Advertisement
nature conferences
Abstract presenting opportunities
Digital Biomarkers
Submit today >>
SPRINGER NATURE

Physical sciences articles within *Nature Communications*

Atom RSS Feed

Featured

Article
07 October 2026 | Open Access

Trillion-scale integrated framework for high-throughput materials databases and seamless sharing

A new computing framework builds large-scale materials databases under resource constraints, with major gains in efficiency, storage, and query speed plus edge-device deployment. A ten-trillion-scale HEA database was built in one week.

Xiaoya Huang, Yu Liu & Peng Kang

Article
07 October 2026 | Open Access

Phase-sensitive signatures of time-reversal-symmetry-breaking superconductivity in magic-angle twisted trilayer graphene

The authors report phase-sensitive signatures consistent with time-reversal-symmetry-breaking chiral superconductivity in magic-angle twisted trilayer graphene, using Josephson interferometry. The time-reversal-symmetry-breaking signatures occur below 0.8 K, distinctly lower than the superconducting onset at Tc ~ 2 K.

Taehyeok Jin, Cheong-Eung Ahn & Sungjae Cho

Article
07 October 2026 | Open Access

Ions leaving no tracks

It has been shown that swift heavy ions leave no tracks in the spinel polymorph of gallium oxide, because of extremely efficient lattice recovery of the radiation disorder, paving a way for designing new radiation-tolerant materials.

Azat Abdullaev, Javier García Fernandez & Andrej Kuznetsov

Article
07 October 2026 | Open Access

Carbon dioxide as a multifunctional regulator in electrochemical vicinal bromination

The authors report a CO2-mediated electrochemical vicinal dibromination, compatible with broad range of alkenes bearing sensitive functional groups, using NaBr as a sustainable bromine source.

Guo-Wei Lai, Haibo Wu & Hai-Tao Tang

Article
07 October 2026 | Open Access

Integration of high-κ oxide on 2D semiconductors with carbon-dot monolayer assembly as van der Waals interfacial layer

The integration of high-κ dielectric materials with 2D semiconductors remains an important challenge for the industrialization of 2D electronics. Here, the authors report the application of a carbon-dot monolayer assembly to facilitate the deposition of high-κ HfO_2 on monolayer graphene and MoS_2, enabling the fabrication of high-performance transistors.

Sunny Wong, Fufei An & Qing Cao

Article
07 October 2026 | Open Access

The WorkReach model for urban work location choices through economic complexity and informality

The WorkReach model captures how economic opportunity and informality shape commuting. Analyzing four major cities, this study shows that measuring job access by perceived benefits, not just proximity, exposes hidden socioeconomic disparities.

Ollin D. Langle-Chimal, Steffen Knoblauch & Marta C. González

Article
07 October 2026 | Open Access

Game theory driven multi-agent framework mitigates language model hallucination

Lightweight AI models can be unreliable in specialized scientific tasks. Here, the authors introduce G-Frame, which uses game theory to coordinate multiple AI agents, automate data generation and training, and reduce hallucinations.

Runzhe Liu, Biquan Bie & Shengyang Tao

Article
07 October 2026 | Open Access

Interfacial ferroelectricity at naturally-formed van der Waals interfaces

The authors show that naturally formed interfaces in van der Waals $SnSe_2$ host switchable electric polarization driven by atomic-layer sliding, offering a scalable platform for low-power memory and in memory computing.

Jiawen Dai, Beituo Liu & Weida Hu

Article
07 October 2026 | Open Access

Test of the gravitational interaction between milligram masses using a miniature torsion pendulum

Probing gravitation between small test masses continues to pose significant challenges. Here, the authors report a miniature closed-loop Cavendish-type torsion balance test using two 7.6 mg silicon masses, over separation distances from 0.654 to 1.554 mm and achieving a maximum uncertainty of 50 aN (2σ).

