

Reinforcement learning: An agent observes the environment acquiring its state (straight arrow), then decides to implement an action (upper curved arrow) thus updating the environment state for the next step. Based on the outcomes an interpreter grants the agent a reward R (lower curved arrow), which the agent aims to maximize. [P. Sgroi, M. G. Palma, and M. Paternostro, Phys. Rev. Lett. **126**, 020601 (2021)]

NEWSPAPER

PHYSICAL REVIEW LETTERS

Contents

Articles published 9 January–15 January 2021

VOLUME 126, NUMBER 2 15 January 2021

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

Observation of Pauli Crystals 020401
Marvin Holten, Luca Bayha, Keerthan Subramanian, Carl Heintze, Philipp M. Preiss, and Selim Jochim

Dissipative Engineering of Gaussian Entangled States in Harmonic Lattices with a Single-Site Squeezed Reservoir 020402
Stefano Zippilli and David Vitali

Efficient Simulation of Loop Quantum Gravity: A Scalable Linear-Optical Approach 020501
Lior Cohen, Anthony J. Brady, Zichang Huang, Hongguang Liu, Dongxue Qu, Jonathan P. Dowling, and Muxin Han

Efficient Qubit Measurement with a Nonreciprocal Microwave Amplifier 020502
F. Lecocq, L. Ranzani, G. A. Peterson, K. Cicak, X. Y. Jin, R. W. Simmonds, J. D. Teufel, and J. Aumentado

Optical-Relayed Entanglement Distribution Using Drones as Mobile Nodes 020503
Hua-Ying Liu, Xiao-Hui Tian, Changsheng Gu, Pengfei Fan, Xin Ni, Ran Yang, Ji-Ning Zhang, Mingzhe Hu, Jian Guo, Xun Cao, Xiaopeng Hu, Gang Zhao, Yan-Qing Lu, Yan-Xiao Gong, Zhenda Xie, and Shi-Ning Zhu

Reinforcement Learning Approach to Nonequilibrium Quantum Thermodynamics 020601
Pierpaolo Sgroi, G. Massimo Palma, and Mauro Paternostro

Dynamical Transitions and Critical Behavior between Discrete Time Crystal Phases 020602
Xiaoqin Yang and Zi Cai

Stochastic Discrete Time Crystals: Entropy Production and Subharmonic Synchronization 020603
Lukas Oberreiter, Udo Seifert, and Andre C. Barato

Gravitation and Astrophysics

Direct Determination of Supermassive Black Hole Properties with Gravitational-Wave Radiation from Surrounding Stellar-Mass Black Hole Binaries 021101
Hang Yu and Yanbei Chen

Axion Emission Can Explain a New Hard X-Ray Excess from Nearby Isolated Neutron Stars 021102
Malte Buschmann, Raymond T. Co, Christopher Dessert, and Benjamin R. Safdi

Search for Gravitational Waves from High-Mass-Ratio Compact-Binary Mergers of Stellar Mass and Subsolar Mass Black Holes 021103
Alexander H. Nitz and Yi-Fan Wang (王一帆)

Potential of Radio Telescopes as High-Frequency Gravitational Wave Detectors 021104
Valerie Domcke and Camilo Garcia-Cely

Localizing Transformations of the Galaxy-Galaxy Lensing Observable 021301
Youngsoo Park, Eduardo Rozo, and Elisabeth Krause

(Continued Inside)

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. Lett. 98, 010001 (2007).

Copyright 2021 American Physical Society

0031-9007(20210115)126:2;1-C

Elementary Particles and Fields

Full Angle Dependence of the Four-Loop Cusp Anomalous Dimension in QED 021601
R. Brüser, C. Dlapa, J. M. Henn, and K. Yan

From Gaudin Integrable Models to *d*-Dimensional Multipoint Conformal Blocks 021602
Ilija Burić, Sylvain Lacroix, Jeremy A. Mann, Lorenzo Quintavalle, and Volker Schomerus

Compact $U^k(1)$ Chern-Simons Theory as a Local Bosonic Lattice Model with Exact Discrete 1-Symmetries 021603
Michael DeMarco and Xiao-Gang Wen

Evolution of the Primordial Axial Charge across Cosmic Times 021801
A. Boyarsky, V. Cheianov, O. Ruchayskiy, and O. Sobol

