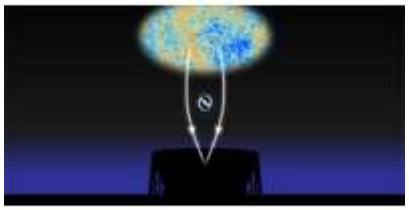
PHYSICAL REVIEW LETTERS
Volume 114, Issue 15, 17 April 2015

HIGHLIGHTED ARTICLES

Featured in Physics **Editors' Suggestion**

Evidence of Lensing of the Cosmic Microwave Background by Dark Matter Halos

Mathew Madhavacheril *et al.* (Atacama Cosmology Telescope Collaboration)
Phys. Rev. Lett. **114**, 151302 (2015) – Published 13 April 2015



Gravitational lensing by foreground dark matter halos leaves an observable imprint on the cosmic microwave background, which can be used to determine their mass.

Featured in Physics **Editors' Suggestion**

Tevatron Constraints on Models of the Higgs Boson with Exotic Spin and Parity Using Decays to Bottom-Antibottom Quark Pairs

T. Aaltonen *et al.* (CDF Collaboration)†, D0 Collaboration)‡)
Phys. Rev. Lett. **114**, 151802 (2015) – Published 15 April 2015

An analysis of data from the now-shuttered Tevatron excludes certain Higgs bosons with exotic properties.

Featured in Physics **Editors' Suggestion**

High-Pressure Hydrogen Sulfide from First Principles: A Strongly Anharmonic Phonon-Mediated Superconductor

Ion Errea, Matteo Calandra, Chris J. Pickard, Joseph Nelson, Richard J. Needs, Yinwei Li, Hanyu Liu, Yunwei Zhang, Yanming Ma, and Francesco Mauri
Phys. Rev. Lett. **114**, 157004 (2015) – Published 16 April 2015

The coupling of electrons to anharmonic crystal vibrations may explain the record high-temperature superconductivity in highly pressurized hydrogen sulfide.

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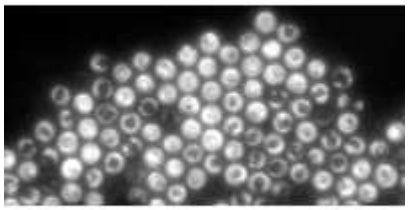
Fast-Moving Bacteria Self-Organize into Active Two-Dimensional Crystals of Rotating Cells

Alexander P. Petroff, Xiao-Lun Wu, and Albert Libchaber
Phys. Rev. Lett. **114**, 158102 (2015) – Published 17 April 2015



Rotating bacteria suck other bacteria into a 2D crystal structure, an unprecedented pattern for living organisms.

Featured in Physics

No-Hair Theorem for Black Holes in Astrophysical Environments

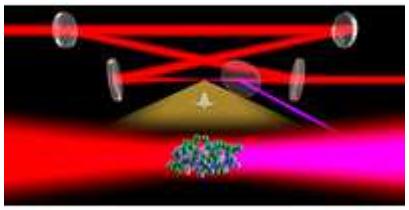
Norman Gürlebeck
Phys. Rev. Lett. **114**, 151102 (2015) – Published 15 April 2015

The no-hair theorem was originally formulated to describe isolated black holes, but an extended version now describes the more realistic case of a black hole distorted by nearby matter.

Featured in Physics

Cavity-Enhanced Field-Free Molecular Alignment at a High Repetition Rate

Craig Benko, Linqiang Hua, Thomas K. Allison, François Labaye, and Jun Ye
Phys. Rev. Lett. **114**, 153001 (2015) – Published 14 April 2015



A frequency comb can align an ensemble of molecules 150 million times per second.

Editors' Suggestion

Linear Mode Stability of the Kerr-Newman Black Hole and Its Quasinormal Modes

Óscar J. C. Dias, Mahdi Godazgar, and Jorge E. Santos

Phys. Rev. Lett. **114**, 151101 (2015) – Published 13 April 2015

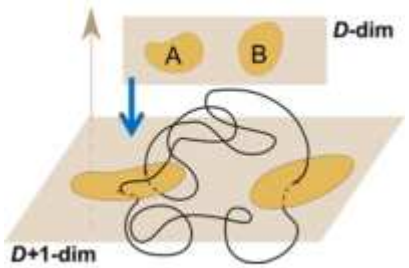
Kerr-Newman black holes – a general family of stationary asymptotically flat black holes – are shown to be linear mode stable. No instability exists for any of the gavito-electomagnetic modes.