Zheng-Jie An, Wen-Hai Tan & Shan-Qing Yang

Article
07 October 2026 | Open Access

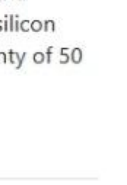
Suppression of spectral gap and flat bands on a cuprate superconductor side-surface

The authors use focused-ion-beam milling to expose the (110) side surface of overdoped $La_{2x}Sr_xCuO_4$, where a zero-energy topological flat band is expected. Angle-resolved photoemission experiments do not show the expected flat-band peak due to broadening of the flat band by Anderson-type disorder.

Gabriele Domaine, Mihir Date & Niels B. M. Schröter

Article
07 October 2026 | Open Access

Post-fabrication reconfiguration of hydrogels through thermodynamic asymmetry in dynamic chemistry



Dynamic covalent chemistry has provided powerful routes to dynamic polymer networks, yet the nature of the dynamic bond is typically defined at the outset and remains unchanged. Here, the authors introduce thermodynamic asymmetry in dynamic covalent chemistry to enable the reconfiguration of network-defining linkages after material formation, allowing for functional material evolution.

Davide Campagna, Diego Ciardi & Andreas Walther

Article
07 October 2026 | Open Access

Sub-stoichiometric degradation is dispensable for potent PROTACs as demonstrated by irreversible covalent BTK degraders

Protein degraders are thought to require repeated rounds of action, so molecules binding their target irreversibly were considered unsuitable. Here, the authors describe a covalent BTK degrader active at sub-nanomolar doses in cells and show what governs its potency.

Ran Cheng, Hanfeng Lin & Jin Wang

Article
07 October 2026 | Open Access

Anti-inflammation lipid nanoparticles enable localized mRNA therapy for inflammatory bowel disease

Inflammatory bowel disease is a persistent disease requiring long-term inflammation management. Here, the authors develop anti-inflammatory lipid nanoparticles that deliver therapeutic mRNA to the inflamed colon, improve disease outcomes and reduce inflammatory signals in animal and ex vivo human models.

Dinglingge Cao, Meng Tian & Yizhou Dong

Article
07 October 2026 | Open Access

Deep diffractive optical neural networks for detecting skyrmionic topologies of light and their live training

The article presents the first direct detector of optical skyrmionic topologies using a deep diffractive neural network, enabling seamless detection of symbols encoded in skyrmionic topology. Its simplified phase layers reduce network complexity and enable in situ training.

Hadrian Bezuidenhout, Cade Peters & Isaac Nape

Article
06 October 2026 | Open Access

Symmetry-engineered and electrically tunable in-plane anomalous Hall effect in oxide heterostructures

The authors demonstrate that engineering crystal symmetry in oxide heterostructures creates a robust in-plane anomalous Hall effect, enabling direct readout of in-plane magnetization and a wide range of fully reversible electrical ON/OFF switching.

Kunjie Dai, Zhen Wang & Lingfei Wang

Article
06 October 2026 | Open Access

Catalytic asymmetric dearomatization of (hetero)aromatic frameworks

Catalytic asymmetric dearomative cycloaddition offers an attractive route to chiral polycycles, but achieving divergent and site-selective transformations across diverse polycyclic aromatics remains challenging. Here, the authors report a vinylidene ortho-quinone methide platform that enables predictable, highly selective dearomative cycloadditions of diverse (hetero)polycyclic aromatics.

Yu Chang, Kai Li & Hailong Yan

Article
06 October 2026 | Open Access

Block copolymer multistate material circuit

'Here, the authors report a recyclable multistate material system with quantitatively defined states and circuit-like transition pathways, offering a series of switchable material properties by dual-phase crystalline control in self-assembled nanostructures.'

Hongxin Wei, Lingmin Lan & Chao Lang

Article
06 October 2026 | Open Access

Chiral-nematic Fermi liquid state as the parent state of kagome metals and superconductors

The authors use spectroscopic-imaging scanning tunneling microscopy to study kagome CsV_3Sb_5 at high doping where the charge density wave of the pure material is suppressed. They discover a multiorbital chiral-nematic Fermi liquid state, which they propose is the parent state.

