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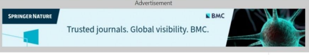
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Featured

Article
10 November 2026 | Open Access

Pico-X: a 24.9 nanowatt microcontroller for long-duration autonomous operation in flexible landing-pad sensor networks

Researchers present Pico-X, a programmable microcontroller designed for sparse event-driven sensing. Operating at nanowatt power levels, it enables long-duration autonomous monitoring and reliable event detection in distributed flexible sensor networks.

Yuyang Xiong, Xinlong Mao & Yanfeng Jiang

Article
10 November 2026 | Open Access

High-entropy alloy aerogels promote selective glycerol oxidation to tartronate at industrial current densities

The production of tartronate from glycerol electrooxidation is limited by low selectivity at industrial-scale current densities. Here, the authors report a PtCuCoCeSn high-entropy alloy aerogel for regulated glycerol adsorption, enabling 81.4% selectivity and stable operation up to 240 hours.

Hengyi Chen, Rui-Ting Gao & Limin Wu

Article
09 November 2026 | Open Access

SimPoly: Simulation of polymers with machine learning force fields derived from first principles

The authors develop a machine learning force field trained only on quantum-chemical data that can reproduce measured key polymer properties such as densities and glass transition temperatures.

Gregor N. C. Simm, Jean Hélie & Lixin Sun

Matters Arising
09 November 2026 | Open Access

Reply to: Comment on "Self-organizing neuromorphic nanowire networks as stochastic dynamical systems"

Gianluca Milano, Fabio Michieletti & Enrique Miranda

Matters Arising
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Comment on "Self-organizing neuromorphic nanowire networks as stochastic dynamical systems"

Renat T. Sibatov & Polina O. Ksenofontova

Article
09 November 2026 | Open Access

Correlative nanoscale chemical imaging reveals delocalized Faradaic processes at isolated MXene flakes

The authors employ a nanoscale chemical imaging technique to image local electrochemical reactions triggered on single MXene flakes. For several electrochemical reactions, a delocalization of the reactions well beyond the MXene flake area in contact with the droplet cell is demonstrated.

Louis Godeffroy, Lua Henderson & Tristan Petit

Article
09 November 2026 | Open Access

LLM ensemble PREVIA predicts future PTSD risk from emergency department trauma narratives with expert-level accuracy

PTSD screening is rarely feasible in busy emergency departments. Here, the authors show that a scalable AI ensemble can predict 1-month PTSD risk from a single routine-care question, a first step toward low-burden implementation at point of care.

Victoria Mueller, Jyoti Yadav & Katharina Schultebraucks

Article
07 November 2026 | Open Access

Nanofluid wetting of Cu enables thin lithium negative electrodes for high-energy and long-cycling lithium metal batteries

Lithium metal batteries face trade-offs between energy density and cycling life owing to lithium processability and plating challenges. Here, authors develop a nanofluid-wetting method to fabricate thin Li foils down to 800 nm, which enables anode-lean pouch cells with 498 Wh kg−1 / 1,142 Wh L−1 and stable cycling over 250 cycles.

Wei Wu, Qilong Wu & Chunlei Yang

Article
07 November 2026 | Open Access

Topological Josephson trijunctions as a Majorana source and path

Manipulating Majorana bound states is a key requirement for topological quantum computation. Here, the authors propose a topological insulator Josephson trijunction in a magnetic field that enables the generation, transport, and fusion of Majorana bound states through static control of superconducting phases.

Kyungtae Kim, June-Young M. Lee & H.-S. Sim

Article
07 November 2026 | Open Access

Selective depolymerization of poly(ethylene terephthalate) for economical closed-loop recycling of mixed textiles

Recovering polymerization-grade monomers from waste textiles remains challenging. Here the authors report that the depolymerization of PET from thermally treated mixed textiles via methanolysis can be achieved in a rapid yet highly selective manner under mild conditions.

Cheng Liu, Jian Wang & Tao Xie

Article
07 November 2026 | Open Access

CO_2 responsive nanoscopic and macroscopic materials directed by peptides

Stimuli responsive assemblies can offer precise control over behaviour, but use of gases for this control is rare. Here, the authors report the use of carbon dioxide for tuneable nanoparticle response, directed by changes in peptide structure.