Editors' Suggestion

Entanglement Entropy of Dispersive Media from Thermodynamic Entropy in One Higher Dimension

M. F. Maghrebi and M. T. H. Reid

Phys. Rev. Lett. **114**, 151602 (2015) – Published 16 April 2015



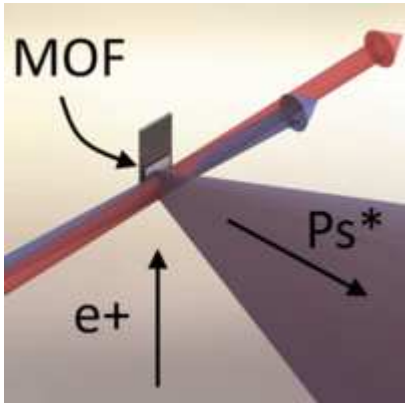
Entanglement entropy – an inherently quantum mechanical property – is related to classical thermodynamic entropy in one higher dimension.

Editors' Suggestion

Monoenergetic Positronium Emission from Metal-Organic Framework Crystals

A. C. L. Jones, H. J. Goldman, Q. Zhai, P. Feng, H. W. K. Tom, and A. P. Mills, Jr.

Phys. Rev. Lett. **114**, 153201 (2015) – Published 17 April 2015



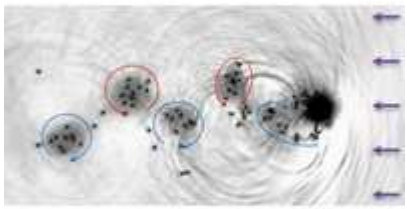
A series of low-energy peaks are observed for positronium emitted by the metal-organic framework crystal ZIF-8.

Editors' Suggestion

Identifying a Superfluid Reynolds Number via Dynamical Similarity

M. T. Reeves, T. P. Billam, B. P. Anderson, and A. S. Bradley

Phys. Rev. Lett. **114**, 155302 (2015) – Published 16 April 2015



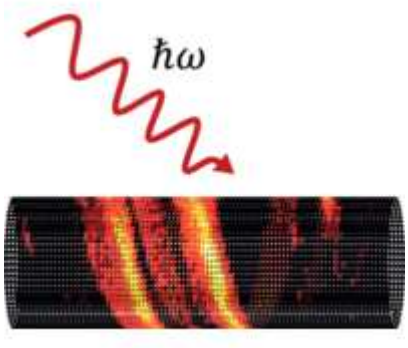
Numerical simulations of a Bose-Einstein condensate flowing past an obstacle uncover a single dimensionless parameter that characterizes the onset of superfluid turbulence.

Editors' Suggestion

Signature of Anomalous Exciton Localization in the Optical Response of Self-Assembled Organic Nanotubes

E. A. Bloemsma, S. M. Vlaming, V. A. Malyshev, and J. Knoester

Phys. Rev. Lett. **114**, 156804 (2015) – Published 17 April 2015



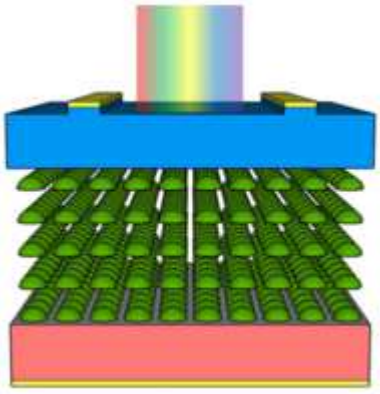
Self-assembled tubular molecular aggregates are robust against exciton localization, and could therefore act as exciton wires.

Editors' Suggestion

Intermediate Band Solar Cell with Extreme Broadband Spectrum Quantum Efficiency

A. Datas, E. López, I. Ramiro, E. Antolín, A. Martí, A. Luque, R. Tamaki, Y. Shoji, T. Sogabe, and Y. Okada

Phys. Rev. Lett. **114**, 157701 (2015) – Published 16 April 2015



The spectral range over which intermediate band gap solar cell devices absorb is significantly increased, with absorption for wavelengths from 250 nm to 6000 nm. In these materials a photocurrent is produced when the material is irradiated with photons with energies below the bandgap of the material.

LETTERS

General Physics: Statistical and Quantum Mechanics, Quantum Information, etc.