Zihao Huang, Zhan Wang & Hong-Jun Gao

Article
06 October 2026 | Open Access

Ultrathin high-performance circular polarizers based on $MoOCl_2$/$NbOCl_2$ van der Waals heterostructures

Circularly polarized light can be used in several applications, but normally requires bulky optical components. Here, the authors report the realization of sub-micron-thick circular polarizers based on the natural phase modulation capability of $NbOCl_2$ and polarization selectivity of $MoOCl_2$ crystals, showing their integration into a LED chip.

Shuxin Huang, Guanyu Zhang & Guowei Lyu

Article
06 October 2026 | Open Access

A generative diffusion framework for physically consistent 3D turbulence

Three-dimensional turbulence contains complex multiscale fluctuations that challenge even state-of-the-art generative models. Here, the authors develop a generative diffusion framework that produces physically consistent 3D turbulence with accurate multiscale statistics.

Tianyi Li, Michele Buzzicotti & Luca Biferale

Article
06 October 2026 | Open Access

MOF-mediated cascade photoreactions under nanoconfinement for defluorination of per- and polyfluoroalkyl substances

Here, authors report a nanoconfinement strategy to encapsulate a MOF photocatalyst within a graphene aerogel matrix. This not only allows cascade reduction-oxidation reactions but also provides kinetic and thermodynamic advantages for efficient defluorination of various PFASs.

Jingjing Tang, Xiang Zhang & Bingcai Pan

Article
06 October 2026 | Open Access

Coherent terahertz control of metastable magnetization in $FePS_3$

Light-driven phonons offer a route to nonequilibrium phases, yet coherent, on demand control of such phases has been hard to achieve. Here, Ilyas, Luo, Ning and co-authors show that the timing of two terahertz pulses sets the amplitude of a metastable magnetization in $FePS_3$, through anharmonic coupling of infrared active phonons to a magnetization inducing Raman mode.

Batyr Ilyas, Tianchuang Luo & Nuh Gedik

Article
06 October 2026 | Open Access

Water-oil interfacial kinetics control enables water-based organic solar cells with 12.59% certified efficiency

The practical applications of environmentally friendly water-based organic solar cells are hindered by low device performance. Bi et al. develop an interfacial-tension-mediated regulation strategy to improve nanoparticle-derived film formation, achieving a power conversion efficiency of 12.64%.

Zhaozhao Bi, Ke Wang & Wei Ma

Matters Arising
06 October 2026 | Open Access

Reply to "On the Author Correction to "Magnetic field screening in hydride superconductors (Nature Comm. 13, 8144 (2024))"

V. S. Minkov, E. F. Talantsev & M. I. Eremets

Article
06 October 2026 | Open Access

Distinct T cell correlates of COVID-19 risk before and after a second booster in previously SARS-CoV-2 infected versus naïve COVAIL trial participants

Vaccines to SARS-CoV-2 clearly stimulate virus specific T cell and antibody responses but T cell-mediated protection is challenging to show. Here the authors use PBMC samples from an open-label clinical trial of different prototype and variant-specific COVID-19 vaccine boosters to examine the function and phenotype of T cell populations and how T cell response levels associate with risk of, and with protection against, symptomatic SARS-CoV-2 infection.

Bo Zhang, Youyi Fong & Peter B. Gilbert

Article
05 October 2026 | Open Access

Self-foaming sintering-resistant iron-tungsten powders enable high-cycle thermochemical hydrogen storage

Researchers show that iron-tungsten powders can repeatedly store and release hydrogen while resisting clumping and capacity loss, offering a safer, compact, solid-state option for stationary hydrogen storage and clean-energy systems

Jie Qi & David C. Dunand

Article
05 October 2026 | Open Access

Coordination ring-opening transamidation copolymerization of cyclic lactones and lactams towards circular and biodegradable poly(ester amide) adhesives

The direct copolymerization of lactones and lactams to produce poly(ester amide)s is a challenge. Here, the authors report the titanium catalyzed ring-opening transamidation polymerization of ε-caprolactone and ε-caprolactam to produce biodegradable poly(ester amide)s with good adhesive properties.