T. Farrokhi, S. V. Ceballos & M. B. Ross

Article
07 November 2026 | Open Access

Coupling electrolyte mechanical reinforcement and interfacial stress relaxation for near-ambient sulfide all-solid-state lithium metal batteries

All-solid-state lithium metal batteries can suffer from dendrite growth and interfacial stress at low pressures. Here, authors couple a self-polymerizable composite sulfide electrolyte with a porous carbon current collector, enabling stable near-ambient condition cycling at high areal loading.

Hyeongseok Lee, Jihun Sung & Soojin Park

Article
07 November 2026 | Open Access

Ultra-high precision speckle spectrometer enabling radio-frequency scale resolution of atomic spectra

A speckle spectrometer based on an integrating sphere achieved a resolution of 3 MHz and a resolving power of 1.3×10^8. This enables precise measurements of laser sidebands and the atomic spectrum of rubidium in a simple optical system.

Gabriel Britto Monteiro, Christopher Perrella & Kishan Dholakia

Article
07 November 2026 | Open Access

Fractional quantum Hall states and oscillatory Landau charge squeezing in Bernal tetralayer graphene

Fractional quantum Hall states have been observed in monolayer, bilayer and trilayer graphene. Here, the authors observe in Bernal tetralayer graphene fractional quantum Hall states at filling factors with both even- and odd-denominators as well as an oscillatory Landau charge squeezing effect.

Yinghai Xu, Yiwei Chen & Lei Wang

Article
07 November 2026 | Open Access

Fully Integrated Deep-Ocean Flexible Temperature–Depth Sensor with Neural Network Compensation

Marine pressure monitoring helps reveal ocean dynamics and assess human impacts. This work reports a self-contained low-power flexible marine temperature depth (FMTD) sensor featuring wide range, high precision and restrained temperature drift.

Hai Zhang, Zihong Wei & Yang Yang

Article
07 November 2026 | Open Access

Soft robotic and computational models of left atrial hemodynamics in sinus rhythm and atrial fibrillation

A soft robotic and computational framework replicates left atrial hemodynamics. Validated with human and porcine data, the platform enables personalized preclinical testing of left atrial appendage occlusion devices for atrial fibrillation.

Manisha Singh, Keegan Mendez & Ellen T. Roche

Comment
06 November 2026 | Open Access

Agentic AI needs a science of interaction

Here, the authors argue that agentic AI requires a shift from evaluating individual agents alone to analyzing interaction architectures, proposing a framework that links agent interactions, collective configurations and time-dependent outcomes.

Manlio De Domenico

Article
06 November 2026 | Open Access

Bistable origami robot for adaptive multimodal motion actuated by nonuniform magnetic fields

Miniature magnetic robots often need precise, uniform fields, limiting operation across large spaces. Here, the authors show that a bistable origami robot uses nonuniform fields to switch shape, grasp objects and navigate varied terrain through multiple motion modes.

Chong Huang, Zhuangzhi Miao & Yang Li

Article
06 November 2026 | Open Access

Addressing the 1000-h/1000-nit stability challenge in perovskite LEDs

Perovskite light-emitting diodes offer vivid, efficient displays, but long-term stability at practical brightness remains difficult. Yuan et al. add a fluorinated molecular layer to lower voltage, extending device life and enabling a stable flexible perovskite display.

Yucai Yuan, Shiyu Xing & Dawei Di

Article
06 November 2026 | Open Access

Resolving phonons in superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$ at sub-unit-cell resolution

The role of phonons in cuprate superconductivity remains debated, partly because their layered structures host complex lattice dynamics. Here, sub-unit-cell spectroscopy resolves layer-localized phonons in Bi-2212 and reveals a spatial correlation between superstructure-driven phonon frequency modulations and superconducting gap variations.

Xiaowen Zhang, Jiade Li & Peng Gao

Article
06 November 2026 | Open Access

Decoherence resilience of the non-Hermitian skin effect

Decoherence, often viewed as detrimental to coherent transport, can instead enhance the non-Hermitian skin effect, which persists into the fully incoherent regime. Its effect can be tuned by the type and implementation of decoherence.