Gravitational Waves and Proton Decay: Complementary Windows into Grand Unified Theories 021802
Stephen F. King, Silvia Pascoli, Jessica Turner, and Ye-Ling Zhou

Limits on the Existence of sub-MeV Sterile Neutrinos from the Decay of ^{7}Be in Superconducting Quantum Sensors 021803
S. Friedrich, G. B. Kim, C. Bray, R. Cantor, J. Dilling, S. Fretwell, J. A. Hall, A. Lennarz, V. Lordi, P. Machule, D. McKeen, X. Mougeot, F. Ponce, C. Ruiz, A. Samanta, W. K. Warburton, and K. G. Leach

Nuclear Physics

Ab Initio Limits of Atomic Nuclei 022501
S. R. Stroberg, J. D. Holt, A. Schwenk, and J. Simonis

Atomic, Molecular, and Optical Physics

Universal Dimerized Quantum Droplets in a One-Dimensional Lattice 023001
Ivan Morera, Grigori E. Astrakharchik, Artur Polls, and Bruno Juliá-Díaz

Optical Mass Spectrometry of Cold $RaOH^+$ and $RaOCH_3{}^+$ 023002
M. Fan, C. A. Holliman, X. Shi, H. Zhang, M. W. Straus, X. Li, S. W. Buechele, and A. M. Jayich

Probing Fundamental Symmetries of Deformed Nuclei in Symmetric Top Molecules 023003
Phelan Yu and Nicholas R. Hutzler

Using Circular Dichroism to Control Energy Transfer in Multiphoton Ionization 023201
A. H. N. C. De Silva, D. Atri-Schuller, S. Dubey, B. P. Acharya, K. L. Romans, K. Foster, O. Russ, K. Compton, C. Rischbieter, N. Douguet, K. Bartschat, and D. Fischer

Statistical Benchmarking of Scalable Photonic Quantum Systems 023601
J. Tiedau, M. Engelkemeier, B. Brecht, J. Sperling, and C. Silberhorn

Shortcuts to Adiabaticity for the Quantum Rabi Model: Efficient Generation of Giant Entangled Cat States via Parametric Amplification 023602
Ye-Hong Chen, Wei Qin, Xin Wang, Adam Miranowicz, and Franco Nori

Experimental Reconstruction of the Few-Photon Nonlinear Scattering Matrix from a Single Quantum Dot in a Nanophotonic Waveguide 023603
Hanna Le Jeannic, Tomás Ramos, Signe F. Simonsen, Tommaso Pregnolato, Zhe Liu, Rüdiger Schott, Andreas D. Wieck, Arne Ludwig, Nir Rotenberg, Juan José García-Ripoll, and Peter Lodahl

Double-Electromagnetically-Induced-Transparency Ground-State Cooling of Stationary Two-Dimensional Ion Crystals 023604
Mu Qiao, Ye Wang, Zhengyang Cai, Botao Du, Pengfei Wang, Chunyang Luan, Wentao Chen, Heung-Ryoul Noh, and Kihwan Kim

Experimental Certification of Nonclassicality via Phase-Space Inequalities 023605
Nicola Biagi, Martin Bohmann, Elizabeth Agudelo, Marco Bellini, and Alessandro Zavatta

Nonlinear Dynamics, Fluid Dynamics, Classical Optics, etc.

Absorption Reduction of Large Purcell Enhancement Enabled by Topological State-Led Mode Coupling 023901
Zhiyuan Qian, Zhichao Li, He Hao, Lingxiao Shan, Qi Zhang, Jianwen Dong, Qihuang Gong, and Ying Gu

Discretized Conical Waves in Multimode Optical Fibers 023902
Bertrand Kibler and Pierre Béjot

(Continued on Preceding Page)

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. Lett. 98, 010001 (2007)

Nanometric Precision Distance Metrology via Hybrid Spectrally Resolved and Homodyne Interferometry in a Single Soliton Frequency Microcomb 023903
Yoon-Soo Jang, Hao Liu, Jinghui Yang, Mingbin Yu, Dim-Lee Kwong, and Chee Wei Wong
Dissipative Polarization Domain Walls in a Passive Coherently Driven Kerr Resonator 023904
Bruno Garbin, Julien Fatome, Gian-Luca Oppo, Miro Erkintalo, Stuart G. Murdoch, and Stéphane Coen

