

Program of the 102nd Statistical Mechanics Conference
Thermodynamics, Statistical Mechanics, and Fundamental Issues
in Biology: Where do We Stand?
Rutgers University, Busch Campus, Hill Center, Room 114
Sunday, Monday, Tuesday, May 10–12, 2009

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Copies of the presentations of the invited talks as well as information about past meetings, positions wanted and available, can be obtained at: <http://www.math.rutgers.edu/events/smm/>.

The next Statistical Mechanics Conferences the 103rd and 104th is scheduled to take place May 9–11, 2010 and December 18–21, 2010.

Invited Talks

H. Swinney, University of Texas
Lethal protein produced in response to competition between bacterial colonies

M. Vergassola, Institut Pasteur
Bacterial chemotaxis as a game against nature

S. Klumpp, Max Planck Institute, Potsdam
Transcription of ribosomal RNA—a central task for rapid bacterial growth

E. Siggia, Rockefeller University
Geometry and genetics

C. Tang, University of California, San Francisco
Linking network function and topology

Y. Tu, IBM—Watson Research Center
The dissipative nature of adaptation and its thermodynamic cost

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G. Menon, institute of Mathematical Sciences, Chennai, India
Stretching fluctuations and loop formation in short double-stranded DNA molecules

A. Morozov, Rutgers University
Statistical mechanics of chromatin structure

M.E. Fisher, University of Maryland
Biology, medicine, and engineering: Roles for theory?

G. Alexe, A. Reddy, M. Seiler, T. Michael, L. Cronk, B. Shraiman, R. Neher, L. McIntosh,
A. George, R. Sachidanandam, A. Levine, and G. Bhanot*, Rutgers University
Scales of selection events-local or genome wide?

U. Alon, Weizmann Institute
On the evolution of modularity

D. Fisher, Stanford University
Quantitative issues in evolutionary dynamics

B. Shraiman, Kavli Institute for Theoretical Physics
Evolution, sex and statistical mechanics

L. Abbott, Columbia University
Controlling chaotic activity in neural networks

R. Monasson, ENS, Paris
Learning in the temporal domain with an integrate-and-fire neuron

J. Hopfield, Princeton University
What is thinking? The dynamics of mental exploration

Human Rights session with U. Alon and H. Swinney

M. Kardar, MIT
Thymic selection of T-cell receptors as an extreme value problem

E. Vanden Eijnden, Courant Institute
Navigating through the maze of rare events

G. West, Sante Fe Institute
Damage and repair; sleep, aging and nucleotide substitution rates

B. Shklovskii, University of Minnesota
Self-assembly of viruses

B. Gelbart, UCLA
What does evolution have to say about our being able to make a virus from scratch?

S. Leibler, Rockefeller University/IAS
Selection and survival in microbial populations

F. Dyson, IAS
Why negative specific heat is good for life

R. Austin, Princeton University
Physics and cancer

D. Botstein, Princeton University

A few examples of quantitative issues in biology

D. Bensimon, ENS, Paris

Single cell physiology

P. Fratzl, Max Planck Institute, Potsdam

Tissue growth and remodelling

M. Schick, University of Washington

“Rafts” as mixtures of lipids and cholesterol: Are we still at sea?

H. Qian, University of Washington

Nonequilibrium phase transition in a biochemical system: Emerging landscape, time scales, and a possible basis for epigenetic-inheritance

R. Levine, The Hebrew University of Jerusalem

Maximal entropy thermodynamic-like analysis of cell signaling with application to early processes in carcinogenesis

K. Mischaikow, Rutgers University

A database schema for multiparameter dynamical systems

W. Bialek, Princeton University

How much can we calculate?: Predicting the structure of genetic networks from an optimization principle

L.-S. Young, Courant Institute

Spike-time reliability of neural oscillator networks

M. Feigenbaum, Rockefeller University

Comments on optics and vision

E. Sontag, Rutgers University

Interconnections in biochemical networks: Signaling, impedance, and insulators.

Short Talks (*Identifies speakers)

Y.-J. Chen*, Cornell University, S. Papanikolaou, J. P. Sethna, G. Durin, S. Zapperi

Merging theory with experiment: Improving the accuracy of scaling theories

R. Fisch, Princeton University

New results for the 3D random field XY model

O. Sariyer*, Koc University, Michael Hinczewski, and A. Nihat Berker

Charge-ordered phases of the $d = 3$ spinless Falicov-Kimball model: Renormalization-group theory

Y.-Y. Anh*, Northeastern University, James P. Bagrow and Sune Lehmann

Link communities reveal multi-scale complexity in networks

D. Adams*, University of Michigan, L. M. Sander and R. M. Ziff

The barrier method: A new algorithm to measure rare transitions in non-equilibrium systems with applications to a model by Maier and Stein