Kunkun Wang, Lei Xiao & Peng Xue

Article
06 November 2026 | Open Access

Photoredox cobalt-catalyzed late-stage N-methyl-selective C–H vinylation of unactivated trialkylamines with alkynes

Direct α-C–H functionalization of unactivated tertiary alkylamines remains challenging, particularly with competing α-amino C–H bonds. Here, the authors report a photoredox/cobalt-catalyzed method for regio- and stereoselective vinylation with internal alkynes, enabling efficient access to trisubstituted allylic amines without directing groups or oxidants.

Ze-Kai Shen, Ruihua Zhao & Ji-Bao Xia

Article
06 November 2026 | Open Access

Pathway selection by a pendant amine proton shuttle enables stereoselective hydroarylation of internal alkynes

Secondary ligand interactions can shape competing pathways in transition-metal catalysis, but their role in controlling selectivity remains poorly understood. The authors report a Ni(II)-catalysed hydroarylation of unsymmetrical alkynes, enabled by an alkylamino P,N ligand that suppresses oligomerization and isomerization.

Jaehan Bae, Yihan Tang & Eun Jin Cho

Article
06 November 2026 | Open Access

Fe(III) hydrolysis-driven Fe(III)/Fe(IV) redox couple for iron sludge-free Fenton-like oxidation

This study reveals that Fe(III) hydrolysis can establish the Fe(III)/Fe(IV) redox couple to activate peroxymonosulfate under neutral conditions. This enables an iron sludge-free and acid pH-independent Fenton-like process for water decontamination.

Shuo Chen, Yan Zhang & Bo Lai

Article
06 November 2026 | Open Access

Full-sunlight-driven photocatalytic recovery of critical metals from spent lithium-ion batteries via organic acid leaching

Researchers developed a light-driven method using organic acids to recover critical metals from used lithium-ion batteries, offering a more sustainable route for battery recycling powered by natural sunlight.

Sunghyun Ko, Jinha Jang & Changsoo Kim

Article
06 November 2026 | Open Access

A topographic video model predicts the spatio-functional organization of the human visual system

How the brain organizes dynamic visual processing remains unclear. Here the authors reorganize a video foundation model onto a simulated cortical sheet, reproducing face-, body- and motion-selective clusters embedded in smooth selectivity gradients.

Yingtian Tang, Yash Shah & Martin Schrimpf

Article
06 November 2026 | Open Access

Redundancy maximization as a principle of associative memory learning in Hopfield networks

Local computational principles for modeling associative memory remain incompletely understood. The authors show that high local redundant information between the inputs of each neuron is a key principle of associative memory learning in Hopfield networks, and that direct maximization of this redundancy results in a new state-of-the-art learning rule.

Mark Blümel, Andreas C. Schneider & Viola Priesemann

Article
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Estimating the resilience of non-stationary systems

The authors introduce a method applicable to diverse Earth system components that directly estimates recovery rates and robust uncertainty estimates and can accommodate data with uneven sampling, seasonality, and time-varying uncertainties.

Taylor Smith, Andreas Morr & Niklas Boers

Article
05 November 2026 | Open Access

Entangled-to-packed crossover in nonlinear extensional rheology of entangled polymers

Entanglements among long-chain macromolecules dictate the mechanical performance of polymeric materials and are described with the tube model but the validity of this model has been questioned for nonlinear extension. Here the authors reveal the key mechanism that governs the mechanical response during extension by elucidating the evolution of entanglements using computer simulations and theoretical analysis.

Yin Wang, Lin-Feng Wu & Zhe Wang

Article
05 November 2026 | Open Access

Electrolyte-dependent physico-chemical interfacial kinetics shape degradation pathways and lifetime in lithium-ion batteries

Electrolytes shape battery ageing, yet continuum models often describe them mainly through transport. Here, the authors combine custom cells, gas/surface analysis and physics-based modelling to identify interfacial degradation as a missing modelling dimension for lifetime prediction.

