Advertisement

nature conferences
Present your work to leaders in the pediatric cancer field
Submit an Abstract >>
SPRINGER NATURE

Physical sciences articles within *Nature Communications*

Atom RSS Feed

Featured

Article
18 July 2026 | Open Access

Morphogenic colloids

Morphogenesis is a dynamic process central to life, in which structure and compartmentalization arise to produce functional architectures but replicating such transformations synthetically remains challenging. Here the authors report a minimal-ingredient platform in which emulsion droplets exposed to amphiphilic triblock copolymers reproduce key features of biological morphogenesis through reversible shape morphing and topology transitions.

Florent Fessler, Adam W. Hauser & Stefano Sacanna

Article
18 July 2026 | Open Access

Wavelength-encoded neuromorphic inference enabled by microcavity MoS_2 photodetector arrays

Conventional vision hardware separates photodetection from computation, incurring substantial latency and energy costs. Chen and Di et al. report an optoelectronic architecture based on a microcavity-integrated MoS2 photodetector array that unifies sensing, weighting and temporal accumulation within each pixel.

Xiang Chen, Kangjian Di & Ningmu Zou

Article
18 July 2026 | Open Access

Raphia hookeri seed-inspired weakly anisotropic nanocomposites

Inspired by densely packed sclereids with interconnected pit structures in *Raphia hookeri* seed, authors fabricate bioinspired structural materials with weak anisotropy and high toughness.

Jiajun Mao, Jia Yan & Qunfeng Cheng

Article
18 July 2026 | Open Access

Reconfigurable optical arithmetic logic unit and its applications

As silicon chips near their physical limits, light offers a faster alternative. The authors built and tested a silicon photonic chip whose tiny microring switches can be reprogrammed to add, subtract and compare 2-bit numbers at 20 Gb/s, and used it for encryption and medical-image processing.

Xudong Zhou, Mingrui Yuan & Yonghui Tian

Article
18 July 2026 | Open Access

Enhanced nuclear fusion in the sub-keV energy regime

Fusion at very low energies is normally strongly suppressed. Here, authors show that deuterium fusion in palladium and titanium hydrides reaches a finite low-energy yield floor, revealing that solid materials can strongly reshape the nuclear reaction environment and alter nuclear reaction rates.

Micah E. Karahadian, Matthew Colborne & Jeremy N. Munday

Article
18 July 2026 | Open Access

Resolving Abrikosov vortex entry in superconducting nanostring resonators via displacement-noise spectroscopy in cavity optomechanics

Abrikosov vortices can disrupt superconducting circuits, yet their entry into mesoscopic elements is hard to detect in situ. Here, the authors use a cavity-optomechanical SQUID nanostring to resolve stochastic vortex-entry events and quantify single-vortex pinning and collective vortex elasticity.

Thomas Luschmann, Tahereh Sadat Parvini & Hans Huebl

Article
18 July 2026 | Open Access

Refractory inclusions in Bennu samples indicative of outer Solar System accretion

Refractory inclusions in samples from asteroid Bennu formed in the earliest Solar System and resemble those in Ryugu and chondritic meteorites. Their size distribution suggests that Bennu's parent planetesimal formed beyond proto-Jupiter's dust trap.

Noriyuki Kawasaki, Toru Matsumoto & Dante S. Lauretta

Article
18 July 2026 | Open Access

Engineering microbial consortia for distributed signal processing

Multiplexed biosensing is often limited by crosstalk between sensors. Here, authors distribute sensing across microbial communities and use timer-resolved modelling and machine learning to infer multiple chemical concentrations from cross-reactive and indirect responses.

Katherine E. Duncker, Ashwini R. Shende & Lingchong You

Article
17 July 2026 | Open Access

Discovering heuristics in a complex SAT solver with large language models

This study is on AI-driven SAT solver optimization. Here, authors developed AutoModSAT, an LLM-based framework for automatic heuristic discovery and solver optimization, achieving substantial performance gains over baseline and state-of-theart SAT solvers across diverse benchmarks.

Yiwen Sun, Furong Ye & Shaowei Cai

Article
17 July 2026 | Open Access

Flow matching for reaction pathway generation

The study introduces MolGEN, an optimal transport flow-matching framework that generates reaction products and transition states, enabling faster reaction-pathway discovery and identifying lower-energy routes.

