H. Tang and H. Leschhorn, “Self-organized interface depinning,” Phys. Rev. Lett. **70**, 3832 (1993).
22. L.-H. Tang and I. F. Lyuksyutov, “Directed polymer localization in a disordered medium,” Phys. Rev. Lett. **71**, 2745 (1993).
23. H. Leschhorn and L.-H. Tang, “Avalanches and correlations in driven interface depinning,” Phys. Rev. E **49**, 1238 (1994).
24. L.-H. Tang and Y. Tang, “Capillary rise in tubes with sharp grooves, ” J. de Physique II **4**, 881 (1994).
25. J. Krug and L.-H. Tang, “Disorder-induced unbinding in confined geometries, ” Phys. Rev. E **50**, 104 (1994).
26. L.-H. Tang, “Two-repulsive lines on disordered lattices, ” J. Stat. Phys. **77**, 581 (1994).

27. H. Chaté, G. Grinstein, and L.-H. Tang, "Long-range correlations in systems with coherent (quasi)periodic oscillations, " Phys. Rev. Lett. **74**, 912 (1995).
28. L.-H. Tang, M. Kardar, and D. Dhar, "Driven depinning in anisotropic media, " Phys. Rev. Lett. **74**, 920 (1995).
29. L.-H. Tang, "Vortex statistics in a disordered two-dimensional XY model, " Phys. Rev. B **54**, 3350 (1996).
30. H. Leschhorn, T. Nattermann, S. Stepanow, and L.-H. Tang, "Driven Interface Depinning in a Disordered Medium, " Annalen der Physik **6**, 1 (1997).
31. R. A. Hyman, M. D. Stiles, L.-H. Tang, and A. Zangwill, "Coercivity of ultrathin films with in-plane magnetization, " J. Appl. Phys. **81**, 3911 (1997).
32. I. S. Aranson, H. Chaté, and L.-H. Tang, "Spiral Motion in a Noisy Complex Ginzburg-Landau Equation, " Phys. Rev. Lett. **80**, 2646 (1998).
33. L.-H. Tang, P. Smilauer, and D. D. Vvedensky, "Noise-assisted mound coarsening in epitaxial growth, " Euro. J. Phys. B **2**, 409 (1998).
34. G.-S. Tian and L.-H. Tang, "Parity effect in a small superconducting grain: A rigorous result, " Phys. Rev. B. **58**, 12333 (1998).
35. H. Chaté, Q.-H. Chen and L.-H. Tang, "Comment on 'Nonuniversal Expoenents in Interface Growth'," Phys. Rev. Lett. **81**, 5471 (1998).
36. L.-H. Tang and G.-S. Tian, "Reaction-diffusion-branching models of stock price variations, " Physica A **264**, 543 (1999).
37. G.-S. Tian and L.-H. Tang, "A general result on charged and spin-excitation gaps in strongly correlated electron systems at half-filling, " Phys. Rev. B **60**, 11336 (1999).
38. G.-S. Tian, L.-H. Tang and Q.-H. Chen, "Superconducting correlations in ultra-small metallic grains, " Europhys. Lett. **50**, 361 (2000).
39. G.-S. Tian, L.-H. Tang and Q.-H. Chen, "Pair-mixing superconducting correlation in ultrasmall metallic grains," Phys. Rev. B **63**, 054511 (2001).
40. L.-H. Tang and H. Chaté, ``Rare-event induced binding transition of heteropolymers," Phys. Rev. Lett. **86**, 830 (2001).
41. Q.-H. Chen, L.-H. Tang and P.-Q. Tong, "Anomalous finite-size effect in superconducting Josephson junction arrays, " Phys. Rev. Lett. **87**, 067001 (2001).
42. K. Chen, X. Sun and L.H. Tang, "Polarizability of polaron in conjugated polymer," Physics Letters A **294**, 113 (2002).
43. L.-H. Tang and Q.-H. Chen, "Finite-size and boundary effects on the I-V characteristics of two-dimensional superconducting networks, " Phys. Rev. B **67**, 024508 (2003).
44. T. Hwa, E. Marinari, K. Sneppen, and L.-H. Tang, "Localization of denaturation bubbles in random DNA sequences," Proceedings of the National Academy of Sciences, USA. **100**, 4411-4416 (2003).
45. L.-H. Tang, "Langevin modelling of high-frequency Hang-Seng index data," Physica A **324**, 272 (2003).
46. A. Mishra, M. Ma, F.-C. Zhang, S. Gürtler, L.-H. Tang, and S. Wan, "Directional Ordering of Fluctuations in a Two-dimensional Compass Model", Phys. Rev. Lett. **93**, 207201 (2004).

