

# PHYSICAL REVIEW E

For editorial and subscription correspondence,  
please see inside front cover  
(ISSN: 1063-651X)

## PERIODICALS

Postmaster send address changes to:  
American Institute of Physics  
Suite 1NO1  
2 Huntington Quadrangle  
Melville, NY 11747-4502

THIRD SERIES, VOLUME 66, NUMBER 5  
PARTS 1 AND 2

CONTENTS

NOVEMBER 2002

*The Table of Contents is a total listing of Parts 1 and 2.*

## PART 1

### RAPID COMMUNICATIONS

#### Statistical physics of soft matter

- $1/f^\alpha$  noise from correlations between avalanches in self-organized criticality (4 pages) ..... 050101(R)  
Jörn Davidsen and Maya Paczuski  
Kinetics of migration-driven aggregation processes (4 pages) ..... 050102(R)  
Jianhong Ke and Zhenquan Lin  
Ratchet for energy transport between identical reservoirs (4 pages) ..... 050103(R)  
Souvik Das, Onuttom Narayan, and Sriram Ramaswamy

#### Granular materials

- Symmetry breaking and coarsening of clusters in a prototypical driven granular gas (4 pages) ..... 050301(R)  
Eli Livne, Baruch Meerson, and Pavel V. Sasorov

#### Structured and complex fluids

- Molecular hydrodynamic theory of supercooled liquids and colloidal suspensions under shear (4 pages) ..... 050501(R)  
Kunimasa Miyazaki and David R. Reichman

#### Polymers

- Elasticity of semiflexible polymers (4 pages) ..... 050801(R)  
Joseph Samuel and Supurna Sinha

#### Biological physics

- Analytic description of stochastic calcium-signaling periodicity (4 pages) ..... 050901(R)  
Lars Meinhold and Lutz Schimansky-Geier  
NMR elastometry of fluid membranes in the mesoscopic regime (4 pages) ..... 050902(R)  
Gary V. Martinez, Emily M. Dykstra, Silvia Lope-Piedrafitra, Constantin Job, and Michael F. Brown

### REGULAR ARTICLES

#### Statistical physics of soft matter

- Three and four current reversals versus temperature in correlation ratchets with a simple sawtooth potential  
(5 pages) ..... 051101  
Risto Tammelo, Romi Mankin, and Dmitri Martila



|                                                                                                                                                                                      |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Asymptotic analysis of a random walk with a history-dependent step length (7 pages) .....                                                                                            | 051102 |
| Ronald Dickman, Francisco Fontenele Araujo, Jr., and Daniel ben-Avraham                                                                                                              |        |
| Hopping diffusion of two coupled particles in the random trap model (4 pages) .....                                                                                                  | 051103 |
| R. Descas and K. Mussawisade                                                                                                                                                         |        |
| Crossover effects in a discrete deposition model with Kardar-Parisi-Zhang scaling (6 pages) .....                                                                                    | 051104 |
| Anna Chame and F. D. A. Aarão Reis                                                                                                                                                   |        |
| Quantum Kramers equation for energy diffusion and barrier crossing dynamics in the low-friction regime (20 pages) .....                                                              | 051105 |
| Dhruba Banerjee, Suman Kumar Banik, Bidhan Chandra Bag, and Deb Shankar Ray                                                                                                          |        |
| Coupling-reentrant phase transition, complex hysteretic behavior, and efficiency optimization in coupled phase oscillators submitted to colored flashing potentials (12 pages) ..... | 051106 |
| S. E. Mangioni, R. R. Deza, and H. S. Wio                                                                                                                                            |        |
| Thermodynamics and structure of self-assembled networks (28 pages) .....                                                                                                             | 051107 |
| A. G. Zilman and S. A. Safran                                                                                                                                                        |        |
| Cluster persistence in one-dimensional diffusion-limited cluster-cluster aggregation (10 pages) .....                                                                                | 051108 |
| E. K. O. Hellén, P. E. Salmi, and M. J. Alava                                                                                                                                        |        |
| Atomic-scale structure of hard-core fluids under shear flow (16 pages) .....                                                                                                         | 051109 |
| James F. Lutsko                                                                                                                                                                      |        |
| Random energy model for dynamics in supercooled liquids: $N$ dependence (11 pages) .....                                                                                             | 051110 |
| T. Keyes, J. Chowdhary, and J. Kim                                                                                                                                                   |        |
| Brownian motion in dynamically disordered media (15 pages) .....                                                                                                                     | 051111 |
| James B. Witkoskie, Shilong Yang, and Jianshu Cao                                                                                                                                    |        |
| Stationary state in $N$ -body system with power law interaction (8 pages) .....                                                                                                      | 051112 |
| Osamu Iguchi                                                                                                                                                                         |        |

**Equilibrium and linear transport properties of fluids**

|                                                                                                                                            |        |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Simple model of capillary condensation in cylindrical pores (11 pages) .....                                                               | 051201 |
| Leszek Szybisz and Ignacio Urrutia                                                                                                         |        |
| Stokes-Einstein-like relation for athermal systems and glasses under shear (4 pages) .....                                                 | 051202 |
| Daniel J. Lacks                                                                                                                            |        |
| NMR visualization of displacement correlations for flow in porous media (16 pages) .....                                                   | 051203 |
| A. A. Khrapitchev, S. Stapf, and P. T. Callaghan                                                                                           |        |
| Wave drag due to generation of capillary-gravity surface waves (13 pages) .....                                                            | 051204 |
| Teodor Burghelea and Victor Steinberg                                                                                                      |        |
| Mixing in fully chaotic flows (17 pages) .....                                                                                             | 051205 |
| A. Wonhas and J. C. Vassilicos                                                                                                             |        |
| Metastable liquid-liquid phase transition in a single-component system with only one crystal phase and no density anomaly (14 pages) ..... | 051206 |
| G. Franzese, G. Malescio, A. Skibinsky, S. V. Buldyrev, and H. E. Stanley                                                                  |        |