Zuowen Shi, Zhipeng Huang & Haobing Wang

Article
05 October 2026 | Open Access

Copper(I)-catalyzed enantioselective Truce-Smiles rearrangement to access glutamine motifs bearing 1,3-nonadjacent stereocenters

Smiles rearrangements enable aryl migration, but catalytic asymmetric variants remain challenging. The authors report a copper(I)-catalysed enantioselective Truce–Smiles rearrangement that furnishes glutamine derivatives with nonadjacent stereocentres, including quaternary centres, while enabling previously inaccessible heteroaryl and alkenyl migrations.

Zhenguang Guo, Zhiwei He & Wei-Ping Deng

Matters Arising
05 October 2026 | Open Access

An inadequate over-parameterized Mössbauer spectral analysis for the mistaken detection of surface $Fe^{IV}=O$, in *Nature Communications* 16, 7642 (2025)

Fernande Grandjean & Gary J. Long

Article
05 October 2026 | Open Access

Electronically tuned N-terminal glycine selective bioconjugation enables in vitro and in vivo species-specific *Staphylococcus aureus* targeting

Methods for precisely targeting a biomolecule within living systems offer high potential for biomedical studies, but their development is limited by selectivity issues. Here, the authors introduce an electronically tunable chemical technology that targets N-terminal glycine and use the method for species-specific detection and inhibition of Staphylococcus aureus and its resistant strains, MRSA and VRSA.

Mohan Kumar, Divya Bindra & Vishal Rai

Article
05 October 2026 | Open Access

Superlattice Engineering in Relaxor Ferroelectric-based Capacitors for Ultra-Highly Efficient Recoverable Energy Storage Density

Superlattice engineering, combining relaxor ferroelectric and paraelectric layers, provides a promising strategy to simultaneously enhance energy storage efficiency and recoverable energy density at low applied electric fields.

Matilde M. G. S. Oliveira, Ampattu R. Jayakrishnan & José P. B. Silva

Article
05 October 2026 | Open Access

Elastically bendable chiral metal halide crystals

Chiral metal halide crystals exhibit elastic bending via a rigid–flexible structural motif, which enables their application in underwater ultrasound sensing

Ying Zhang, Cheng Qian & Xian-He Bu

Article
05 October 2026 | Open Access

Reconfiguring interfacial hydrogen-bond networks to enhance anodic oxidation for efficient wastewater treatment

This study reports Fe^{3+}-mediated anodic oxidation strengthening interfacial water H-bonds to accelerate hydroxyl radical and high-valent iron production, expanding oxidation scope for contaminants and enabling stable low-cost operation.

Tong Liu, Shuang Zhong & Bo Lai

Article
05 October 2026 | Open Access

Electrochemiluminescence shunt via bi-based co-reaction accelerator for the identification of pentanol isomers

High-performance biofuels require a well-defined flash point, yet the coexistence of pentanol isomers can introduce ignition-point variations that compromise fuel performance. Here, the authors present an electrochemiluminescence shunt strategy based on a bifunctional catalytic system that exploits the distinct reactive oxygen species scavenging properties of pentanol isomers. The approach generates differential anodic and cathodic luminol signals, enabling their precise discrimination and providing a powerful tool for fuel-quality assessment.

Peipei Zong, Yaqi Zhao & Xiaoquan Lu

Article
05 October 2026 | Open Access

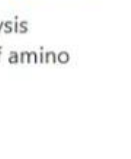
Selective radical pathways on defect-engineered electrophilic biochar for sustainable water purification

This study develops a defect-engineered biochar from nitrogenous agricultural waste that selectively activates peracetic acid into reactive acetylperoxyl radicals, offering an efficient and sustainable strategy for precision wastewater purification.

Ying Hu, Wei Ren & Yongfa Zhu

Article
05 October 2026 | Open Access

Linearly polarized light-induced magnetism in bilayer $MoSe_2$

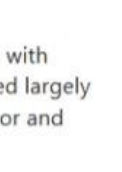


Light can be used to drive transient changes in a materials phase; in some cases, breaking material symmetries, in others restoring them. Here, using time resolved Faraday rotation measurements, Seo et al demonstrate that linear polarised light can break time reversal symmetry, leading to a transient magnetization in $MoSe_2$.