Plasma and Beam Physics

Laser-Ion Lens and Accelerator 024801
Tianhong Wang, Vladimir Khudik, and Gennady Shvets
Record Energetics for an Inertial Fusion Implosion at NIF 025001
A. B. Zylstra, A. L. Kritcher, O. A. Hurricane, D. A. Callahan, K. Baker, T. Braun, D. T. Casey, D. Clark, K. Clark, T. Döppner, L. Divol, D. E. Hinkel, M. Hohenberger, C. Kong, O. L. Landen, A. Nikroo, A. Pak, P. Patel, J. E. Ralph, N. Rice, R. Tommasini, M. Schoff, M. Stadermann, D. Strozzi, C. Weber, C. Young, C. Wild, R. P. J. Town, and M. J. Edwards
Evidence of Three-Dimensional Asymmetries Seeded by High-Density Carbon-Ablator Nonuniformity in Experiments at the National Ignition Facility 025002
D. T. Casey, B. J. MacGowan, J. D. Sater, A. B. Zylstra, O. L. Landen, J. Milovich, O. A. Hurricane, A. L. Kritcher, M. Hohenberger, K. Baker, S. Le Pape, T. Döppner, C. Weber, H. Huang, C. Kong, J. Biener, C. V. Young, S. Haan, R. C. Nora, S. Ross, H. Robey, M. Stadermann, A. Nikroo, D. A. Callahan, R. M. Bionta, K. D. Hahn, A. S. Moore, D. Schlossberg, M. Bruhn, K. Sequoia, N. Rice, M. Farrell, and C. Wild
Metallization of Shock-Compressed Liquid Ammonia 025003
A. Ravasio, M. Bethkenhagen, J.-A. Hernandez, A. Benuzzi-Mounaix, F. Datchi, M. French, M. Guarguaglini, F. Lefevre, S. Ninet, R. Redmer, and T. Vinci
Threshold Heat-Flux Reduction by Near-Resonant Energy Transfer 025004
P. W. Terry, P.-Y. Li, M. J. Pueschel, and G. G. Whelan

Condensed Matter: Structure, etc.

Quantum Droplets of Dipolar Mixtures 025301
R. N. Bisset, L. A. Peña Ardila, and L. Santos
Quantum Droplet States of a Binary Magnetic Gas 025302
Joseph C. Smith, D. Baillie, and P. B. Blakie
Role of Static Displacements in Stabilizing Body Centered Cubic High Entropy Alloys 025501
G. D. Samolyuk, Y. N. Osetsky, G. M. Stocks, and J. R. Morris
Theory of Pressure-Induced Rejuvenation and Strain Hardening in Metallic Glasses 025502
Anh D. Phan, Alessio Zaccone, Vu D. Lam, and Katsunori Wakabayashi
Fracture Diodes: Directional Asymmetry of Fracture Toughness 025503
N. R. Brodnik, S. Brach, C. M. Long, G. Ravichandran, B. Bourdin, K. T. Faber, and K. Bhattacharya
Elasticity of a Pseudoproper Ferroelastic Transition from Stishovite to Post-Stishovite at High Pressure 025701
Yanyao Zhang, Suyu Fu, Baoyun Wang, and Jung-Fu Lin
Spatial Clustering of Depinning Avalanches in Presence of Long-Range Interactions 025702
Clément Le Priol, Pierre Le Doussal, and Alberto Rosso

Condensed Matter: Electronic Properties, etc.

Dominant Fifth-Order Correlations in Doped Quantum Antiferromagnets 026401
A. Bohrdt, Y. Wang, J. Koepsell, M. Kánasz-Nagy, E. Demler, and F. Grusdt
Spin Fluctuations in Quantized Transport of Magnetic Topological Insulators 026601
Yu-Hang Li and Ran Cheng
Gate-Tunable Fractional Chern Insulators in Twisted Double Bilayer Graphene 026801
Zhao Liu, Ahmed Abouelkomsan, and Emil J. Bergholtz
Two-Dimensional Superconductivity at the $LaAlO_3/KTaO_3(110)$ Heterointerface 026802
Zheng Chen, Zhongran Liu, Yanqiu Sun, Xiaoxin Chen, Yuan Liu, Hui Zhang, Hekang Li, Meng Zhang, Siyuan Hong, Tianshuang Ren, Chao Zhang, He Tian, Yi Zhou, Jirong Sun, and Yanwu Xie