- A. Baule*, Rockefeller University, E. G. D. Cohen, H. Touchette
Path integral approach to random motion with nonlinear friction
- V. Tkachenko, Ben-Gurion University of the Negev, Israel
An inverse problem for 1d ordinary differential operator of order 4
- A. Toom*, UFPE, Brazil and A.D. Ramos
Non-ergodicity and growth are compatible for 1-D local interaction
- Y. Zhang, Fundan University/University of Maryland
A tug of war model for organelle transport can display three stable steady states
- M. Palassini*, University of Barcelona, and M. Dias
Delay and noise in negative-feedback genetic regulatory loops
- D. Rabson*, University of South Florida C.-M. Lo, and D. Lovelady
Sometimes the noise is the signal
- T. Reichenbach*, Rockefeller University and A. J. Hudspeth
A ratchet mechanism for low-frequency hearing in mammals
- I. Nemenman*, Emory University, G. Bel and B. Munsky
Simplicity of completion time distributions of kinetic proofreading-like biochemical process
- E.-M. Schoetz*, Princeton University, J. Talbot and J. Dunkel
Dynamics of asexual reproduction in flatworms
- R. Weinkamer*, Max Planck Institute, M. Rusconi, A. Valleriani, J.W.C. Dunlop, J. Kurths
Control of bone remodeling
- S. Maslov*, Brookhaven National Laboratory, S. Krishna, T.-Y. Pang, K. Sneppen
“Home depot” model of evolution of prokaryotic metabolic networks and their regulation
- R. Zia*, Virginia Tech, M.F.J. Pleimling and B. Schmittmann
Convection cells driven by spontaneous symmetry breaking
- F. Family*, Emory University, H. Grossniklaus, M. Arizmendi, K. Mazitello, J. Glazier
A statistical physics look at macular degeneration
- S. Redner, Boston University and A. Clauset
Distribution of species body masses
- S. Harvey*, Georgia Institute of Technology, and M. R. Smyda
The entropic penalty of confining a polymer into a very small space
- S. Ji*, Rutgers University and K. So
The universal law of thermal transitions applicable to blackbody radiation, single-molecule enzymology and whole-cell metabolism
- R. Movassagh, MIT
Qudit chains and their ground states
- S.J. Rahi, MIT
Scattering theory approach to electrodynamic Casimir forces
- A. Davidson*, Rutgers University, P. Chin, D. Patel, R. Shah, K. So and S. Ji
Energy-dependent and pathway-specific transitions of RNA levels in budding yeast induced by glucose-galactose shift

J. Bechhoefer, Simon Fraser University

Defects in DNA replication: A tale of two regimes?

T. Julou, Ecole Normale Supérieure

Public goods in bacterial populations: Beyond the mean field description

D. David-Rus, Ecole Normale Supérieure, Paris

Understanding regulation of the states of DARPP-32 phosphorylations- a stochastic approach

M. Barbosa, Cornell University

A linear relation between solvation free energy and the potential of mean force in a lattice model of fluid

B. Daniels, Cornell University

Statistical mechanics of the DNA supercoiling transition

B. Fernandez, Bastien Fernandez* and Lev Tsimring, CNRS & NYU

A thermal dynamics of strongly coupled stochastic three-state oscillators

U. Harbola*, Shaul Mukamel, Massimiliano Esposito, University of California, San Diego

Fluctuation theorems and electron counting statistics

J. Xing, Virginia Tech.

Mapping between stochastic dissipative and Hamiltonian systems

J. Menche*, Angelo Valleriani, Reinhard Lipowsky, Max Planck Institute

Activity patterns on scale-free networks

M. Transtrum*, Cornell University, B. Machta, J. Sethna

Differential geometric approach to fitting data

S. Papanikolaou*, Cornell University, F. Bohn, R. L. Sommer, G. Durin, S. Zapperi and J.P. Sethna

Beyond scaling: The average avalanche shape

S. Mishra*, Syracuse University, A. Baskaran, M.C. Marchetti

Pattern formation and traveling bands in dense layers of self-propelled rods

B. Miller*, Texas Christian University and W. Maier

A minimal model for the study of polychronous groups

R. Forties, R. Bundschuh*, and Michael Poirier, Ohio State University

Flexibility of short DNA

K. Korolev*, Harvard University and O. Hallatschek

Genetic waves under strong noise

R. Vandiver*, Bryn Mawr College and A. Goriely

On the mechanical stability of growing arteries

C. Henley, Cornell University

Possible mechanisms to determine macroscopic left-right asymmetry in animals and plants

J. England, Lewis-Sigler Institute, Princeton University

An exactly solvable model of structure from sequence: The solution to a Gaussian folding problem

D. Sisan*, NIST, D. Yarar, C. M. Waterman, and J. S. Urbach

Event ordering in live cell imaging determined from temporal cross correlation asymmetry

B. Machta*, Cornell University, S. Papanikolaou, S. Veatch, and J. Sethna

Criticality in biological membranes

S. Norrelykke*, Princeton University and E. Cox

Foraging strategies for starving and feeding amoeba

M. Halter*, NIST, J. Elliott, J. B. Hubbard, A. Tona and A. Plant

Modeling growth rates and division times of cells in culture

C. Franck*, Cornell University, X. Qiao, S. Zhou, A. Deshmukh, E. Bogart, S. Lau, K. Daie,

A. Bae, B. Webster, R. Monaghan, W. Ip, N. Franck, and T. Thi Le

Exploration of transitions to multicellular life in amoeba colonies