**Granular materials**

|                                                                            |        |
|----------------------------------------------------------------------------|--------|
| Shocks in vertically oscillated granular layers (9 pages) .....            | 051301 |
| J. Bougie, Sung Joon Moon, J. B. Swift, and Harry L. Swinney               |        |
| Transport theory of granular swarms (12 pages) .....                       | 051302 |
| S. B. Vrhovac, D. Arsenović, and A. Belić                                  |        |
| Molecular dynamics simulations of vibrated granular gases (13 pages) ..... | 051303 |
| Alain Barrat and Emmanuel Trizac                                           |        |
| Driven low density granular mixtures (8 pages) .....                       | 051304 |
| Riccardo Pagnani, Umberto Marini Bettolo Marconi, and Andrea Puglisi       |        |

|                                                                                                                                                                                  |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Viscosity bifurcation in granular materials, foams, and emulsions (7 pages) .....                                                                                                | 051305 |
| F. Da Cruz, F. Chevoir, Daniel Bonn, and P. Coussot                                                                                                                              |        |
| Breakdown of self-organized criticality in sandpiles (5 pages) .....                                                                                                             | 051306 |
| Maria de Sousa Vieira                                                                                                                                                            |        |
| Stability of monomer-dimer piles (10 pages) .....                                                                                                                                | 051307 |
| Deniz Ertas, Thomas C. Halsey, Alex J. Levine, and Thomas G. Mason                                                                                                               |        |
| <b>Colloidal dispersions, suspensions, and aggregates</b>                                                                                                                        |        |
| Flory-Huggins theory for athermal mixtures of hard spheres and larger flexible polymers (9 pages) .....                                                                          | 051401 |
| Richard P. Sear                                                                                                                                                                  |        |
| Rearrangements in hard-sphere glasses under oscillatory shear strain (13 pages) .....                                                                                            | 051402 |
| G. Petekidis, A. Moussaïd, and P. N. Pusey                                                                                                                                       |        |
| <b>Structured and complex fluids</b>                                                                                                                                             |        |
| Simple model for heterogeneous flows of yield stress fluids (12 pages) .....                                                                                                     | 051501 |
| Guillemette Picard, Armand Ajdari, Lydéric Bocquet, and François Lequeux                                                                                                         |        |
| Contribution of physical clusters to phase behavior (18 pages) .....                                                                                                             | 051502 |
| Tetsuo Kaneko                                                                                                                                                                    |        |
| Nonlinear response of a dipolar system with rotational diffusion to a rotating field (8 pages) .....                                                                             | 051503 |
| B. U. Felderhof                                                                                                                                                                  |        |
| Rotation due to hydrodynamic interactions between two spheres in contact (14 pages) .....                                                                                        | 051504 |
| M. L. Ekiel-Jeżewska, N. Lecoq, R. Anthore, F. Bostel, and F. Feuillebois                                                                                                        |        |
| <b>Films, interfaces, and crystal growth</b>                                                                                                                                     |        |
| Reconstruction and roughening of a catalytic Pt(110) surface coupled to kinetic oscillations (9 pages) .....                                                                     | 051601 |
| Michael Monine and Len Pismen                                                                                                                                                    |        |
| Nucleation rates and induction times during colloidal crystallization: Links between models and experiments (10 pages) .....                                                     | 051602 |
| Narendra M. Dixit and Charles F. Zukoski                                                                                                                                         |        |
| Interface scaling in a two-dimensional porous medium under combined viscous, gravity, and capillary effects (12 pages) .....                                                     | 051603 |
| Yves Méheust, Grunde Løvoll, Knut Jørgen Måløy, and Jean Schmittbuhl                                                                                                             |        |
| Dynamics of low anisotropy morphologies in directional solidification (11 pages) .....                                                                                           | 051604 |
| B. Utter and E. Bodenschatz                                                                                                                                                      |        |
| Restricted curvature model with suppression of extremal height (5 pages) .....                                                                                                   | 051605 |
| Hyeong-Chai Jeong and Jin Min Kim                                                                                                                                                |        |
| <b>Liquid crystals</b>                                                                                                                                                           |        |
| Electric-field-induced transition between the anticlinic and the synclinic smectic-C surfaces in free-standing films (6 pages) .....                                             | 051701 |
| Barbara Rovšek, Mojca Čepič, and Boštjan Žekš                                                                                                                                    |        |
| Wetting and capillary nematization of binary hard-platelet and hard-rod fluids (10 pages) .....                                                                                  | 051702 |
| L. Harnau and S. Dietrich                                                                                                                                                        |        |
| Three-dimensional director structures of defects in Grandjean-Cano wedges of cholesteric liquid crystals studied by fluorescence confocal polarizing microscopy (16 pages) ..... | 051703 |
| I. I. Smalyukh and O. D. Lavrentovich                                                                                                                                            |        |
| Antiferroelectric liquid-crystal mixture without smectic layer shrinkage at the direct Sm-A*–Sm-C <sub>a</sub> * transition (5 pages) .....                                      | 051704 |
| Frank Giesselmann, Jan P. F. Lagerwall, Gunnar Andersson, and Marc D. Radcliffe                                                                                                  |        |

