PHYSICAL REVIEW E™

For editorial and subscription correspondence, please see inside front cover
(ISSN: 1539-3755)

PERIODICALS
Postmaster send address changes to:
APS Subscription Services
Suite 1NO1
2 Huntington Quadrangle
Melville, NY 11747-4502

THIRD SERIES, VOLUME 84, NUMBER 6 ***CONTENTS*** **DECEMBER 2011**

PART 1: STATISTICAL, SOFT MATTER, AND BIOLOGICAL PHYSICS

RAPID COMMUNICATIONS

Statistical physics

Transient-state fluctuationlike relation for the driving force on a biomolecule *(5 pages)* . . . . . 060101(R)
M. Ponmurugan and Satyavani Vemparala

Computation as an emergent feature of adaptive synchronization *(4 pages)* . . . . . 060102(R)
M. Zanin, D. Papo, I. Sendiña-Nadal, and S. Boccaletti

Colloidal dispersions, suspensions, and aggregates

Nonmonotonic settling of a sphere in a cornstarch suspension *(4 pages)* . . . . . 060401(R)
Stefan von Kann, Jacco H. Snoeijer, Detlef Lohse, and Devaraj van der Meer

Bulk and shear moduli of compressed microgel suspensions *(4 pages)* . . . . . 060402(R)
Juan José Liétor-Santos, Benjamín Sierra-Martín, and Alberto Fernández-Nieves

Liquid crystals

Short-range correlations seen in the nematic phase of bent-core liquid crystals by dielectric and electro-optic studies *(5 pages)* . . . . . 060701(R)
Yun Jang, Vitaly P. Panov, A. Kocot, A. Lehmann, C. Tschierske, and J. K. Vij

Biological physics

Electronic properties of conductive pili of the metal-reducing bacterium *Geobacter sulfurreducens* probed by scanning tunneling microscopy *(4 pages)* . . . . . 060901(R)
Joshua P. Veazey, Gemma Reguera, and Stuart H. Tessmer

Boundary-induced orientation of dynamic filament networks and vesicle agglomerations *(4 pages)* . . . . . 060902(R)
Philip Greulich and Ludger Santen

ARTICLES

Statistical physics

Order statistics of $1/f^{\alpha}$ signals *(8 pages)* 061101
N. R. Moloney, K. Ozogány, and Z. Rácz

Copyright 2011 by American Physical Society

(Continued)

1539-3755(201112)84:6:1;1-Y

PHYSICAL REVIEW E **THIRD SERIES, VOLUME 84, NUMBER 6** **DECEMBER 2011**

Ground states of the lattice-gas model on the triangular lattice with nearest- and next-nearest-neighbor pairwise interactions and with three-particle interaction: Ground states at boundaries of full-dimensional regions *(17 pages)* 061102
Yu. I. Dublenych

Avalanche spatial structure and multivariable scaling functions: Sizes, heights, widths, and views through windows *(22 pages)* 061103
Yan-Jiun Chen, Stefanos Papanikolaou, James P. Sethna, Stefano Zapperi, and Gianfranco Durin

Fractional Feynman-Kac equation for weak ergodicity breaking *(12 pages)* 061104
Shai Carmi and Eli Barkai

Casimir force induced by an imperfect Bose gas *(7 pages)* 061105
Marek Napiórkowski and Jarosław Piasecki

Nonequilibrium steady state of a stochastic system driven by a nonlinear drift force *(9 pages)* 061106
Chulan Kwon and Ping Ao

Evaporation-condensation transition of the two-dimensional Potts model in the microcanonical ensemble *(6 pages)* 061107
Tomoaki Nogawa, Nobuyasu Ito, and Hiroshi Watanabe

Negative thermal conductivity of chains of rotors with mechanical forcing *(6 pages)* 061108
Alessandra Iacobucci, Frédéric Legoll, Stefano Olla, and Gabriel Stoltz

Reliable index for measuring information flow *(7 pages)* 061109
Takashi Shibuya, Tatsuya Harada, and Yasuo Kuniyoshi

Thermodynamic cost of measurements *(5 pages)* 061110
Léo Granger and Holger Kantz

Non-Gaussian stochastic dynamics of spins and oscillators: A continuous-time random walk approach *(13 pages)* 061111
Daniel M. Packwood and Yoshitaka Tanimura