Meenkyo Seo, Hanbyul Kim & Dong Eon Kim

Article
05 October 2026 | Open Access

Strategy for hybrid connection of porous strut and triply periodic minimal surface lattice structures



A hybrid strategy connects two porous structure types via twinned cells, integrating their strengths. It enables on-demand stiffness tuning and balanced multi-property performance. Prototypes confirm seamless integration, bone-to-tendon compatibility, and 3D printability.

Jianxing Yang, Vahid Moosabeiki & Mohammad J. Mirzaali

Article
05 October 2026 | Open Access

Chiral discrimination of amino acids in meteorite and desert soil extracts via single-molecule nanogap conductance

Chiral amino acids are important biomarkers in the search for life beyond Earth, but their analysis remains challenging. Here, the authors demonstrate single-molecule electrical identification of amino acid chirality and apply it to Murchison meteorite and Atacama Desert samples.

Takahito Ohshiro, Yuki Komoto & Masateru Taniguchi

Article
03 October 2026 | Open Access

Thermally programmed disassembly and reconstruction of 2D polymer platelets via melting-governed crystallization-driven self-assembly

'Crystallization-driven self-assembly is a useful tool for the synthesis of polymer nanostructures with precise dimensions, but the melting behavior of polymer crystals grown in solution has remained largely unexplored. Here, the authors show that melting temperature is a structurally sensitive descriptor and an active design parameter for 2D platelets.'

Emre Turan & Maria C. Arno

Article
03 October 2026 | Open Access

Sustainability cost of defect engineering in color centers for quantum communications

Sustainable manufacturing is becoming an increasingly important consideration for emerging quantum technologies. Here, the authors assess the environmental, chemical, human-health, and economic impacts of defect engineering strategies for color-center platforms used in quantum communications, highlighting trade-offs between quantum functionality and resource demands while identifying lower-impact solutions.

Sahar Shata & Julie M. Schoenung

Article
03 October 2026 | Open Access

Bulk mesophases modeling of ferroelectric nematic liquid crystals

Ferroelectric nematic liquid crystals are an emerging class of materials in which nematic orientational order coexists with spontaneous macroscopic polarization. Vats et al. develop a free-energy framework to rationalize their bulk structures and predict potential bend-instability-driven mesophases.

Aditya Vats, Alenka Mertelj & Miha Ravnik

Comment
03 October 2026 | Open Access

Volitional control of wearable robots

This Comment motivates the development of human–machine interfaces that decode spinal motor neuron activity and resulting muscle force information in moving humans. Such interfaces could enable users across the neuromuscular functional spectrum to volitionally control wearable robots with muscle-like behaviour.

Massimo Sartori & Gregory S. Sawicki

Article
03 October 2026 | Open Access

Enantioselective palladium-catalyzed carbonylation of *gem*-dibromoalkenes to chiral benzo[7]annulenes

The authors report a palladium-catalyzed asymmetric monocarbonylation of conformationally rigid, prochiral benzo[7]annulenebased gemdibromoalkenes, furnishing inherently chiral tetrasubstituted benzo[7]annulene derivatives with excellent yields and high enantioselectivities.

Yu Luo, Xilong Wang & Qiang Zhu

Article
03 October 2026 | Open Access

A proximity-driven and regioselective peptide bicyclization (PReP-Bicyc) approach for phage display libraries

Peptide bicycles offer superior conformational constraint but remain challenging to construct within phage-displayed peptide libraries due to the necessity for phage-compatible chemistry. Here, the authors report Proximity-Driven, Regioselective Peptide Bicyclization (PReP-Bicyc), a general, additive-free, and phage-compatible strategy for site-selective bicyclization of phage-displayed peptide libraries.