|                                                                                                                                                                       |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Coarsening dynamics of biaxial nematic liquid crystals (7 pages) . . . . .                                                                                            | 051705 |
| N. V. Priezjev and Robert A. Pelcovits                                                                                                                                |        |
| Intermediate periodic “saddle-splay” nematic phase in the vicinity of a nematic–smectic-A transition (10 pages) . . . . .                                             | 051706 |
| G. Barbero and V. M. Pergamenschchik                                                                                                                                  |        |
| Effect of mosaicity in x-ray studies of critical behavior at the nematic to smectic-A transition (13 pages) . . . .                                                   | 051707 |
| Andrew Primak, Michael Fisch, and Satyendra Kumar                                                                                                                     |        |
| Acoustic realignment of nematic liquid crystals (7 pages) . . . . .                                                                                                   | 051708 |
| J. V. Selinger, M. S. Spector, V. A. Greanya, B. T. Weslowski, D. K. Shenoy, and R. Shashidhar                                                                        |        |
| Surface effects in nucleation and growth of smectic-B crystals in thin samples (14 pages) . . . . .                                                                   | 051709 |
| T. Börzsönyi and S. Akamatsu                                                                                                                                          |        |
| Length and speed selection in dendritic growth of electrohydrodynamic convection in a nematic liquid crystal (7 pages) . . . . .                                      | 051710 |
| N. Gheorghiu and J. T. Gleeson                                                                                                                                        |        |
| Interaction of particles in a deformed nematic liquid crystal (13 pages) . . . . .                                                                                    | 051711 |
| Jun-ichi Fukuda, Bohdan I. Lev, Keiko M. Aoki, and Hiroshi Yokoyama                                                                                                   |        |
| Full energy expression of a uniaxial nematic phase with spatially dependent density and order parameters: From microscopic to macroscopic theory (10 pages) . . . . . | 051712 |
| V. M. Pergamenschchik and S. B. Chernyshuk                                                                                                                            |        |
| Electroconvection in nematic liquid crystals with positive dielectric and negative conductivity anisotropy (8 pages) . . . . .                                        | 051713 |
| A. Buka, B. Dressel, W. Otowski, K. Camara, T. Toth-Katona, L. Kramer, J. Lindau, G. Pelzl, and W. Pesch                                                              |        |

**Polymers**

|                                                                                                                          |        |
|--------------------------------------------------------------------------------------------------------------------------|--------|
| First-order wetting transition at finite contact angle (5 pages) . . . . .                                               | 051801 |
| F. A. M. Leermakers, J. H. Maas, and M. A. Cohen Stuart                                                                  |        |
| Conformational instability of rodlike polyelectrolytes due to counterion fluctuations (7 pages) . . . . .                | 051802 |
| Ramin Golestanian and Tanniemola B. Liverpool                                                                            |        |
| Structural modifications in the swelling of inhomogeneous microgels by light and neutron scattering (10 pages) . . . . . | 051803 |
| A. Fernández-Barbero, A. Fernández-Nieves, I. Grillo, and E. López-Cabarcos                                              |        |
| Kinetic arrest of crowded soft spheres in solvents of varying quality (9 pages) . . . . .                                | 051804 |
| E. Stiakakis, D. Vlassopoulos, B. Loppinet, J. Roovers, and G. Meier                                                     |        |
| Scattering from supramacromolecular structures (8 pages) . . . . .                                                       | 051805 |
| Carlos I. Mendoza and Carlos M. Marques                                                                                  |        |
| Effects of nonuniform segment deformation on the constitutive relation of polymeric solids (15 pages) . . . .            | 051806 |
| Duan Z. Zhang, Cheng Liu, and Francis H. Harlow                                                                          |        |
| Dissolution of a polyelectrolyte-macroion complex by addition of salt (7 pages) . . . . .                                | 051807 |
| Marie Skepö and Per Linse                                                                                                |        |

**Biological physics**

|                                                                                                                                           |        |
|-------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Growth patterns of microscopic brain tumors (7 pages) . . . . .                                                                           | 051901 |
| Leonard M. Sander and Thomas S. Deisboeck                                                                                                 |        |
| Effects of macromolecular crowding on protein folding and aggregation studied by density functional theory: Dynamics (10 pages) . . . . . | 051902 |
| Akira R. Kinjo and Shoji Takada                                                                                                           |        |
| Binless strategies for estimation of information from neural data (15 pages) . . . . .                                                    | 051903 |
| Jonathan D. Victor                                                                                                                        |        |