Jarzynski equality in van der Pol and Rayleigh oscillators *(10 pages)* 061112
Hideo Hasegawa

Thermodynamic formula for the cumulant generating function of time-averaged current *(18 pages)* 061113
Takahiro Nemoto and Shin-ichi Sasa

Superdiffusion induced by a long-correlated external random force *(8 pages)* 061114
M. A. Despósito

Statistical description of Coulomb-like systems *(7 pages)* 061115
B. I. Lev and A. G. Zagorodny

Perturbation calculation of thermodynamic density of states *(4 pages)* 061116
G. Brown, T. C. Schulthess, D. M. Nicholson, M. Eisenbach, and G. M. Stocks

Maxwell's demon and data compression *(5 pages)* 061117
Akio Hosoya, Koji Maruyama, and Yutaka Shikano

Fluctuation relations with intermittent non-Gaussian variables *(7 pages)* 061118
Adrián A. Budini

(Continued)

PHYSICAL REVIEW E **THIRD SERIES, VOLUME 84, NUMBER 6** **DECEMBER 2011**

Design of two-tooth unidirectional rotary-ratchet molecular machines driven by linearly polarized ac fields *(11 pages)* 061119
Hiroki Tutu and Yuta Hoshino

Brownian motion in shear flow: Direct observation of anomalous diffusion *(5 pages)* 061120
Hiroshi Orihara and Yoshinori Takikawa

Signal-to-noise ratio in parametrically driven oscillators *(8 pages)* 061121
Adriano A. Batista and Raoni S. N. Moreira

Molecular dynamics simulations of weak detonations *(15 pages)* 061122
Morag Am-Shallem, Yehuda Zeiri, Sergey V. Zybin, and Ronnie Kosloff

Model-free thermodynamics of fluid vesicles *(7 pages)* 061123
Haim Diamant

Stochastic dynamics beyond the weak coupling limit: Thermalization *(6 pages)* 061124
A. V. Plyukhin

Multiplication law and S transform for non-Hermitian random matrices *(17 pages)* 061125
Z. Burda, R. A. Janik, and M. A. Nowak

Stability intervals of metastable states in hysteretic systems *(6 pages)* 061126
Joël Puibasset

Orbital ice: An exact Coulomb phase on the diamond lattice *(6 pages)* 061127
Gia-Wei Chern and Congjun Wu

Nonperturbative renormalization group for the Kardar-Parisi-Zhang equation: General framework and first applications *(18 pages)* 061128
Léonie Canet, Hugues Chaté, Bertrand Delamotte, and Nicolás Wschebor

Space fractional Wigner equation and its semiclassical limit *(15 pages)* 061129
B. A. Stickler and E. Schachinger

Collision statistics for random flights with anisotropic scattering and absorption *(8 pages)* 061130
A. Zoia, E. Dumonteil, and A. Mazzolo

Non-Markovian models for migration-proliferation dichotomy of cancer cells: Anomalous switching and spreading rate *(8 pages)* 061131
Sergei Fedotov, Alexander Iomin, and Lev Ryashko

Langevin dynamics, entropic crowding, and stochastic cloaking *(7 pages)* 061132
Iddo Eliazar

Parametric correlations versus fidelity decay: The symmetry breaking case *(7 pages)* 061133
H. Kohler, T. Nagao, and H.-J. Stöckmann

Entrainment of a driven oscillator as a dynamical phase transition *(8 pages)* 061134
Alex Dickson, S. M. Ali Tabei, and Aaron R. Dinner

Ingredients of thermal rectification: The case of classical and quantum self-consistent harmonic chains of oscillators *(7 pages)* 061135
Emmanuel Pereira, Humberto C. F. Lemos, and Ricardo R. Ávila

(Continued)

PHYSICAL REVIEW E **THIRD SERIES, VOLUME 84, NUMBER 6** **DECEMBER 2011**

Depletion potentials in highly size-asymmetric binary hard-sphere mixtures: Comparison of simulation results with theory *(15 pages)* 061136
Douglas J. Ashton, Nigel B. Wilding, Roland Roth, and Robert Evans