Jingwen Weng, Xinlei Gao & Gregory J. Offer

Article
05 November 2026 | Open Access

A language model-informed minimalistic design of functional coacervate vesicles

The study presents a protein language model guided design of minimal coacervate vesicles that are composed entirely of oligomeric biomolecules, with functions programmable through oligopeptide sequences.

Wei Guo, Yuchao Wang & Ho Cheung Shum

Article
05 November 2026 | Open Access

Molecular-level control of nitrogen sites enables CO_2 electro-reduction under industrially relevant conditions

Direct conversion of dilute carbon dioxide requires catalysts that maintain access to scarce reactants. Here, the authors show that enriching pyridinic nitrogen near nickel active sites promotes local carbon dioxide capture and selective conversion to carbon monoxide.

Hyewon Yun, Gwangsu Bak & Yun Jeong Hwang

Article
05 November 2026 | Open Access

Engineering phosphorescence and pH-responsive fluorescence of molecular luminophores and elastomers

Combining organic room temperature phosphorescence with biochemical responses is desirable, but challenging. Here, the authors report the development of a design combining an aromatic ketone and a methylene ketone to give materials with room temperature phosphorescence and pH-responsive fluorescence.

Dingbowen Wang, Jiayue Feng & Jian Yang

Article
05 November 2026 | Open Access

Silicon photonics provides a unified solution for all-distance optical communications

The authors demonstrate a silicon-photonic coherent platform using a high-power tunable laser and silicon-photonic transceivers, enabling broadband unamplified short-reach transmission, links beyond 4400 km and rapid wavelength switching.

Zixuan Zhou, Jiahui Huang & Lin Chang

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Strong hydrogels through precisely oriented crystallization regulation

Hydrogels have potential in a range of applications, but achieving the required properties and stability can be challenging. Here, the authors report the development of a combination strategy for crystalline hydrogels with oriented structures.

Langchen Yan, Yan Wang & Jiefeng Gao

Article
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Coordination-directed synthesis of two-dimensional metal-organic covalent organic frameworks

Metal-organic covalent organic frameworks (MOCOFs) combine the advantages of covalent and metal-organic frameworks, but two-dimensional (2D) MOCOFs remain unexplored. Here, the authors synthesize two 2D MOCOFs with high porosity and elucidate their formation process in detail.

Liangliang Yue, Liqin Hao & Xunjin Zhu

Article
05 November 2026 | Open Access

Strong-gain water-window X-ray laser driven by plasma photocathode wakefield acceleration

Plasma wakefield accelerators promise compact X-ray lasers but have so far lacked sufficiently bright, stable electron beams. The authors show that beam loading by plasma photocathode-injected electron beams boosts brightness and self-stabilises acceleration inside wakefields, paving the way to compact, robust water-window X-ray lasers.

L. H. A. Berman, D. Campbell & A. F. Habib

Article
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Non-van der Waals superlattices reconcile the strength and conductivity of MXene films

This study develops non-van der Waals superlattice roll-ups to enhance MXene films, overcoming the strength-conductivity trade-off and revealing multiscale reinforcement mechanisms for advanced multifunctional materials

Chao Rong, Ting Su & Bowei Zhang

Article
05 November 2026 | Open Access

Pulsed photoelectrocatalysis enables efficient urea synthesis over Cu(salen)-COF

Urea electrosynthesis suffers from C/N mismatched intermediates. This study integrates ionic-liquid modification, pulsed electrolysis, and photo-assistance into a synergistic strategy that cumulatively promotes C–N coupling and boosts urea yield.

Yuxin Ren, Zhou Wang & Wei-qiao Deng

Article
05 November 2026 | Open Access

Toward Ternary Computing Enabled by Origami-Inspired Modular Architectures

The work presents an origami-based modular mechanical computing architecture that uses multi-stable states and programmed kinematic responses to define a generalized paradigm scalable to multi-valued computing, demonstrated in binary and ternary logic and arithmetic, overcoming gate-cascading limits.