Ping Tuo, Jiale Chen & Ju Li

Article
17 July 2026 | Open Access

Reforging Mitsunobu reaction via sulfoxides-catalyzed $C(sp^3)$-O bond activation of alkanols

Due to the inherent environmental drawbacks of phosphorus chemistry, an alternative to the Mitsunobu reaction is pressingly demanded. Herein, the authors develop well-designed sulfoxide catalysts for an alternative catalytic Mitsunobu-type reaction with broad substrate scope, generating H_2O as the sole by-product.

赢取一辆
YOU IN?
BUICK GNX
+$400,000 | 7月24日
YAAMAVA' RESORT & CASINO AT SAN MANUEL
40

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 »

Qigang Li, Wannan Zhang & Jun Yang

Article
17 July 2026 | Open Access

High-yield visible-to-ultraviolet upconversion by ZnSe quantum dots with dynamic triplet transfer

Triplet–triplet annihilation upconversion sensitized by quantum dots generally requires triplet transmitters tethered on the quantum dot. This work reports a transmitter-free system with 24% quantum yield, the highest for QD sensitizers so far.

Xin Zhang, Rongxin Zhang & Guijie Liang

Article
17 July 2026 | Open Access

Targeted polar entropy regulation enables superior energy-storage in tungsten bronze multilayer capacitors

The proposed targeted polar entropy regulation strategy, through precisely reshaping local polarization configurations, enables high energy density, efficiency, and thermal stability in tungsten bronze multilayer capacitors.

Haonan Peng, Jiyang Xie & Genshui Wang

Article
17 July 2026 | Open Access

Dielectric-tuned charge and exciton dynamics in perylene bisimide supramolecular aggregates

Separating the effects of the dielectric environment from structural reorganization in supramolecular systems remains a challenge due to their intrinsic complexity. Here the authors report the dielectric-tuned charge and exciton dynamics in a robust perylene bisimide H-aggregate that maintains its packing geometry regardless of solvent polarity

Hyeonwoo Choi, Minjung Chae & Woojae Kim

Article
17 July 2026 | Open Access

Bound water as a kinetic crosslinker for bio-inspired impact-stiffening polymers

Impact stiffening polymers typically rely on specific chemical structures to enable dynamic cross-linking. Here, the authors report an impact-stiffening system which utilises the crosslinking of residual water to form dynamic hydrogen bonds within poly(thioctic acid) networks, which is appliable to variety of polymer networks.

Siyu Jin, Zhaoming Zhang & Lingyan Gao

Article
17 July 2026 | Open Access

Visualizing excitonic states in constructed cyclic molecular architectures by tip-enhanced photoluminescence

Researchers visualized how energy is distributed in artificial molecular rings with sub-nanometer resolution. They found that two perpendicular transition dipoles enable dipole rotation, while hollow rings support energy-retaining dark states.

Shi-Hao Jing, Fan-Fang Kong & Yang Zhang

Article
17 July 2026 | Open Access

High-performance multijunction perovskite LEDs with reduced interconnection loss

Tandem perovskite light-emitting diodes offer advantages for improving device performance but are limited by lossy, unstable interconnections. Zhao et al. design a robust layered interconnection enabling efficient stacked perovskite devices with high efficiency, brightness and low voltage.

Feiyun Zhao, Haifeng Zhao & Yanrong Li

Article
17 July 2026 | Open Access

Coexistence of high temperature superconductivity and antiferromagnetic order in a cuprate with multiple hole Fermi pockets

The authors study cuprate superconductor $Bi_2Sr_2Ca_6Cu_7O_{18+\delta}$ with seven CuO_2 planes in the unit cell, finding multiple hole-like Fermi pockets in the $(\pi/2,\pi/2)$ nodal region. They observe strong electron pairing with an energy gap as high as ~ 42 meV on one of the highly-underdoped inner planes where a robust antiferromagnetic order persists.

Xiangyu Luo, Yinghao Li & X. J. Zhou

Article
17 July 2026 | Open Access

Mid-IR light modulators enabled by dynamically tunable ultra-high-Q silicon membrane metasurfaces

Mid-infrared metasurfaces have the potential to enable advanced sensing and communication technologies, but scalable active devices remain challenging. Here, the authors demonstrate wafer-scale silicon membrane metasurfaces with record-high quality factor resonances for dynamic light modulation.

Felix Ulrich Brikh, Aleksei Ezerskii & Hatice Altug

Article
17 July 2026 | Open Access

Quasi-solitons in Rydberg atom chains

This work identifies long-lived chiral quasiparticles emerging on top of periodically reviving scarlike states in a Rydberg atom chain at high energy densities where instead thermalization is expected. These quasiparticles enable ballistic energy transport, coherent information transfer, and have direct non-trivial analogues in a corresponding nonlinear classical system while far from the semiclassical limit.