Power-series expansion of the Boltzmann equation and reciprocal relations for nonlinear irreversible phenomena *(6 pages)* 061137
Felix Sharipov

Artificial photosynthetic reaction centers coupled to light-harvesting antennas *(12 pages)* 061138
Pulak Kumar Ghosh, Anatoly Yu. Smirnov, and Franco Nori

Effectiveness of mixing in violent relaxation *(9 pages)* 061139
Pierre de Buyl and Pierre Gaspard

Precise determination of the nonequilibrium tricritical point based on Lynden-Bell theory in the Hamiltonian mean-field model *(8 pages)* 061140
Shun Ogawa and Yoshiyuki Y. Yamaguchi

Exact solution of a heterogeneous multilane asymmetric simple exclusion process *(4 pages)* 061141
Takahiro Ezaki and Katsuhiro Nishinari

Statistical thermodynamics of straight rigid rods with nonadditive lateral interactions: Theory and Monte Carlo simulations *(11 pages)* 061142
O. A. Pinto, F. Nieto, and A. J. Ramirez-Pastor

Asymptotic solutions of decoupled continuous-time random walks with superheavy-tailed waiting time and heavy-tailed jump length distributions *(7 pages)* 061143
S. I. Denisov, S. B. Yuste, Yu. S. Bystrik, H. Kantz, and K. Lindenberg

O'Connell's process as a vicious Brownian motion *(11 pages)* 061144
Makoto Katori

Simulations of driven and reconstituting lattice gases *(10 pages)* 061145
M. D. Grynberg

Continuous-time random walks that alter environmental transport properties *(8 pages)* 061146
C. Angstmann and B. I. Henry

Quantum maximum-entropy principle for closed quantum hydrodynamic transport within a Wigner function formalism *(29 pages)* 061147
M. Trovato and L. Reggiani

Cooperation, structure, and hierarchy in multiadaptive games *(10 pages)* 061148
Sungmin Lee, Petter Holme, and Zhi-Xi Wu

Positive congestion effect on a totally asymmetric simple exclusion process with an adsorption lane *(7 pages)* 061149
Takahiro Ezaki and Katsuhiro Nishinari

Extremely large-scale simulation of a Kardar-Parisi-Zhang model using graphics cards *(7 pages)* 061150
Jefrrey Kelling and Géza Ódor

Self-consistent inhomogeneous steady states in Hamiltonian mean-field dynamics *(5 pages)* 061151
Pierre de Buyl, David Mukamel, and Stefano Ruffo

(Continued)

PHYSICAL REVIEW E **THIRD SERIES, VOLUME 84, NUMBER 6** **DECEMBER 2011**

Exponential complexity of the quantum adiabatic algorithm for certain satisfiability problems *(8 pages)* 061152
Itay Hen and A. P. Young

Bounds and correlation approximation for the effective conductivity of heterogeneous plates *(14 pages)* 061153
H. Le Quang, G. Bonnet, and D. C. Pham

Granular materials

Antiphase synchronization of electrically shaken conducting beads *(5 pages)* 061301
E. Mersch and N. Vandewalle

Lift force on an asymmetrical obstacle immersed in a dilute granular flow *(10 pages)* 061302
Fabricio Q. Potiguar

Creep motion of a model frictional system *(9 pages)* 061303
Baptiste Blanc, Luis A. Pugnaloni, and Jean-Christophe Géminard

Colloidal dispersions, suspensions, and aggregates

Simulations of thermophoretic nanoswimmers *(5 pages)* 061401
Mingcheng Yang and Marisol Ripoll

Structured and complex fluids

Mode-coupling glass transition in a fluid confined by a periodic potential *(8 pages)* 061501
Saroj Kumar Nandi, Sarika Maitra Bhattacharyya, and Sriram Ramaswamy

Mode-coupling theory for the glass transition: Test of the convolution approximation for short-range interactions *(8 pages)* 061502
A. Ayadim, Ph. Germain, and S. Amokrane

Direct evidence of heterogeneous mechanical relaxation in supercooled liquids *(7 pages)* 061503
Akira Furukawa and Hajime Tanaka

Deionization shocks in microstructures *(13 pages)* 061504
Ali Mani and Martin Z. Bazant