|                                                                                                                                                   |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Iron normal mode dynamics in a porphyrin-imidazole model for deoxyheme proteins ( <i>12 pages</i> ) . . . . .                                     | 051904 |
| Brajesh K. Rai, Stephen M. Durbin, Earl W. Prohofsky, J. Timothy Sage, Mary K. Ellison,<br>W. Robert Scheidt, Wolfgang Sturhahn, and E. Ercan Alp |        |
| Temperature dependence of formation of a supported phospholipid bilayer from vesicles on SiO <sub>2</sub><br>( <i>4 pages</i> ) . . . . .         | 051905 |
| E. Reimhult, F. Höök, and B. Kasemo                                                                                                               |        |
| Origin of the pattern of trabecular bone: An experiment and a model ( <i>5 pages</i> ) . . . . .                                                  | 051906 |
| Zbisl w Tabor, Eugeniusz Rokita, and Tadeusz Cichocki                                                                                             |        |
| Unsteady two-dimensional theory of a flapping wing ( <i>10 pages</i> ) . . . . .                                                                  | 051907 |
| F. O. Minotti                                                                                                                                     |        |
| Stochastic neural network model for spontaneous bursting in hippocampal slices ( <i>18 pages</i> ) . . . . .                                      | 051908 |
| B. Biswal and C. Dasgupta                                                                                                                         |        |
| Regions of cardiorespiratory synchronization in humans under paced respiration ( <i>9 pages</i> ) . . . . .                                       | 051909 |
| S. Rzecinski, N. B. Janson, A. G. Balanov, and P. V. E. McClintock                                                                                |        |
| Physical model for the gating mechanism of ionic channels ( <i>5 pages</i> ) . . . . .                                                            | 051910 |
| Cheol-Min Ghim and Jeong-Man Park                                                                                                                 |        |
| Langevin dynamics of proteins at constant <i>pH</i> ( <i>8 pages</i> ) . . . . .                                                                  | 051911 |
| Aleksandra M. Walczak and Jan M. Antosiewicz                                                                                                      |        |
| Adsorption of a random copolymer at a lipid bilayer membrane ( <i>6 pages</i> ) . . . . .                                                         | 051912 |
| Aleksander V. Ermoshkin, Jeff Z. Y. Chen, and Pik-Yin Lai                                                                                         |        |
| Weakly nonlinear analysis of the electrohydrodynamic instability of a charged membrane ( <i>10 pages</i> ) . . . . .                              | 051913 |
| R. M. Thaokar and V. Kumaran                                                                                                                      |        |
| Unzipping dynamics of long DNAs ( <i>11 pages</i> ) . . . . .                                                                                     | 051914 |
| Simona Cocco, R mi Monasson, and John F. Marko                                                                                                    |        |
| Spatial heterogeneity and the stability of reaction states in autocatalysis ( <i>9 pages</i> ) . . . . .                                          | 051915 |
| Glenn Marion, Xuerong Mao, Eric Renshaw, and Junli Liu                                                                                            |        |
| Effect of environment partitioning on the survival and coexistence of autocatalytic replicators<br>( <i>19 pages</i> ) . . . . .                  | 051916 |
| İnan  Birol, Satish J. Parulekar, and Fouad Teymour                                                                                               |        |
| Population dynamics of interacting spiking neurons ( <i>19 pages</i> ) . . . . .                                                                  | 051917 |
| Maurizio Mattia and Paolo Del Giudice                                                                                                             |        |
| Smectic phases of semiflexible manifolds: Constant-pressure ensemble ( <i>14 pages</i> ) . . . . .                                                | 051918 |
| Lianghui Gao and Leonardo Golubovi                                                                                                                |        |

**BRIEF REPORTS****Granular materials**

|                                                                                                          |        |
|----------------------------------------------------------------------------------------------------------|--------|
| Analysis of microstresses in cement paste by fluorescence piezospectroscopy ( <i>4 pages</i> ) . . . . . | 052301 |
| Sven M. F. Asmus and Giuseppe Pezzotti                                                                   |        |

**Films, interfaces, and crystal growth**

|                                                                                               |        |
|-----------------------------------------------------------------------------------------------|--------|
| Different time regimes of tracer exchange in single-file systems ( <i>4 pages</i> ) . . . . . | 052601 |
| Sergey Vasenkov and J rg K rger                                                               |        |

**Liquid crystals**

- Propagation of acoustic waves in nematic elastomers (*4 pages*) ..... 052701  
 E. M. Terentjev, I. V. Kamotski, D. D. Zakharov, and L. J. Fradkin

**Polymers**

- Fluorescence study on the phase transition of hydrogen-bonding gels (*4 pages*) ..... 052801  
 Yaşar Yılmaz
- Anisotropy of lamellar block copolymer grains (*4 pages*) ..... 052802  
 N. P. Balsara, C. M. Marques, B. A. Garetz, M. C. Newstein, and S. P. Gido

**Biological physics**

- Mechanism for membrane electroporation irreversibility under high-intensity, ultrashort electrical pulse conditions (*4 pages*) ..... 052901  
 R. P. Joshi and K. H. Schoenbach
- Clustering of diffusing organisms (*4 pages*) ..... 052902  
 B. Houchmandzadeh

**PART 2****RAPID COMMUNICATIONS****General methods of statistical physics**

- Infinite-order percolation and giant fluctuations in a protein interaction network (*4 pages*) ..... 055101(R)  
 J. Kim, P. L. Krapivsky, B. Kahng, and S. Redner
- Monochromatic path crossing exponents and graph connectivity in two-dimensional percolation (*3 pages*) ... 055102(R)  
 Jesper Lykke Jacobsen and Paul Zinn-Justin

**Chaos and pattern formation**

- Dominance of Milnor attractors in globally coupled dynamical systems with more than  $7 \pm 2$  degrees of freedom (*4 pages*) ..... 055201(R)  
 Kunihiro Kaneko
- Phase synchronization and topological defects in inhomogeneous media (*4 pages*) ..... 055202(R)  
 Jörn Davidsen and Raymond Kapral
- Patterns in spherical Rayleigh-Bénard convection: A giant spiral roll and its dislocations (*4 pages*) ..... 055203(R)  
 Pu Zhang, Xinhao Liao, and Keke Zhang

**Nonlinear hydrodynamics and turbulence**

- Soret driven convection in a colloidal solution heated from above at very large solutal Rayleigh number (*4 pages*) ..... 055301(R)  
 Roberto Cerbino, Alberto Vailati, and Marzio Giglio

**Classical physics, including nonlinear media and photonic materials**

- Optimal bistable switching in nonlinear photonic crystals (*4 pages*) ..... 055601(R)  
 Marin Soljačić, Mihai Ibanescu, Steven G. Johnson, Yoel Fink, and J. D. Joannopoulos

|                                                                                        |           |
|----------------------------------------------------------------------------------------|-----------|
| Stability of spiralling solitary waves in Hamiltonian systems ( <i>4 pages</i> ) ..... | 055602(R) |
| Dmitry V. Skryabin, John M. McSloy, and William J. Firth                               |           |

