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Anomalous spin–lattice coupling in a 2D antiferromagnetic semiconductor revealed by surface acoustic Rayleigh waves
While there is now an extensive literature on spin-phonon coupling in van der Waals magnets, crucially, these have been limited to Raman-active optical modes that probe local spin correlations. Here, Nataj et al use angle resolved Brillouin–Mandelstam scattering spectroscopy to investigate the influence of long-range magnetic order on spin-phonon coupling.
Zahra Ebrahim Nataj, Md Sabbir Hossen Bijoy & Alexander A. Balandin

Article
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In situ reduction-driven formation of sub-nanometer alternating heterostructures
Sub-nanometer heterostructures offer opportunities to tune interfacial reactivity, but their precise construction remains challenging. Here, the authors report alternating Ni/$NiMoO_4$ heterostructures that promote hydrogen evolution and sustain durable high-current electrolysis.
Yuan Huang, Zhenyu Ren & Xun Wang

Article
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Inhomogeneity of negative enthalpy enables excellent mechanical properties in nanosized single crystals of multi-principal element alloys
Nanosized multi-principal element alloy single-crystals achieve both strength ~3 GPa and uniform elongation ~20% due to uneven enthalpy distribution, which promotes random, widespread defect formation and prevents localized stress buildup.
Yan Ma, Zhanxin Wang & Xiaodong Han

Article
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HCV incidence and prevalence trends among people who use drugs in France 2004 to 2023
Authors show in 2013-2023 France saw a substantial reduction in hepatitis C virus prevalence and incidence among people who use drugs. Widespread treatment and harm reduction drove the decline, bringing France closer to WHO 2030 elimination targets.
Chiara E. Sabbatini, Yann Le Strat & Marie Jauffret-Roustide

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Time-lapse RESOLFT nanoscopy empowered by deep learning
The authors use two deep-learning methods for RESOLFT nanoscopy: HDN denoising enables five-fold longer live-cell imaging, while spatial upsampling with temporal context restores subsampled data for fourfold higher frame rates and reduced artifacts.
Guillaume Minet, Anirban Ray & Ilaria Testa

Article
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Large-scale identical-location electron microscopy enables quantifying nanoparticulate electrocatalyst degradation
Fuel cells rely on catalysts made of metal nanoparticles, but tracking how these particles wear down individually has been difficult. Here, the authors build an automated image analysis pipeline to track hundreds of platinum-cobalt nanoparticles and classify the degradation pathways they undergo.
Ana Rebeka Kamšek, Francisco Ruiz-Zepeda & Nejc Hodnik

Article
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Fluorescence-illuminated diffraction tomography using explicit neural fields
Fluorescence-illuminated diffraction tomography uses fluorescence within a sample to reconstruct label-free 3D refractive index, enabling reflection-mode fluorescence-phase imaging in thick samples without transmission access.
Renzhi He, Yucheng Li & Yi Xue

Article
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Twisted superconducting quantum diodes for high fidelity anharmonic qubits
Superconducting diodes can provide nonreciprocal elements for superconducting and quantum circuits, but the role of diode efficiency in quantum-device performance remains unclear. Here, the authors demonstrate an enhanced superconducting diode effect in twisted $NbSe_2$ and show that even a moderate degree of nonreciprocity is sufficient to stabilize anharmonic qubit circuits.
Han Zhong, Denis Kochan & Yingying Wu

Article
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Giant step-boundary-triggered nonlocal modulation of magnetization reversal in multi-stepped van der Waals ferromagnet Fe_3GaTe_2
Boundaries can serve as nucleation points for magnetic domains, influencing the switching behavior. Here, Chen, Liu, Zhang, Chen and co-authors study magnetization reversal from stepped boundaries in van der Waals magnets, finding two distinct regimes of switching.
Xiaoli Chen, Daxiang Liu & Qian Li