Guoqing Jin, Yifan Shi & Wenshe Ray Liu

Article
03 October 2026 | Open Access

Joule-heated regenerable carbon dioxide capture filter for demand-controlled ventilation in indoor applications

The study develops a carbon fiber carbon dioxide filter coated with amine-functionalized silica and regenerates it by electrical Joule heating (95% desorption in 15 minutes at 100 degrees Celsius). Simulations optimize control and estimate 14.9–25% ventilation energy savings.

Minjae Kim, Joo Young Shin & Yong Tae Kang

Article
03 October 2026 | Open Access

Universal random matrix behavior of a Fermionic quantum gas

Random matrix theory (RMT) is used to describe non-interacting ultracold Fermi gases. Here, the authors directly probe the full counting statistics in a 2D system of 6Li atoms with two interacting spin states, by means of a continuum quantum gas microscopy technique. The measured number and spacing statistics agree well with predictions from RMT, also in the strongly interacting regime.

Maxime Dixmerias, Giuseppe Del Vecchio Del Vecchio & Tarik Yefsah

Article
03 October 2026 | Open Access

Monolithic three-dimensionally integrated memristor-thin-film transistor for electrically programmable multimode reservoir computing

Current reservoir computing hardware is efficient but limited by fixed dynamics. Shim et al. report a monolithically integrated memristor-transistor reservoir with electrically programmable temporal dynamics, supporting multiple temporal processing modes for motion recognition and biomedical signal classification.

Sung Keun Shim, Wonho Choi & Cheol Seong Hwang

Article
03 October 2026 | Open Access

Design principle for mitigating moisture-induced degradation in 2D halide perovskites

In humid air, 2D perovskites degrade into various lead-rich nonperovskite phases. The easier it is for such phases to form, the faster degradation proceeds. By tuning a 2D perovskite's molecular cations to not accommodate any lead-rich phases, stability can be markedly improved.

Isaac Metcalf, Shanize Forte & Aditya D. Mohite

Article
03 October 2026 | Open Access

Self-restoration of reactive centers via contaminant-to-catalyst electron replenishment for sustained Fenton-like activity

In this study, high-spin Mo^{2+} species in FeS_2 mediate a "contaminant-to-catalyst" electron replenishment pathway to enable active-site restoration, allowing contaminants to function beyond their conventional role as degradation targets.

Yu-Hang Li, Anjie Chen & Haodong Ji

Article
03 October 2026 | Open Access

Spatiotemporally synchronized pure high-even-order dispersion solitons in multimode fiber lasers

Soliton solutions of nonlinear wave equations in diverse physical systems continue to attract scientific interest. Here, authors demonstrate spatiotemporally synchronized pure high-even-order dispersion solitons in a multimode fiber laser through dispersion engineering and transverse mode control.

Wenqi Ma, Xiuquan Li & Guijun Hu

← Previous 1 2 3 … 686 Next →

Browse narrower subjects

- Astronomy and planetary science
- Chemistry
- Energy science and technology
- Engineering
- Materials science
- Mathematics and computing
- Nanoscience and technology
- Optics and photonics
- Physics

Browse Physical sciences across other nature.com journals »

Nature Communications (*Nat Commun*) ISSN 2041-1723 (online)

About Nature Portfolio
About us
Press releases
Press office
Contact us

Discover content
Journals A-Z
Articles by subject
protocols.io
Nature Index
Nature Books

Publishing policies
Nature portfolio policies
Open access

Author & Researcher services
Reprints & permissions
Research data
Language editing
Scientific editing
Nature Masterclasses
Research Solutions

Libraries & institutions
Librarian service & tools
Librarian portal
Open research
Recommend to library

Advertising & partnerships
Advertising
Partnerships & Services
Media kits
Branded content

Professional development
Nature Awards
Nature Careers
Nature Conferences

Regional websites
Nature Africa
Nature China
Nature India
Nature Japan
Nature Middle East

Privacy Policy Use of cookies Your privacy choices/Manage cookies Legal notice Accessibility statement Terms & Conditions
Your US state privacy rights

© 2026 Springer Nature Limited