**REGULAR ARTICLES****General methods of statistical physics**

|                                                                                                                                                         |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Scaling analysis of a divergent prefactor in the metastable lifetime of a square-lattice Ising ferromagnet at low temperatures ( <i>7 pages</i> ) ..... | 056101 |
| Kyungwha Park, M. A. Novotny, and P. A. Rikvold                                                                                                         |        |
| Singularities of the canonical partition functions of fluid systems with continuous interaction potentials ( <i>7 pages</i> ) .....                     | 056102 |
| Xian-Zhi Wang                                                                                                                                           |        |
| Exact results for hydrogen recombination on dust grain surfaces ( <i>12 pages</i> ) .....                                                               | 056103 |
| Ofar Biham and Azi Lipshtat                                                                                                                             |        |
| Aggregate formation in a system of coagulating and fragmenting particles with mass-dependent diffusion rates ( <i>9 pages</i> ) .....                   | 056104 |
| R. Rajesh, Dibyendu Das, Bulbul Chakraborty, and Mustansir Barma                                                                                        |        |
| Geography in a scale-free network model ( <i>5 pages</i> ) .....                                                                                        | 056105 |
| C. P. Warren, L. M. Sander, and I. M. Sokolov                                                                                                           |        |
| Importance of multispin couplings in renormalized Hamiltonians ( <i>4 pages</i> ) .....                                                                 | 056106 |
| Dorit Ron and Robert H. Swendsen                                                                                                                        |        |
| Largest and second largest cluster statistics at the percolation threshold of hypercubic lattices ( <i>5 pages</i> ) .....                              | 056107 |
| C. R. da Silva, M. L. Lyra, and G. M. Viswanathan                                                                                                       |        |
| Fractional Schrödinger equation ( <i>7 pages</i> ) .....                                                                                                | 056108 |
| Nick Laskin                                                                                                                                             |        |
| Phase transitions of soft disks in external periodic potentials: A Monte Carlo study ( <i>13 pages</i> ) .....                                          | 056109 |
| W. Strepp, S. Sengupta, and P. Nielaba                                                                                                                  |        |
| Large scale cross-correlations in Internet traffic ( <i>7 pages</i> ) .....                                                                             | 056110 |
| Marc Barthélemy, Bernard Gondran, and Eric Guichard                                                                                                     |        |
| Continuum analysis of an avalanche model for solar flares ( <i>10 pages</i> ) .....                                                                     | 056111 |
| Han-Li Liu, Paul Charbonneau, Annick Pouquet, Thomas Bogdan, and Scott McIntosh                                                                         |        |
| Slow dynamics in the three-dimensional gonihedric model ( <i>9 pages</i> ) .....                                                                        | 056112 |
| P. Dimopoulos, D. Espriu, E. Jané, and A. Prats                                                                                                         |        |
| Percolation in a random environment ( <i>7 pages</i> ) .....                                                                                            | 056113 |
| Róbert Juhász and Ferenc Igloi                                                                                                                          |        |
| Slow relaxation in a constrained Ising spin chain: Toy model for granular compaction ( <i>9 pages</i> ) .....                                           | 056114 |
| Satya N. Majumdar and David S. Dean                                                                                                                     |        |
| Contact tracing and epidemics control in social networks ( <i>4 pages</i> ) .....                                                                       | 056115 |
| Ramon Huerta and Lev S. Tsimring                                                                                                                        |        |
| Pure stationary states of open quantum systems ( <i>7 pages</i> ) .....                                                                                 | 056116 |
| Vasily E. Tarasov                                                                                                                                       |        |
| Edge wetting of an Ising three-dimensional system ( <i>6 pages</i> ) .....                                                                              | 056117 |
| L. Bahmad, A. Benyoussef, and H. Ez-Zahraouy                                                                                                            |        |
| Coevolutionary games on networks ( <i>8 pages</i> ) .....                                                                                               | 056118 |
| Holger Ebel and Stefan Bornholdt                                                                                                                        |        |
| Information geometry of the Ising model on planar random graphs ( <i>5 pages</i> ) .....                                                                | 056119 |
| W. Janke, D. A. Johnston, and Ranasinghe P. K. C. Malmimi                                                                                               |        |
| Random graph coloring: Statistical physics approach ( <i>15 pages</i> ) .....                                                                           | 056120 |
| J. van Mourik and D. Saad                                                                                                                               |        |