(Continued on Preceding Page)

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. Lett. 98, 010001 (2007)

Topological Transition of Superconductivity in Dirac Semimetal Nanowire Josephson Junctions 027001
Cai-Zhen Li, An-Qi Wang, Chuan Li, Wen-Zhuang Zheng, Alexander Brinkman, Da-Peng Yu, and Zhi-Min Liao

Fragile Topology and Flat-Band Superconductivity in the Strong-Coupling Regime 027002
Valerio Peri, Zhi-Da Song, B. Andrei Bernevig, and Sebastian D. Huber

Measurement of the Spin Absorption Anisotropy in Lateral Spin Valves 027201
M. Cosset-Chéneau, L. Vila, G. Zahnd, D. Gusakova, V. T. Pham, C. Grèzes, X. Waintal, A. Marty, H. Jaffrès, and J.-P. Attané

Shallow and Deep States of Beryllium Acceptor in GaN: Why Photoluminescence Experiments Do Not Reveal Small Polarons for Defects in Semiconductors 027401
D. O. Demchenko, M. Vorobiov, O. Andrieiev, T. H. Myers, and M. A. Reshchikov

Stronger Interlayer Interactions Contribute to Faster Hot Carrier Cooling of Bilayer Graphene under Pressure 027402
Kun Ni, Jinxiang Du, Jin Yang, Shujuan Xu, Xin Cong, Na Shu, Kai Zhang, Aolei Wang, Fei Wang, Liangbing Ge, Jin Zhao, Yan Qu, Kostya S. Novoselov, Pingheng Tan, Fuhai Su, and Yanwu Zhu

Quantifying the Robustness of Topological Slow Light 027403
Guillermo Arregui, Jordi Gomis-Bresco, Clivia M. Sotomayor-Torres, and Pedro David Garcia

Topological Charge Pumping in Excitonic Insulators 027601
Zhiyuan Sun and Andrew J. Millis

Ultrafast Neuromorphic Dynamics Using Hidden Phases in the Prototype of Relaxor Ferroelectrics 027602
Sergey Prosandeev, Julie Grollier, Diyar Talbayev, Brahim Dkhil, and L. Bellaiche

Polymer, Soft Matter, Biological, Climate, and Interdisciplinary Physics

Searching for the Gardner Transition in Glassy Glycerol 028001
Samuel Albert, Giulio Biroli, François Ladieu, Roland Tourbot, and Pierfrancesco Urbani

Control of Superselectivity by Crowding in Three-Dimensional Hosts 028002
Andrew T. R. Christy, Halim Kusumaatmaja, and Mark A. Miller

Evaporation-Induced Liquid Expansion and Bubble Formation in Binary Mixtures 028003
Qiyun Tang and Marcus Müller

Quantifying Material Properties of Cell Monolayers by Analyzing Integer Topological Defects 028101
Carles Blanch-Mercader, Pau Guillamat, Aurélien Roux, and Karsten Kruse

Hidden Topological Structure of Flow Network Functionality 028102
Jason W. Rocks, Andrea J. Liu, and Eleni Katifori

Swirling Instability of the Microtubule Cytoskeleton 028103
David B. Stein, Gabriele De Canio, Eric Lauga, Michael J. Shelley, and Raymond E. Goldstein

Dominant Reaction Pathways by Quantum Computing 028104
Philipp Hauke, Giovanni Mattiotti, and Pietro Faccioli

Desynchronization Transitions in Adaptive Networks 028301
Rico Berner, Simon Vock, Eckehard Schöll, and Serhiy Yanchuk

Errata

Erratum: Energy Transfer from Large to Small Scales in Turbulence by Multiscale Nonlinear Strain and Vorticity Interactions [Phys. Rev. Lett. **124**, 104501 (2020)] 029901
Perry L. Johnson

This paper was highlighted in the APS publication *Physics* (physics.aps.org).
By suggesting a few manuscripts each week, we hope to promote reading across fields. Please see our Announcement Phys. Rev. Lett. 98, 010001 (2007).

Physics
spotlighting exceptional research

The American Physical Society's free online publication, *Physics* (physics.aps.org), provides thought-provoking analysis and spotlights exceptional research.