Review articles

47. L.-H. Tang, "Models of random tiling quasicrystal," Periodico di Mineralogia **59**, 101 (1990).
48. L.-H. Tang, "Nonequilibrium surfaces, " in *Annual Reviews of Computational Physics II*, edited by D. Stauffer, (World Scientific, Singapore, 1995), p. 137.

Mini-reviews

49. L.-H. Tang, "Phason elasticity in equilibrium quasicrystal models, " Modern Phys. Lett. **B3**, 1121 (1989).

50. B. M. Forrest and L.-H. Tang, "Surface roughening in a class of growth models," Mod. Phys. Lett. **B4**, 1185 (1990).

Articles in conference proceedings (mostly refereed)

51. D. E. Wolf, R. B. Griffiths, and L. Tang, "Surface stress and surface tension for solid-vapor interfaces, " Surface Science **162**, 114 (1985).
52. L.-H. Tang and M. V. Jaric, "Phason elasticity and surface roughening (invited)," in *Proceedings of Adriatico research conference on quasicrystals*, eds. M. V. Jaric and S. Lundqvist (World Scientific, Singapore, 1990).
53. L.-H. Tang, T. Nattermann, and B. M. Forrest, "Crossover phenomena in kinetic roughening, " in *Proceedings of NATO ASI summer school on Growth and Form: Nonlinear aspects*, Cargese, France, 1990, edited by P. Pelce (Plenum, New York, 1991).
54. D. E. Wolf and L.-H. Tang, "Inhomogeneous growth of rough surfaces, " in *Proceedings of NATO ASI summer school on Growth and Form: Nonlinear aspects*, Cargese, France, 1990, edited by P. Pelce (Plenum, New York, 1991).
55. L.-H. Tang, J. Villain, and T. Nattermann, "Statistical physics of crystal growth from atomic beams, " in *Proceedings of Les Houches workshop on Dynamical Phenomena at Surfaces, Interfaces and Membranes*, (Nova Science Publishers, Commack, 1991).
56. L.-H. Tang, "Waiting-time formulation of surface growth and mapping to directed polymers in a random medium, " in *NATO ASI series: Growth Patterns in Physical Sciences and Biology*, edited by J. M. Garcia-Ruiz, E. Louis, P. Meakin and L. M. Sander, (Plenum, New York, 1993), p. 99-108.
57. L.-H. Tang and H. Leschhorn, "Pinning related to directed percolation, in *Proceedings of Les Houches workshop on Surface disordering: growth, roughening and phase transitions*, edited by R. Jullien, J. Kertész, P. Meakin and D. E. Wolf, (Nova Science Publishers, Commack, 1993).
58. T. Nattermann and L.-H. Tang, "Kinetic roughening in molecular beam epitaxy, in *Proceedings of Les Houches workshop on Surface disordering: growth, roughening and phase transitions*, edited by R. Jullien, J. Kertész, P. Meakin and D. E. Wolf, (Nova Science Publishers, Commack, 1993).
59. L.-H. Tang, "Flattenning of grooves: from step dynamics to continuum theory, " in *Dynamics of crystal surfaces and interfaces*, edited by P. M. Duxbury and T. Pence, (Plenum, NY, 1997), p. 169-184.
60. L.-H. Tang, I. S. Aranson, and H. Chaté, "Noise-driven spiral diffusion in the complex Ginzburg-Landau equation, " in *Dynamics of fluctuating interfaces and related phenomena*, ed. by D. Kim, H. Park, and B. Kahng, (World Scientific, Singapore, 1997), p.321.
61. L.-H. Tang, "Unstable growth and coarsening in molecular beam epitaxy," Physica A **254**, 135 (1998).
62. L.-H. Tang and Q.-H. Chen, "Vortex pinning and motion in randomly frustrated Josephson-junction arrays", Physica B **279**, 227 (2000).
63. L.-H. Tang and Z.-F. Huang, "Modelling High-frequency Economic Time Series," Physica A **288**, 444 (2000).
64. L-H. Tang, "Flat Histogram Monte Carlo for Low Temperature Simulations," to appear in the Proceedings of the ICCP6.

Books edited

P. M. Hui, P. Sheng and L.-H. Tang
Proceedings of the fifth international conference on electrical transport and optical properties of inhomogeneous media, Physica B **279**, Nos. 1-3 (2000).