|                                                                                                                                                                       |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Multifractal stationary random measures and multifractal random walks with log infinitely divisible scaling laws (16 pages) .....                                     | 056121 |
| Jean-François Muzy and Emmanuel Bacry                                                                                                                                 |        |
| Trapping thresholds in invasion percolation (6 pages) .....                                                                                                           | 056122 |
| Lincoln Paterson, Adrian P. Sheppard, and Mark A. Knackstedt                                                                                                          |        |
| Quantum statistics in complex networks (5 pages) .....                                                                                                                | 056123 |
| Ginestra Bianconi                                                                                                                                                     |        |
| Effects of pore walls and randomness on phase transitions in porous media (9 pages) .....                                                                             | 056124 |
| Marek Cieplak, Amos Maritan, Michael R. Swift, Flavio Toigo, and Jayanth R. Banavar                                                                                   |        |
| Statistical mechanics in the context of special relativity (17 pages) .....                                                                                           | 056125 |
| G. Kaniadakis                                                                                                                                                         |        |
| Random $K$ -satisfiability problem: From an analytic solution to an efficient algorithm (27 pages) .....                                                              | 056126 |
| Marc Mézard and Riccardo Zecchina                                                                                                                                     |        |
| Absence of first-order transition and tricritical point in the dynamic phase diagram of a spatially extended bistable system in an oscillating field (12 pages) ..... | 056127 |
| G. Korniss, P. A. Rikvold, and M. A. Novotny                                                                                                                          |        |
| Ramanujan sums for signal processing of low-frequency noise (7 pages) .....                                                                                           | 056128 |
| Michel Planat, Haret Rosu, and Serge Perrine                                                                                                                          |        |
| Stochastic synchronization in globally coupled phase oscillators (5 pages) .....                                                                                      | 056129 |
| Hidetsugu Sakaguchi                                                                                                                                                   |        |
| Defect-induced perturbations of atomic monolayers on solid surfaces (4 pages) .....                                                                                   | 056130 |
| H. Schiessel, G. Oshanin, A. M. Cazabat, and M. Moreau                                                                                                                |        |
| <b>Chaos and pattern formation</b>                                                                                                                                    |        |
| Entropy and bifurcations in a chaotic laser (8 pages) .....                                                                                                           | 056201 |
| Pieter Collins and Bernd Krauskopf                                                                                                                                    |        |
| Quantization conditions in Bogomolny's transfer operator method (6 pages) .....                                                                                       | 056202 |
| Cheng-Hung Chang                                                                                                                                                      |        |
| Phase synchronization in coupled chaotic oscillators with time delay (7 pages) .....                                                                                  | 056203 |
| J. Y. Chen, K. W. Wong, and J. W. Shuai                                                                                                                               |        |
| Bubble and spherical air shell formation dynamics (7 pages) .....                                                                                                     | 056204 |
| A. Tufaile and J. C. Sartorelli                                                                                                                                       |        |
| Dynamical effects induced by long range activation in a nonequilibrium reaction-diffusion system (10 pages) .....                                                     | 056205 |
| M. Fuentes, M. N. Kuperman, J. Boissonade, E. Dulos, F. Gauffre, and P. De Kepper                                                                                     |        |
| Dynamical fidelity of a solid-state quantum computation (9 pages) .....                                                                                               | 056206 |
| G. P. Berman, F. Borgonovi, G. Celardo, F. M. Izrailev, and D. I. Kamenev                                                                                             |        |
| Quantum chaos in optical systems: The annular billiard (13 pages) .....                                                                                               | 056207 |
| Martina Hentschel and Klaus Richter                                                                                                                                   |        |
| Crossover of quantum Loschmidt echo from golden-rule decay to perturbation-independent decay (9 pages) .....                                                          | 056208 |
| Wen-ge Wang and Baowen Li                                                                                                                                             |        |
| Context-tree modeling of observed symbolic dynamics (11 pages) .....                                                                                                  | 056209 |
| Matthew B. Kennel and Alistair I. Mees                                                                                                                                |        |
| Early time diffusion for the quantum kicked rotor with narrow initial momentum distributions (8 pages) ....                                                           | 056210 |
| A. J. Daley and A. S. Parkins                                                                                                                                         |        |

**Nonlinear hydrodynamics and turbulence**

|                                                                                                                                                                                                                               |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Rayleigh-Bénard percolation transition of thermal convection in porous media: Computational fluid dynamics, NMR velocity mapping, NMR temperature mapping (13 pages) . . . . .                                                | 056301 |
| Markus Weber and Rainer Kimmich                                                                                                                                                                                               |        |
| Decay of passive scalars under the action of single scale smooth velocity fields in bounded two-dimensional domains: From non-self-similar probability distribution functions to self-similar eigenmodes (11 pages) . . . . . | 056302 |
| Jai Sukhatme and Raymond T. Pierrehumbert                                                                                                                                                                                     |        |
| Electron-ion bremsstrahlung spectra calculations for sonoluminescence (6 pages) . . . . .                                                                                                                                     | 056303 |
| Dominik Hammer and Lothar Frommhold                                                                                                                                                                                           |        |
| Particle transport in a random velocity field with Lagrangian statistics (19 pages) . . . . .                                                                                                                                 | 056304 |
| Piero Olla                                                                                                                                                                                                                    |        |
| Anticonvection with an inclined temperature gradient (10 pages) . . . . .                                                                                                                                                     | 056305 |
| I. B. Simanovskii, P. Colinet, A. A. Nepomnyashchy, and J.-C. Legros                                                                                                                                                          |        |
| Anomalous and dimensional scaling in anisotropic turbulence (4 pages) . . . . .                                                                                                                                               | 056306 |
| L. Biferale, I. Daumont, A. Lanotte, and F. Toschi                                                                                                                                                                            |        |
| Unified lattice Boltzmann method for flow in multiscale porous media (11 pages) . . . . .                                                                                                                                     | 056307 |
| Qinjun Kang, Dongxiao Zhang, and Shiyi Chen                                                                                                                                                                                   |        |
| Rotating convection-driven dynamos at low Ekman number (15 pages) . . . . .                                                                                                                                                   | 056308 |
| Jon Rotvig and Chris A. Jones                                                                                                                                                                                                 |        |
| Viscous dissipation for Euler's disk (2 pages) . . . . .                                                                                                                                                                      | 056309 |
| Lars Bildsten                                                                                                                                                                                                                 |        |
| Onset of convection in a very compressible fluid: The transient toward steady state (8 pages) . . . . .                                                                                                                       | 056310 |
| Horst Meyer and Andrei B. Kogan                                                                                                                                                                                               |        |
| Stable two-dimensional solitary pulses in linearly coupled dissipative Kadomtsev-Petviashvili equations (10 pages) . . . . .                                                                                                  | 056311 |
| Bao-Feng Feng, Boris A. Malomed, and Takuji Kawahara                                                                                                                                                                          |        |