Self-Testing Quantum Random Number Generator
Tommaso Lunghi, Jonatan Bohr Brask, Charles Ci Wen Lim, Quentin Lavigne, Joseph Bowles, Anthony Martin, Hugo Zbinden, and Nicolas Brunner
Phys. Rev. Lett. **114**, 150501 (2015) – Published 15 April 2015

Energy-Tunable Sources of Entangled Photons: A Viable Concept for Solid-State-Based Quantum Relays
Rinaldo Trotta, Javier Martín-Sánchez, Istvan Daruka, Carmine Ortix, and Armando Rastelli
Phys. Rev. Lett. **114**, 150502 (2015) – Published 15 April 2015

Jarzynski Equality in PT-Symmetric Quantum Mechanics
Sebastian Deffner and Avadh Saxena
Phys. Rev. Lett. **114**, 150601 (2015) – Published 13 April 2015

Identification of the Predicted $5s-4f$ Level Crossing Optical Lines with Applications to Metrology and Searches for the Variation of Fundamental Constants
A. Windberger, J.R. Crespo López-Urrutia, H. Bekker, N.S. Oreshkina, J.C. Berengut, V. Bock, A. Borschevsky, V.A. Dzuba, E. Eliav, Z. Harman, U. Kaldor, S. Kaul, U.I. Safronova, V.V. Flambaum, C.H. Keitel, P.O. Schmidt, J. Ullrich, and O.O. Versolato
Phys. Rev. Lett. **114**, 150801 (2015) – Published 16 April 2015

Gravitation and Astrophysics

Editors' Suggestion

Linear Mode Stability of the Kerr-Newman Black Hole and Its Quasinormal Modes
Óscar J.C. Dias, Mahdi Godazgar, and Jorge E. Santos
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No-Hair Theorem for Black Holes in Astrophysical Environments
Norman Gürlebeck
Phys. Rev. Lett. **114**, 151102 (2015) – Published 15 April 2015

Muon-Induced Neutrons Do Not Explain the DAMA Data
J. Klinger and V.A. Kudryavtsev
Phys. Rev. Lett. **114**, 151301 (2015) – Published 13 April 2015

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Mathew Madhavacheril *et al.* (Atacama Cosmology Telescope Collaboration)
Phys. Rev. Lett. **114**, 151302 (2015) – Published 13 April 2015

Natural Inflation and Quantum Gravity
Anton de la Fuente, Prashant Saraswat, and Raman Sundrum

Phys. Rev. Lett. **114**, 151303 (2015) – Published 14 April 2015

Elementary Particles and Fields

Measurement of the Direct CP Asymmetry in $B^- \to X_{s+d}\gamma$ Decays with a Lepton Tag

L. Pesántez *et al.* (Belle Collaboration)

Phys. Rev. Lett. **114**, 151601 (2015) – Published 15 April 2015

Editors' Suggestion

Entanglement Entropy of Dispersive Media from Thermodynamic Entropy in One Higher Dimension

M. F. Maghrebi and M. T. H. Reid

Phys. Rev. Lett. **114**, 151602 (2015) – Published 16 April 2015

Explaining $h \to \mu^\pm \tau^\mp$, $B \to K^* \mu^+ \mu^-$, and $B \to K \mu^+ \mu^- / B \to K e^+ e^-$ in a Two-Higgs-Doublet Model with Gauged $L_\mu - L_\tau$

Andreas Crivellin, Giancarlo D'Ambrosio, and Julian Heeck

Phys. Rev. Lett. **114**, 151801 (2015) – Published 14 April 2015

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T. Aaltonen *et al.* (CDF Collaboration)†, D0 Collaboration)‡)

Phys. Rev. Lett. **114**, 151802 (2015) – Published 15 April 2015

Nuclear Physics

Principal Component Analysis of Event-by-Event Fluctuations

Rajeev S. Bhalerao, Jean-Yves Ollitrault, Subrata Pal, and Derek Teaney

Phys. Rev. Lett. **114**, 152301 (2015) – Published 16 April 2015

Atomic, Molecular, and Optical Physics

Featured in Physics

Cavity-Enhanced Field-Free Molecular Alignment at a High Repetition Rate

Craig Benko, Linqiang Hua, Thomas K. Allison, François Labaye, and Jun Ye

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Phys. Rev. Lett. **114**, 153201 (2015) – Published 17 April 2015

Orientation and Alignment Echoes

G. Karras, E. Hertz, F. Billard, B. Lavorel, J.-M. Hartmann, O. Faucher, Erez Gershnabel, Yehiam Prior, and Ilya Sh. Averbukh

Phys. Rev. Lett. **114**, 153601 (2015) – Published 15 April 2015

Experimental Implementation of Optimal Linear-Optical Controlled-Unitary Gates

Karel Lemr, Karol Bartkiewicz, Antonín Černoch, Miloslav Dušek, and Jan Soubusta

Phys. Rev. Lett. **114**, 153602 (2015) – Published 16 April 2015

Nonlinear Dynamics, Fluid Dynamics, Classical Optics, etc.