Boundary effect in electrorheological fluids *(7 pages)* 061505
X. L. Gong, F. Yang, S. H. Xuan, L. H. Zong, W. Zhu, and W. Q. Jiang

Films, interfaces, and crystal growth

Elastocapillary instability under partial wetting conditions: Bending versus buckling *(11 pages)* 061601
Bruno Andreotti, Antonin Marchand, Siddhartha Das, and Jacco H. Snoeijer

Wetting and contact-line effects for spherical and cylindrical droplets on graphene layers: A comparative molecular-dynamics investigation *(8 pages)* 061602
Giulio Scocchi, Danilo Sergi, Claudio D'Angelo, and Alberto Ortona

Random sequential adsorption of partially oriented linear k-mers on a square lattice *(11 pages)* 061603
Nikolai I. Lebovka, Natalia N. Karmazina, Yuri Yu. Tarasevich, and Valeri V. Laptev

Effect of immobile impurities on motion of steps on a vicinal face *(7 pages)* 061604
Masahide Sato

(Continued)

PHYSICAL REVIEW E **THIRD SERIES, VOLUME 84, NUMBER 6** **DECEMBER 2011**

Nonlinear dynamics of a thin nonisothermal liquid film on an axially oscillating cylindrical surface *(9 pages)* 061605
Ory Haimovich and Alexander Oron

Geometric evolution law for modeling strongly anisotropic thin-film morphology *(9 pages)* 061606
Christopher Ograin and John Lowengrub

Thermodynamic properties of a symmetrical binary mixture in the coexistence region *(10 pages)* 061607
Subir K. Das and Kurt Binder

Liquid crystals

Stripe and line textures in the $B2$ phase of bent-shape molecules in samples with polar surface anchoring *(9 pages)* 061701
Lubor Lejček, Vladimíra Novotná, and Milada Glogarová

Computing with liquid crystal fingers: Models of geometric and logical computation *(10 pages)* 061702
Andrew Adamatzky, Stephen Kitson, Ben De Lacy Costello, Mario Ariosto Matranga, and Daniel Younger

Rigid probe solutes in a smectic-A liquid crystal: An unconventional route to the latter's positional order parameters *(7 pages)* 061703
Maria Enrica Di Pietro, Giorgio Celebre, Giuseppina De Luca, and Giorgio Cinacchi

Binary mixtures of liquid crystalline compounds with a reentrant smectic-A^* phase *(7 pages)* 061704
Natalia Podoliak, Vladimíra Novotná, Milada Glogarová, Damian Pociecha, Ewa Gorecka, Miroslav Kašpar, and Věra Hamplová

Memory effect in composites of liquid crystal and silica aerosil *(11 pages)* 061705
Sabrina Relaix, Robert L. Leheny, Linda Reven, and Mark Sutton

Crossover from tricritical to critical end point behavior in free-standing smectic films *(5 pages)* 061706
Maria S. S. Pereira, Italo N. de Oliveira, and Marcelo L. Lyra

Polymers

Aggregation kinetics of a simulated telechelic polymer *(9 pages)* 061801
Mark Wilson, Avinoam Rabinovitch, and Arlette R. C. Baljon

Biological physics

Effect of viscoelasticity on the collective behavior of swimming microorganisms *(4 pages)* 061901
Yaser Bozorgi and Patrick T. Underhill

Fiber-probe detection for positron-emission-assisted Cherenkov-radiation brain mapping *(5 pages)* 061902
Aleksei Zheltikov and Konstantin Anokhin

Attractive double-layer forces between neutral hydrophobic and neutral hydrophilic surfaces *(5 pages)* 061903
Eduardo R. A. Lima, Mathias Boström, Nadine Schwierz, Bo E. Sernelius, and Frederico W. Tavares

Time-resolved small-angle x-ray scattering study of the early stage of amyloid formation of an apomyoglobin mutant *(10 pages)* 061904
Maria Grazia Ortore, Francesco Spinozzi, Silvia Vilasi, Ivana Sirangelo, Gaetano Irace, Anuj Shukla, Theyencheri Narayanan, Raffaele Sinibaldi, and Paolo Mariani

(Continued)

PHYSICAL REVIEW E **THIRD SERIES, VOLUME 84, NUMBER 6** **DECEMBER 2011**

Energetics of synchronized states in three-dimensional beating flagella *(14 pages)* 061905
Clément Mettot and Eric Lauga