Aron Kerschbaumer, Jean-Yves Desaules & Maksym Serbyn

Article
17 July 2026 | Open Access

Highly Efficient Methane Electrosynthesis Enabled by Precise, Multifaceted Interface Regulation

Electrochemical CO_2 reduction offers a route to renewable methane but is hindered by inefficient mass transport and demanding reaction kinetics. Here, the authors report a honeycomb-like four-channel copper tubular penetration electrode enabling highly efficient and durable CO_2-to-CH_4 conversion.

Weicong Xu, Xiaomin Xu & Zongping Shao

Article
17 July 2026 | Open Access

Ultrafast reset-free integrated polarization tracking enabled by thin-film lithium tantalate

This study reports an integrated chip that stabilizes light polarization with a previously unattainable combination of reset-free operation and Mrad/s-rate tracking for robust optical interconnects.

Zichao Gao, Siyu Lu & Ming Tang

Article
17 July 2026 | Open Access

A computational framework for designing micron-scale crisscross DNA megastructures

Crisscross polymerization enables the assembly of hundreds of unique DNA origami 'slats' into micronsized structures with nanoscale precision, but the design of these megastructures is highly challenging. Here, the authors present a unified framework that standardizes the design and fabrication of crisscross megastructures, using an evolutionary algorithm to optimize handle assignment and minimize parasitic binding between slats.

Matthew Aquilina, Florian Katzmeier & William M. Shih

Article
17 July 2026 | Open Access

Measuring cardiac stroke volume through in-ear audio sensing

Stroke volume is a key indicator of cardiac function but requires specialised equipment to measure. Here the authors show that a deep learning model using in-ear audio from standard earbuds can accurately estimate stroke volume.

Kayla-Jade Butkow, Navazh Jalaludeen & Cecilia Mascolo

Article
17 July 2026 | Open Access

Charge-spin dichotomy in the kagome metal $CsCr_3Sb_5$

Kagomes can host distinct density wave orders. Here, the authors provide evidence of an additional phase transition in $CsCr_3Sb_5$ and propose that charge-density wave and spin-density wave orders occur with distinct transition temperatures.

Asato Onishi, Yoichi Kageyama & Takasada Shibauchi

Article
17 July 2026 | Open Access

Understanding the European energy crisis through structural causal models

Despite a low share of gas-fired generation, French electricity prices showed stronger relative increases during the energy crisis. In the present paper, authors demonstrate how nuclear unavailability led to higher French import dependence, and evaluate the impact of the Spanish gas cap.

Sarah Schreyer, Anton Tausendfreund & Dirk Witthaut

Article
17 July 2026 | Open Access

Enhancing sit-to-stand transitions and walking efficiency in older adults with a soft robotic suit

Declines in muscle strength make sit-to-stand transitions and walking difficult for older adults. Here, the authors demonstrate that a soft hip exosuit improves sit-to-stand performance and reduces the metabolic cost of walking while preserving natural movement and users sense of agency.

Xiaohui Zhang, Enrica Tricomi & Lorenzo Masia

Article
16 July 2026 | Open Access

Base-catalyzed regioselective $C(sp^3)$–Si bond activation of silacyclobutanes and benzosilacyclobutenes

Herein, a transition-metal- and ligand-free, base-catalyzed regioselective $C(sp^3)$–Si bond activation of silacyclobutanes (SCBs) and benzosilacyclobutenes (BSBs) has been developed.

Yuanfang Kong & Delong Mu

Article
16 July 2026 | Open Access

A generalized Knudsen theory for gas transport in disordered porous materials

Here authors present a theory to predict gas flow in disordered porous materials. Using only porosity and pore size, the model accurately calculates gas permeability and selectivity, which can guide the design of gas separation membranes.

Jianhao Qian, Ruoyu Wang & Menachem Elimelech

Article
16 July 2026 | Open Access

Measurement of a strong nonlinear force between superconductors compatible with the Casimir force

The authors observe a force acting on a superconducting drum resonator integrated in a microwave optomechanical cavity through the nonlinear dynamics this force imparts to the resonator. The measured dynamics points to an extremely intense force found to be compatible in magnitude with the Casimir force.