Resolving Multiple Molecular Orbitals Using Two-Dimensional High-Harmonic Spectroscopy

Hyeok Yun, Kyung-Min Lee, Jae Hee Sung, Kyung Taec Kim, Hyung Taek Kim, and Chang Hee Nam

Phys. Rev. Lett. **114**, 153901 (2015) – Published 14 April 2015

Plasma and Beam Physics

Theory of Two Threshold Fields for Relativistic Runaway Electrons

Pavel Aleynikov and Boris N. Breizman

Phys. Rev. Lett. **114**, 155001 (2015) – Published 14 April 2015

Measurements of the Conduction-Zone Length and Mass Ablation Rate in Cryogenic Direct-Drive Implosions on OMEGA

D. T. Michel, A. K. Davis, V. N. Goncharov, T. C. Sangster, S. X. Hu, I. V. Igumenshchev, D. D. Meyerhofer, W. Seka, and D. H. Froula
Phys. Rev. Lett. **114**, 155002 (2015) – Published 14 April 2015

Resistive Interchange Modes Destabilized by Helically Trapped Energetic Ions in a Helical Plasma

X. D. Du, K. Toi, M. Osakabe, S. Ohdachi, T. Ido, K. Tanaka, M. Yokoyama, M. Yoshinuma, K. Ogawa, K. Y. Watanabe, M. Isobe, K. Nagaoka, T. Ozaki, S. Sakakibara, R. Seki, A. Shimizu, Y. Suzuki, H. Tsuchiya, and Anonymous
Phys. Rev. Lett. **114**, 155003 (2015) – Published 17 April 2015

Condensed Matter: Structure, etc.

Critical Properties of the Superfluid—Bose-Glass Transition in Two Dimensions
Juan Pablo Álvarez Zúñiga, David J. Luitz, Gabriel Lemarié, and Nicolas Laflorencie
Phys. Rev. Lett. **114**, 155301 (2015) – Published 14 April 2015
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Identifying a Superfluid Reynolds Number via Dynamical Similarity

M. T. Reeves, T. P. Billam, B. P. Anderson, and A. S. Bradley
Phys. Rev. Lett. **114**, 155302 (2015) – Published 16 April 2015

New Density Functional Approach for Solid-Liquid-Vapor Transitions in Pure Materials
Gabriel Kocher and Nikolas Provatas
Phys. Rev. Lett. **114**, 155501 (2015) – Published 15 April 2015

Strong Influence of Coadsorbate Interaction on CO Desorption Dynamics on Ru(0001) Probed by Ultrafast X-Ray Spectroscopy and Ab Initio *Simulations*

H. Xin, J. LaRue, H. Öberg, M. Beye, M. Dell'Angela, J. J. Turner, J. Gladh, M. L. Ng, J. A. Sellberg, S. Kaya, G. Mercurio, F. Hieke, D. Nordlund, W. F. Schlotter, G. L. Dakovski, M. P. Minitti, A. Föhlisch, M. Wolf, W. Wurth, H. Ogasawara, J. K. Nørskov, H. Öström, L. G. M. Pettersson, A. Nilsson, and F. Abild-Pedersen
Phys. Rev. Lett. **114**, 156101 (2015) – Published 16 April 2015

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Nonexistence of the Luttinger-Ward Functional and Misleading Convergence of Skeleton Diagrammatic Series for Hubbard-Like Models
Evgeny Kozik, Michel Ferrero, and Antoine Georges
Phys. Rev. Lett. **114**, 156402 (2015) – Published 15 April 2015

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Ivan I. Naumov and Russell J. Hemley
Phys. Rev. Lett. **114**, 156403 (2015) – Published 17 April 2015

Magnetoresistance in Two-Component Systems

P. S. Alekseev, A. P. Dmitriev, I. V. Gornyi, V. Yu. Kachorovskii, B. N. Narozhny, M. Schütt, and M. Titov
Phys. Rev. Lett. **114**, 156601 (2015) – Published 14 April 2015

Spectral Weight Redistribution in $(LaNiO_3)_n/(LaMnO_3)_2$ Superlattices from Optical Spectroscopy
P. Di Pietro, J. Hoffman, A. Bhattacharya, S. Lupi, and A. Perucchi
Phys. Rev. Lett. **114**, 156801 (2015) – Published 13 April 2015

Anomalously Low Magnetoroton Energies of the Unconventional Fractional Quantum Hall States of Composite Fermions
Sutirtha Mukherjee and Sudhansu S. Mandal
Phys. Rev. Lett. **114**, 156802 (2015) – Published 16 April 2015