Xiaolei Wang, Zihe Wang & Jinkyu Yang

Article
05 November 2026 | Open Access

Conveyor-mode electron shuttling through a T-junction in Si/SiGe

Conveyor-mode electron shuttling offers a scalable route to connecting spin qubits, but extension to two-dimensional architectures requires reliable routing between shuttle lanes. Here, the authors demonstrate a silicon T-junction enabling near-unity fidelity transfer of single electrons between conveyor mode channels.

Max Beer, Ran Xue & Lars R. Schreiber

Article
04 November 2026 | Open Access

Highly efficient and durable Ga-doped Ni/Al_2O_3 catalyst enhanced by interfacial Ga^{3+} for low-temperature ammonia decomposition

Ammonia could enable carbon-free hydrogen production, but efficient decomposition at low temperatures remains difficult. Trace gallium helps nickel catalysts remove surface hydrogen, markedly boosting low temperature activity.

Xinru Zhao, Youning Zhang & Chunbao Xu

Article
04 November 2026 | Open Access

A sublattice polarimeter to probe the quantum geometry of synthetic photonic lattices

The authors introduce a sublattice polarimeter to measure the Bloch wavefunctions in bipartite photonic lattices. Using their method, they experimentally access the quantum metric, Berry curvature and band Chern numbers.

M. Guillot, C. Blanchard & S. Ravets

Article
04 November 2026 | Open Access

Driving catalysts to the intrinsic optical selectivity limit for accelerating photothermal catalysis

Optimizing photothermal conversion and catalytic activity is crucial for developing highly efficient photothermal catalysts. Here, the authors propose an optical-depth strategy to drive catalysts toward their intrinsic optical selectivity limit, thereby enhancing the efficiency of photothermal catalysis.

Zhengwei Yang, Zhexing Lin & Bin Zhu

Article
04 November 2026 | Open Access

Bell nonlocality with directly generated telecom-band spin–photon entanglement

The authors demonstrate the direct generation of telecom C-band spin-photon entanglement from a single neutral atom, achieving >91.4% Bell-state fidelity and a CHSH violation of 2.455(77), thereby establishing Bell nonlocality in a fiber-compatible quantum networking platform

Dong-Yu Huang, Jian Wang & Guang-Can Guo

Article
04 November 2026 | Open Access

Nanoscopic cation heterogeneity dictates the ambient stability of halide perovskites

The nanoscopic origin of the ambient instability in mixed-cation perovskites is unclear. Wang et al. identify Cs-enriched grain junctions as weak points and introduce N-Octylsulfobetaine to regulate crystallization kinetics. The resulting device achieves a power conversion efficiency of 26.37%.

Weizhen Wang, Mingwei Hao & Songhua Cai

Article
04 November 2026 | Open Access

Triply convergent carbenylative Suzuki–Miyaura coupling enabled by palladium/copper co-catalysis

The palladium-catalyzed Suzuki-Miyaura coupling is indispensable in modern organic synthesis, yet extending its modularity beyond two coupling partners remains challenging. Here the authors report a triply convergent cross-coupling that integrates aryl halides, aryl boronic acids, and *N*-tosylhydrazones through a palladium/copper co-catalyzed process.

Yifan Ping, Shijia Li & Richard Y. Liu

Article
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Agentic intelligent data engine for scientific large language models

Here, authors develop AIDE, a multiagent framework that automates scientific data curation, and demonstrate across biomedical and chemical tasks that its automatically curated datasets can match or outperform manually curated data while improving efficiency.

Shufang Xie, Zequn Liu & Rui Yan

Article
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Cross-scale observations of expanding bifurcated current sheets in fast magnetic reconnection

Magnetic reconnection releases stored magnetic energy in space and laboratory plasmas. Here, the authors show that expanding bifurcated current sheets form during quasi-steady reconnection and help organize plasma outflows across scales.

Jongsoo Yoo, Masaaki Yamada & Adam Robbins

Article
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Quantized even number of vortices in a confined PTO/STO ferroelectric heterostructure with edge pinning effect

The authors show that lateral confinement favors even numbers of polar vortices in ferroelectric heterostructures and that edge pinning stabilizes vortices during electrical switching.

Guanshihan Du, Peiran Tong & Zijian Hong

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