Matthijs H. J. de Jong, Evren Korkmazgil & Laure Mercier de Lépinay

---

Article
16 July 2026 | Open Access

Mixed triplet-singlet order parameter in decoupled superconducting 1H monolayers of transition-metal dichalcogenides

The authors study single crystals of "misfit" compound (SnS)1.15(TaS2), a heterostructure composed of alternating SnS and 1H-TaS2 layers where SnS layers effectively decouple the TaS2 into electronically isolated 1H sheets. The spectroscopic data are consistent with a theoretical model of a mixed-singlet triplet superconducting state based on the non-centrosymmetric structure of the 1H sheets.

Avior Almoalem, Sajilesh K. P. & Vidya Madhavan

Article
16 July 2026 | Open Access

Ultrafast non-volatile charge storage and mid-infrared photoluminescence in LuminoMem tellurium devices for in-memory computing

The monolithic integration of memory and photonic devices is normally limited by inefficient electronic-to-photonic interfaces. Here, the authors report optoelectronic floating-gate memory devices based on tellurium, integrating multi-bit electrical storage and mid-infrared light emission at 3.4 μm with nanosecond-scale electrical programming speed.

Delang Liang, Shiyu Wang & Jing Liu

Article
16 July 2026 | Open Access

Structural and spectroscopic characterization of a Tb(IV) polyoxometalate

Here, authors describe how polyoxometalate chemistry can overcome intrinsic redox and reactivity limitations in aqueous media to allow for structural and spectroscopic characterization of terbium in the +4 oxidation state.

Primadi J. Subintoro, Brett Lottes & Korey P. Carter

Article
16 July 2026 | Open Access

Intermetallic Pt_3In concave tetrahedra for oxygen reduction electrocatalysis in proton exchange membrane fuel cells

Phosphate binding to platinum catalysts limits the efficiency and durability of high-temperature fuel cells. Here, the authors report ordered concave platinum-indium nanocatalysts that weaken phosphate binding and improve oxygen reduction and fuel-cell performance.

Wenhe Yu, Menggang Li & Shaojun Guo

Article
16 July 2026 | Open Access

GA2AD: a generalized adaptive adversarial training framework considering surrounding hybrid risk field for autonomous driving

The study presents a training framework that adaptively generates risky driving scenarios to improve autonomous vehicle safety and robustness, demonstrating reduced collision rates and smoother driving in both simulation and field tests with only minimal impact on operational efficiency.

Haocheng Xu, Yusheng Ci & Lei Feng

Article
16 July 2026 | Open Access

Wavelength-dependent feedback behavior in light-gated polymersome nanoreactors

Biological systems integrate multiple feedback processes to regulate their adaptation to evolving stimuli with high specificity. Here, the authors present polymersomes functionalized with a broad-spectrum pyrazolone-based Donor–Acceptor Stenhouse Adduct (DASA) which encapsulate an esterase enzyme and undergo distinct light-gated permeability switching mechanisms in response to orthogonal visible wavelengths.

Uthaya Lathan, Beyzanur Kaya & Omar Rifaie-Graham

Article

16 July 2026 | Open Access

High-voltage and high-safety lithium-ion batteries enabled by nonflammable electrolyte with enhanced Li^+ desolvation behavior

Enhancing high-capacity silicon-graphite negative electrodes and high-voltage positive electrodes is crucial for improving specific energy of lithium batteries. Here, the authors design an anion-rich electrolyte with high oxidation resistance and rapid desolvation that forms effective interphases and improves electrochemical performance.

Jiahe Chen, Fangkun Li & Jun Liu

Article

16 July 2026 | Open Access

Rational design of polymer film morphology via structure-performance linkage for enhanced condensation performance

Inducing dropwise condensation is critical for energy transfer applications, yet optimizing surface modifications remains challenging. Here, the authors enhance dropwise condensation by tuning the nanoscale morphology of fluoropolymer deposited via initiated chemical vapor deposition to promote both droplet nucleation and sweeping.

Jun Soo Kim, Minjeong Kang & Youngsuk Nam

Article

16 July 2026 | Open Access

Modulating nonequilibrium electron–phonon interactions and energy relaxation in MXenes by surface-anchored Mo_3S_7 nanoclusters

Using ultrafast spectroscopy, the authors reveal that surface-anchored Mo_3S_7 nanoclusters redirect hot carrier relaxation in MXenes, suppressing coherent phonons and electron–phonon couplings to reduce energy loss and improve thermal management.

Jiaxu Zhang, Rafael Muñoz-Mármol & Xinliang Feng

Article

16 July 2026 | Open Access

From stars to molecules: AI guided device-agnostic super-resolution imaging

From distant stars to single molecules, device-agnostic AI can reveal details blurred by ordinary optics. The approach works across imaging systems, helping make super-resolution more widely usable in science.