Intrinsic Damping of Collective Spin Modes in a Two-Dimensional Fermi Liquid with Spin-Orbit Coupling
Saurabh Maiti and Dmitrii L. Maslov
Phys. Rev. Lett. **114**, 156803 (2015) – Published 17 April 2015
Editors' Suggestion

Signature of Anomalous Exciton Localization in the Optical Response of Self-Assembled Organic Nanotubes
E. A. Bloemsma, S. M. Vlaming, V. A. Malyshev, and J. Knoester
Phys. Rev. Lett. **114**, 156804 (2015) – Published 17 April 2015

Experimental Demonstration of a Two-Band Superconducting State for Lead Using Scanning Tunneling Spectroscopy
Michael Ruby, Benjamin W. Heinrich, Jose I. Pascual, and Katharina J. Franke
Phys. Rev. Lett. **114**, 157001 (2015) – Published 14 April 2015

Structural and Magnetic Phase Transitions near Optimal Superconductivity in $BaFe_2(As_{1-x}P_x)_2$
Ding Hu, Xingye Lu, Wenliang Zhang, Huiqian Luo, Shiliang Li, Peipei Wang, Genfu Chen, Fei Han, Shree R. Banjara, A. Sapkota, A. Kreyssig, A. I. Goldman, Z. Yamani, Christof Niedermayer, Markos Skoulatos, Robert Georgii, T. Keller, Pengshuai Wang, Weiqiang Yu, and Pengcheng Dai
Phys. Rev. Lett. **114**, 157002 (2015) – Published 17 April 2015

Reversibility Of Superconducting Nb Weak Links Driven By The Proximity Effect In A Quantum Interference Device
Nikhil Kumar, T. Fournier, H. Courtois, C. B. Winkelmann, and Anjan K. Gupta
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High-Pressure Hydrogen Sulfide from First Principles: A Strongly Anharmonic Phonon-Mediated Superconductor
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Phys. Rev. Lett. **114**, 157004 (2015) – Published 16 April 2015

Nearly Linear Light Cones in Long-Range Interacting Quantum Systems
Michael Foss-Feig, Zhe-Xuan Gong, Charles W. Clark, and Alexey V. Gorshkov
Phys. Rev. Lett. **114**, 157201 (2015) – Published 13 April 2015

Weyl Spin Liquids
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Dissipationless Multiferroic Magnonics
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Phys. Rev. Lett. **114**, 157203 (2015) – Published 17 April 2015

Realizing Strong Light-Matter Interactions between Single-Nanoparticle Plasmons and Molecular Excitons at Ambient Conditions
Gülis Zengin, Martin Wersäll, Sara Nilsson, Tomasz J. Antosiewicz, Mikael Käll, and Timur Shegai
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Editors' Suggestion

Intermediate Band Solar Cell with Extreme Broadband Spectrum Quantum Efficiency
A. Datas, E. López, I. Ramiro, E. Antolín, A. Martí, A. Luque, R. Tamaki, Y. Shoji, T. Sogabe, and Y. Okada
Phys. Rev. Lett. **114**, 157701 (2015) – Published 16 April 2015

Polymer, Soft Matter, Biological, and Interdisciplinary Physics

Local Origin of Global Contact Numbers in Frictional Ellipsoid Packings
Fabian M. Schaller, Max Neudecker, Mohammad Saadatfar, Gary W. Delaney, Gerd E. Schröder-Turk, and Matthias Schröter
Phys. Rev. Lett. **114**, 158001 (2015) – Published 14 April 2015

Thermodynamic Uncertainty Relation for Biomolecular Processes
Andre C. Barato and Udo Seifert
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Fast-Moving Bacteria Self-Organize into Active Two-Dimensional Crystals of Rotating Cells
Alexander P. Petroff, Xiao-Lun Wu, and Albert Libchaber
Phys. Rev. Lett. **114**, 158102 (2015) – Published 17 April 2015

Age-Dependent Modes of Extensional Necking Instability in Soft Glassy Materials
David M. Hoyle and Suzanne M. Fielding
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Dynamics and Scission of Rodlike Cationic Surfactant Micelles in Shear Flow
Abhinanden Sambasivam, Ashish V. Sangwai, and Radhakrishna Sureshkumar
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Reducing Degeneracy in Maximum Entropy Models of Networks
Szabolcs Horvát, Éva Czabarka, and Zoltán Toroczkai
Phys. Rev. Lett. **114**, 158701 (2015) – Published 14 April 2015