Article
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Quantum-sensing-based super-resolution live cell microenvironment imaging
This work presents a super-resolution quantum biosensing approach by integrating nitrogen vacancy (NV) center-based quantum nanodiamond sensors with structured illumination microscopy, which achieves super-resolution multi-physical imaging within live cells.
Yuxian Lu, Yibo Yang & Jiandong Feng

Article
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Intrinsically flexible inorganic piezoelectric subnanowire enables wireless wearable bioelectronics for non-invasive multimodal human-machine interfacing
Piezoelectric materials enable bioelectronic sensing by converting mechanical stimuli into electrical signals. Xu et al. introduce intrinsically flexible polyoxometalate-based subnanowires and demonstrate their scalable integration into wireless wearable systems for human physiological monitoring.
Xin Xu, Xiaoya Wang & Xun Wang

Article
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Photocluster catalytic oxidation enabled by structurally precise copper-hydride nanoclusters
The utilization of light energy has emerged as a prominent strategy to boost copper nanocluster photocatalysis for organic synthesis, but the scope of transformations remains relatively narrow. Here we report the catalytic performance of a copper-hydride nanocluster, $Cu_{13}H_6$, for photocatalytic α-C–H oxidation.
Xiaona Yang, Cong Fang & Nanfeng Zheng

Article
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Spinons, solitons and random-singlet-like behaviours in the spin-chain compound copper benzoate
A detailed low-temperature NMR study on copper benzoate reveals spinon excitations, low-temperature random-singlet-like behaviours and field-induced solitons, highlighting the interplay between crystal structure and weak disorder in a spin-chain system.
Ying Chen, Guijing Duan & Weiqiang Yu

Article
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Fast-charging and durable all-solid-state lithium-sulfur batteries enabled by pre-embedded solid-solid redox mediator
All-solid-state lithium sulfur batteries suffer from sluggish solid-solid sulfur redox reactions. Here, the authors report fast charging and durable all-solid-state lithium-sulfur batteries enabled by a pre-embedded solid-solid redox mediator in an amorphous sulfur/iodine nano-eutectic positive electrode.
Huimin Song, Ruizhuo Zhang & Quanquan Pang

Article
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Reversible dissociation of a sterically distorted dimer of a phosphagermylenylidene
Accessing heavier analogues of isonitriles remains challenging because inefficient π overlap leads to weak and highly polarized π bonds that strongly favor dimerization or oligomerization. Herein, the authors report the reversible dimer–monomer equilibrium of a phosphagermylenylidene in solution.
Zixu Wang, Lei Xu & Gengwen Tan

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Fluorine-free polymer binder enables circular manufacturing and recycling of lithium-ion batteries
Conventional polymer binders rely on fossil-derived chemicals and toxic solvents. Here, the authors develop a renewable citric acid-crosslinked polymer binder that enables durable lithium-ion batteries, improves electrode integrity, and supports sustainable battery manufacturing and recycling.
Jiao Lin, Anthony Mu & Zheng Chen

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Bias-reconfigurable barrier photodetectors for integrated broadband sensing and neuromorphic vision
Intelligent vision systems require diverse functionalities, ranging from high-speed sensing to neuromorphic processing. Wang et al. report a reconfigurable photodetector that seamlessly switches between these two operating modes, with its response time continuously tunable from nanoseconds to seconds.
Shizheng Wang, Fang Yang & Hongwei Liu

Article
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Precious metal free tunable manganese oxides for sustainable anion exchange membrane fuel cells
Replacing platinum in fuel cell cathodes with abundant materials remains challenging because activity and durability are difficult to combine. Here, the authors use atomically dispersed tin sites to regulate manganese oxide, enabling durable oxygen reduction and competitive fuel cell performance.
Xuepeng Zhong, Chuangxin Ge & Jiwei Ma

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Environmentally Relevant Concentrations of Nanomaterials Drive Photochemical Production of Reactive Species and Pollutant Degradation in Surface Waters
Environmentally relevant nanomaterial concentrations can rival dissolved organic matter in driving pollutant transformation under sunlight or UV-based water treatment.
Joshua Quinn, Aidan McClure & Paul Westerhoff