Dominik Vašinka, Filip Juráň & Miroslav Ježek

Article

16 July 2026 | Open Access

High-gain and broadband in vivo amplifiers enabled by matched materials

Organic electrochemical transistor (OECT)-based circuits combine high-gain signal amplification with low power consumption and biocompatibility. However, highperformance complementary amplifiers require matched *p*- and *n*-type OECTs with balanced electrical and dynamic characteristics that are complex to fabricate, limiting their practical deployment. Here, the authors introduce design principles for the development of a balanced n-p material that enables high-performance OECT-based amplifiers for in vivo biosignal amplification. By employing a simple fluorination strategy, the authors developed a high-performance *n*-type polymer and integrated it with a matched *p*-type counterpart, achieving a gain of over 800 $V V^{-1}$ at V_{DD} = 0.6 V and a bandwidth of over 600 Hz.

Yuting Zheng, Qi Li & Zhi Zhang

Article

16 July 2026 | Open Access

Pseudo point nodal superconducting gap in spin-triplet UTe_2

The authors report thermal conductivity measurements on UTe2 down to 50 mK. From the data, they argue that UTe2 exhibits a fully-gapped state with a pseudo point-nodal structure, where gap minima along the b axis approach but never reach zero.

S. Hosoi, K. Imamura & Y. Matsuda

Article

16 July 2026 | Open Access

Amine/ammonium buffering enables efficient *anti*-Markovnikov hydroamination of olefins with alkylamines

Authors present an anti-Markovnikov hydroamination of olefins with alkylamines using an amine/ammonium buffering system under photocatalytic conditions. Key to this strategy is mitigating deprotonation of the involved aminium radical cation intermediate, formed through single electron oxidation of the associated alkylamine substrate, ensuring its effective addition to alkenes.

Jing-Yu Shen, Jin-Kai Cheng & Fei Wang

Article

16 July 2026 | Open Access

Wavelength-scale noise-resistant on-chip spectrometer

The authors demonstrate a wavelength-scale on-chip spectrometer that uses inverse designed resonances to achieve noise-resistant spectral reconstruction, enabling 10 nm spectral resolution across the mid-infrared band in an ultracompact footprint.

Jianbo Yu, Hsuan Lo & Qi Jie Wang

Article

16 July 2026 | Open Access

Strain-induced faceting of Ti_4O_7 for active chlorine electrosynthesis

Active chlorine electrosynthesis depends on the most reactive facets that are often thermodynamically disfavored during crystal growth. Here, the authors present a faceting strategy to realize facet transition in Ti_4O_7 for selective active chlorine electrosynthesis and side reaction suppression.

Kuanchang He, Wei Li & Defeng Xing

Article

16 July 2026 | Open Access

Dual-physics programmable metasurfaces for dynamical controls of acoustics and electromagnetics

The authors present a dual-physics programmable metasurface that enables the simultaneous, independent, and dynamic manipulation of both acoustic and electromagnetic waves.

Zheng Zhang, Han Wei Tian & Wei Xiang Jiang

Article

16 July 2026 | Open Access

Intensity-correlation synthetic wavelength imaging in dynamic scattering media

Imaging through dynamic scattering media is fundamentally limited by multiple light scattering and the resulting speckle decorrelation. The authors present an imaging method to counter this, combining second-order intensity correlations with synthetic-wavelength holography to achieve robust reconstruction through dynamic scatterers.

Khaled Kassem, Areeba Fatima & Florian Willomitzer

Article

16 July 2026 | Open Access

Biophysical modeling of anatomically realistic prenatal cortical folding development

Using fetal MRI data and biophysical simulations, this study shows that region-specific cortical growth helps shape realistic brain folding and provides insight into normal development and congenital malformations.

Jixin Hou, Zhengwang Wu & Xianqiao Wang

Article
16 July 2026 | Open Access

Interactively addressable organic metadevices

An interactively addressable organic metadevice enables independent electrical control of metasurface pixels to generate reconfigurable holographic projections, providing a platform for programmable and user-interactive photonic systems.

Xiangyu Huang, Benjamin Renz & Na Liu

Article
16 July 2026 | Open Access

Episodic planetesimal disruptions triggered by dissipation of gas disk

Meteorites record catastrophic collisions in the first 10 Myr of the Solar System. Here, the authors show that sweeping secular resonances driven by gas dissipation can trigger these collisions, a mechanism likely ubiquitous in protoplanetary disks.

Kang Shuai, Li-Yong Zhou & Hejiu Hui

← Previous 1 2 3 4 ··· 665 Next →

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

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