**Plasma physics**

|                                                                                                                                                                                      |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Calculated sheath dynamics under the influence of an asymmetrically pulsed dc bias (9 pages) . . . . .                                                                               | 056401 |
| E. V. Barnat and T.-M. Lu                                                                                                                                                            |        |
| Charge-exchange-induced two-electron satellite transitions from autoionizing levels in dense plasmas (16 pages) . . . . .                                                            | 056402 |
| F. B. Rosmej, H. R. Griem, R. C. Elton, V. L. Jacobs, J. A. Cobble, A. Ya. Faenov, T. A. Pikuz, M. Geißel, D. H. H. Hoffmann, W. Süß, D. B. Uskov, V. P. Shevelko, and R. C. Mancini |        |
| Implosion of multilayered cylindrical targets driven by intense heavy ion beams (9 pages) . . . . .                                                                                  | 056403 |
| A. R. Piriz, R. F. Portugues, N. A. Tahir, and D. H. H. Hoffmann                                                                                                                     |        |
| Static configurations of gravitating dusty plasmas (7 pages) . . . . .                                                                                                               | 056404 |
| Frank Verheest and V. M. Cadež                                                                                                                                                       |        |
| Effect of the electron gas polarizability on the specific heat of phonons in Coulomb crystals (10 pages) . . . . .                                                                   | 056405 |
| D. A. Baiko                                                                                                                                                                          |        |
| Photon acceleration of ultrashort laser pulses by relativistic ionization fronts (7 pages) . . . . .                                                                                 | 056406 |
| J. M. Dias, N. C. Lopes, L. O. Silva, G. Figueira, J. T. Mendonça, C. Stenz, F. Blasco, A. Dos Santos, and A. Mysyrowicz                                                             |        |
| Diffusion in two-temperature thermal plasmas (9 pages) . . . . .                                                                                                                     | 056407 |
| V. Rat, J. Aubreton, M. F. Elchinger, P. Fauchais, and A. B. Murphy                                                                                                                  |        |
| Nonlinear features of two-plasmon decay in a long-scale-length plasma (6 pages) . . . . .                                                                                            | 056408 |
| D. R. Dimitrijević and M. S. Jovanović                                                                                                                                               |        |
| Stochastic diffusion of ions due to a finite set of lower hybrid waves (13 pages) . . . . .                                                                                          | 056409 |
| Lucio M. Tozawa and Luiz F. Ziebell                                                                                                                                                  |        |

|                                                                                                                                                                                  |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Symmetry transforms for ideal magnetohydrodynamics equilibria (11 pages) . . . . .                                                                                               | 056410 |
| Oleg I. Bogoyavlenskij                                                                                                                                                           |        |
| Complex-plasma boundaries (4 pages) . . . . .                                                                                                                                    | 056411 |
| B. M. Annaratone, S. A. Khrapak, P. Bryant, G. E. Morfill, H. Rothermel, H. M. Thomas, M. Zuzic,<br>V. E. Fortov, V. I. Molotkov, A. P. Nefedov, S. Krikalev, and Yu. P. Semenov |        |
| Electrical conductivity of hot expanded aluminum: Experimental measurements and <i>ab initio</i> calculations<br>(8 pages) . . . . .                                             | 056412 |
| Vanina Recoules, Patrick Renaudin, Jean Cl  rouin, Pierre Noiret, and Gilles Z  rah                                                                                              |        |
| <b>Physics of beams</b>                                                                                                                                                          |        |
| Resistive wall impedance and tune shift for a chamber with a finite thickness (6 pages) . . . . .                                                                                | 056501 |
| Yoshihiro Shobuda and Kaoru Yokoya                                                                                                                                               |        |
| Free-electron-laser oscillator with a linear taper (7 pages) . . . . .                                                                                                           | 056502 |
| A. Christodoulou, D. Lampiris, K. Polykandriotis, W. B. Colson, P. P. Crooker, S. Benson,<br>J. Gubeli, and G. R. Neil                                                           |        |
| Self-consistent nonstationary processes in phase-mixed electron beams focused by mobile ions (10 pages) . . .                                                                    | 056503 |
| Yu. P. Bliokh, G. S. Nusinovich, J. Felsteiner, and V. L. Granatstein                                                                                                            |        |
| Generation and growth rates of nonlinear distortions in a traveling wave tube (5 pages) . . . . .                                                                                | 056504 |
| John G. W  hlbier, Ian Dobson, and John H. Booske                                                                                                                                |        |
| <b>Classical physics, including nonlinear media and photonic materials</b>                                                                                                       |        |
| Superluminal effects and negative group delays in electronics, and their applications (4 pages) . . . . .                                                                        | 056601 |
| Daniel Solli, R. Y. Chiao, and J. M. Hickmann                                                                                                                                    |        |
| Defining the Fresnel zone for broadband radiation (4 pages) . . . . .                                                                                                            | 056602 |
| Jeremy Pearce and Daniel Mittleman                                                                                                                                               |        |
| Breathers in a discrete nonlinear Schr  dinger-type model: Exact stability results (9 pages) . . . . .                                                                           | 056603 |
| Avijit Lahiri, Subhendu Panda, and Tarun K. Roy                                                                                                                                  |        |
| Cylinder gratings in conical incidence with applications to modes of air-cored photonic crystal fibers<br>(16 pages) . . . . .                                                   | 056604 |
| G. H. Smith, L. C. Botten, R. C. McPhedran, and N. A. Nicorovici                                                                                                                 |        |
| Coherence properties of the parametric three-wave interaction driven from an incoherent pump<br>(14 pages) . . . . .                                                             | 056605 |
| Antonio Picozzi, Carlos Montes, and Marc Haelterman                                                                                                                              |        |
| Coexistence of a self-induced transparency soliton and a Bragg soliton (10 pages) . . . . .                                                                                      | 056606 |
| Hong-Yih Tseng and Sien Chi                                                                                                                                                      |        |
| Pulse dynamics in actively mode-locked lasers with frequency shifting (10 pages) . . . . .                                                                                       | 056607 |
| S. Longhi                                                                                                                                                                        |        |
| High-power regime of femtosecond-laser pulse propagation in silica: Multiple-cone formation (8 pages) . . . .                                                                    | 056608 |
| Kenichi Ishikawa, Hiroshi Kumagai, and Katsumi Midorikawa                                                                                                                        |        |
| Omnidirectional elastic band gap in finite lamellar structures (8 pages) . . . . .                                                                                               | 056609 |
| D. Bria and B. Djafari-Rouhani                                                                                                                                                   |        |
| Measurement of the magneto-optical correlation length in turbid media (4 pages) . . . . .                                                                                        | 056610 |
| Ralf Lenke, Christoph Eisenmann, Daniel Reinke, and Georg Maret                                                                                                                  |        |
| Experimental demonstration of realizability of optical focus wave modes (9 pages) . . . . .                                                                                      | 056611 |
| Kaido Reivelt and Peeter Saari                                                                                                                                                   |        |
| Temperature-controlled random laser action in liquid crystal infiltrated systems (5 pages) . . . . .                                                                             | 056612 |
| Diederik S. Wiersma and Stefano Cavali  ri                                                                                                                                       |        |
| Dipolar effects on soliton dynamics on a discrete ferromagnetic chain (17 pages) . . . . .                                                                                       | 056613 |
| Jean-Pierre Nguenang, Aurelien Jiotso Kenfack, and Tim  l  on Cr  prin Kofan                                                                                                     |        |