Mechanics of soft composites of rods in elastic gels *(9 pages)* 061906
Moumita Das and F. C. MacKintosh

Mechanochemical model of cell migration on substrates of varying stiffness *(7 pages)* 061907
Tanny Lai and K.-H. Chiam

Computational and experimental study of chemotaxis of an ensemble of bacteria attached to a microbead *(6 pages)* 061908
Mahama A. Traoré, Ali Sahari, and Bahareh Behkam

Membrane morphology induced by anisotropic proteins *(5 pages)* 061909
Kiyotaka Akabori and Christian D. Santangelo

Equilibrium properties of realistic random heteropolymers and their relevance for globular and naturally unfolded proteins *(8 pages)* 061910
G. Tiana and L. Sutto

Suppressing epidemics with a limited amount of immunization units *(6 pages)* 061911
Christian M. Schneider, Tamara Mihaljev, Shlomo Havlin, and Hans J. Herrmann

Kinetic Monte Carlo method applied to nucleic acid hairpin folding *(8 pages)* 061912
Ben Sauerwine and Michael Widom

Fast wandering of slow birds *(8 pages)* 061913
John Toner

Correlation transfer in stochastically driven neural oscillators over long and short time scales *(9 pages)* 061914
Aushra Abouzeid and Bard Ermentrout

Pulmonary diffusional screening and the scaling laws of mammalian metabolic rates *(6 pages)* 061915
Chen Hou and Michael Mayo

Gel electrophoresis of linear and star-branched DNA *(7 pages)* 061916
Henry W. Lau and Lynden A. Archer

Genesis of two-dimensional patterns in cross-gradient fields *(10 pages)* 061917
L. M. Pismen and D. S. A. Simakov

Multivariate multiscale entropy: A tool for complexity analysis of multichannel data *(10 pages)* 061918
Mosabber Uddin Ahmed and Danilo P. Mandic

Scale-free duplication dynamics: A model for ultraduplication *(10 pages)* 061919
M. V. Koroteev and J. Miller

Velocity-jump models with crowding effects *(13 pages)* 061920
Katrina K. Treloar, Matthew J. Simpson, and Scott W. McCue

Phase transition in an exactly solvable extinction model *(4 pages)* 061921
Debarshee Bagchi and P. K. Mohanty

Curvature multiphase field model for phase separation on a membrane *(5 pages)* 061922
C. Varea, R. A. Barrio, and A. Hernández-Machado

(Continued)

PHYSICAL REVIEW E THIRD SERIES, VOLUME 84, NUMBER 6 DECEMBER 2011

BRIEF REPORTS

Statistical physics

Analytical behavior of the fourth and fifth virial coefficients of a hard-sphere mixture *(3 pages)* 062101
Ignacio Urrutia

Brownian colloidal particles: Ito, Stratonovich, or a different stochastic interpretation *(3 pages)* 062102
J. M. Sancho

Equilibrium and linear transport properties of fluids

Viscosity of methane to 6 GPa and 673 K *(4 pages)* 062201
Evan H. Abramson

Granular materials

High-precision synthetic computed tomography of reconstructed porous media *(5 pages)* 062301
R. Hilfer and Th. Zauner

Liquid crystals

Conductivity anisotropy of assembled and oriented carbon nanotubes *(5 pages)* 062701
Camilo Zamora-Ledezma, Christophe Blanc, Nicolas Puech, Maryse Maugey, Cécile Zakri, Eric Anglaret, and Philippe Poulin

Biological physics

Detection and prediction of the onset of human ventricular fibrillation: An approach based on complex network theory *(4 pages)* 062901
Xiang Li and Zhao Dong

Length-dependent dynamics of microtubules *(4 pages)* 062902
Vandana Yadav and Sutapa Mukherji

Stochastic binary modeling of cells in continuous time as an alternative to biochemical reaction equations *(4 pages)* 062903
Shunsuke Teraguchi, Yutaro Kumagai, Alexis Vandenbon, Shizuo Akira, and Daron M Standley

Stiffness and strength of suture joints in nature *(5 pages)* 062904
Yaning Li, Christine Ortiz, and Mary C. Boyce