|                                                                                                                                                           |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Hydrogen atom in the presence of uniform magnetic and quadrupolar electric fields: Integrability, bifurcations, and chaotic behavior (12 pages) . . . . . | 056614 |
| M. Íñarrea, J. P. Salas, and V. Lanchares                                                                                                                 |        |

**Computational physics**

|                                                                                                                                |        |
|--------------------------------------------------------------------------------------------------------------------------------|--------|
| Efficient Brownian dynamics simulation of particles near walls. I. Reflecting and absorbing walls (7 pages) . . . . .          | 056701 |
| E. A. J. F. Peters and Th. M. A. O. M. Barenbrug                                                                               |        |
| Efficient Brownian dynamics simulation of particles near walls. II. Sticky walls (11 pages) . . . . .                          | 056702 |
| E. A. J. F. Peters and Th. M. A. O. M. Barenbrug                                                                               |        |
| Generalization of the Wang-Landau method for off-lattice simulations (9 pages) . . . . .                                       | 056703 |
| M. Scott Shell, Pablo G. Debenedetti, and Athanassios Z. Panagiotopoulos                                                       |        |
| First- and last-passage Monte Carlo algorithms for the charge density distribution on a conducting surface (8 pages) . . . . . | 056704 |
| James A. Given, Chi-Ok Hwang, and Michael Mascagni                                                                             |        |
| Coarse-grained loop algorithms for Monte Carlo simulation of quantum spin systems (12 pages) . . . . .                         | 056705 |
| Kenji Harada and Naoki Kawashima                                                                                               |        |

**BRIEF REPORTS****General methods of statistical physics**

|                                                                                                                             |        |
|-----------------------------------------------------------------------------------------------------------------------------|--------|
| Sweeny and Gliozzi dynamics for simulations of Potts models in the Fortuin-Kasteleyn representation (4 pages) . . . . .     | 057101 |
| Jian-Sheng Wang, Oner Kozan, and Robert H. Swendsen                                                                         |        |
| Dynamical mean-field approximation for a pair contact process with a particle source (4 pages) . . . . .                    | 057102 |
| Attila Szolnoki                                                                                                             |        |
| Simplified transfer matrix approach in the two-dimensional Ising model with various boundary conditions (4 pages) . . . . . | 057103 |
| Boris Kastening                                                                                                             |        |
| Wealth distribution in an ancient Egyptian society (3 pages) . . . . .                                                      | 057104 |
| A. Y. Abul-Magd                                                                                                             |        |

**Chaos and pattern formation**

|                                                                                        |        |
|----------------------------------------------------------------------------------------|--------|
| Chaotic dynamics of an air-damped bouncing ball (3 pages) . . . . .                    | 057201 |
| M. A. Naylor, P. Sánchez, and Michael R. Swift                                         |        |
| Detection and classification of nonlinear dynamic switching events (4 pages) . . . . . | 057202 |
| Christian Storm and Walter J. Freeman                                                  |        |

**Nonlinear hydrodynamics and turbulence**

|                                                                                    |        |
|------------------------------------------------------------------------------------|--------|
| Bifurcation diversity of dynamic thermocapillary liquid layers (4 pages) . . . . . | 057301 |
| S. Hoyas, H. Herrero, and A. M. Mancho                                             |        |

**Plasma physics**

|                                                                                                  |        |
|--------------------------------------------------------------------------------------------------|--------|
| Propagation of linear waves in relativistic anisotropic magnetohydrodynamics (4 pages) . . . . . | 057401 |
| W. B. Gebretsadkan and G. L. Kalra                                                               |        |

**Computational physics**

|                                                                              |        |
|------------------------------------------------------------------------------|--------|
| Parallel-in-time molecular-dynamics simulations ( <i>4 pages</i> ) . . . . . | 057701 |
| L. Baffico, S. Bernard, Y. Maday, G. Turinici, and G. Zérah                  |        |

**ERRATA**

|                                                                                                                                                                            |           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Erratum: Nonuniversal size dependence of the free energy of confined systems near criticality [Phys. Rev. E <b>66</b> , 016102 (2002)] ( <i>1 page</i> ) . . . . .         | 059901(E) |
| X. S. Chen and V. Dohm                                                                                                                                                     |           |
| Erratum: Self-amplified coherent spontaneous emission in the planar wiggler free-electron laser [Phys. Rev. E <b>65</b> , 046503 (2002)] ( <i>1 page</i> ) . . . . .       | 059902(E) |
| B. W. J. McNeil and G. R. M. Robb                                                                                                                                          |           |
| Publisher's Note: False neighbors and false strands: A reliable minimum embedding dimension algorithm [Phys. Rev. E <b>66</b> , 026209 (2002)] ( <i>1 page</i> ) . . . . . | 059903(E) |

|                                          |   |
|------------------------------------------|---|
| <b>Cumulative Author Index</b> . . . . . | i |
|------------------------------------------|---|