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A cross-layer 2D photodetection framework for standardized readout and signal fusion
Persistent photoconductivity usually complicates the readout of 2D photodetectors, limiting the stability and speed of the signal representation and processing. Here, the authors introduce a cross-layer signal engineering approach to analyse and stabilize the dynamic outputs of 2D MoS_2, WSe_2 and $PtSe_2$ photodetectors, showing its extension to multi-sensor image recognition tasks.
Ximing Sun, Xiangkai Liu & Zegao Wang

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Precise polymerization of phenolic pollutants by a nanoconfined reactor with Fe-Mo dual-site
This work demonstrates a Fe-Mo dual-site catalyst that redirects phenolic pollutant transformation toward controlled oligomerization. The resulting membrane system achieves near-complete pollutant removal over 144 h with reduced oxidant usage and carbon emissions.
Yandong Chai, Zhongzheng Hu & Minghua Zhou

Article
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Topological diversity and scintillating dynamics of dipolar surface twists in a van der Waals magnet
Authors investigate the field- and current-driven dynamics of three-dimensional magnetic textures in Fe_3GaTe_2, revealing topological diversity and distinct dynamical behaviors at the surface and in the bulk.
Xiaowei Lv, Jiazhuan Qin & Renchao Che

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FtmOx1-catalyzed diverse C(sp^3)-H oxyfunctionalization enables versatile late-stage diversification of phenethylamines and tetrahydroisoquinolines
Enzymatic late-stage functionalization of C(sp^3)-H bonds is an important strategy in medicinal chemistry, and verruculogen synthase (FtmOx1) is an enzyme that catalyses endoperoxidation of its native substrate, fumitremorgin B. Here, the authors report the catalytic versatility of FtmOx1 in mediating diverse C(sp^3)-H transformations of non-native substrates, including phenethylamines and tetrahydroisoquinolines, through β-hydroxylation, β-ketone formation, dealkylation, and α, β-desaturation.
Jiapeng Zhang, Hengrui Liang & Hong Liu

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Non-sewered sanitation systems reshape microplastics into chemically complex and reactive contaminants
Microplastics are known to be present within non-sewered sanitation systems, but how treatment processes alter their physicochemical properties is not well understood. Here, the authors use a range of techniques to study the fate and transformation of microplastics with treatment.
Nana Liu, Zifu Li & Iseult Lynch

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P450-catalyzed enantiodivergent kinetic oxidation to access chiral haloalcohols
Differentiation between highly similar substituents is a challenge in asymmetric catalysis. Here, the authors report an enzymatic approach enabling kinetically enantioselective hydroxylation of (2-chloropropyl)benzene derivatives using engineered P450PL2 to obtain the 2-chloro-benzyl alcohol derivatives with up to 99:1 enantiomeric ratio and >99:1 diastereomeric ratio.
Ting Ma, Hai-Bo Cui & Yong-Zheng Chen

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Multi-model collaborative early warning for battery systems with integrated fiber optic sensors
To tackle the challenge of early detection of thermal runaway in EV batteries, a distributed temperature sensing system using fiber optic sensors integrated with a multi-model warning framework is developed and validated under real-world vehicle operations.
Jiangong Zhu, Chao Yu & Haifeng Dai

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Topologically robust programmable processing arrays using light and matter skyrmions
Optical skyrmions offer a route to scalable photonic computing via perturbation-resilient topological invariants of the optical field. Here, authors introduce a platform-independent architecture for skyrmion-based processing arrays, built around a library of topologically robust optical primitives.
Ruofu Liu, Yunqi Zhang & Chao He

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Cooperative outer-surface recognition extends host–guest chemistry for high-capacity molecular separation beyond cavity inclusion
The separation of azeotropic and structurally similar mixtures remains challenging for conventional porous materials. Here the authors introduce a conceptual extension of classical host–guest chemistry that moves beyond exclusive cavity-based recognition to exploit cooperative interactions at the outer surface of macrocyclic hosts.
Yafang Zhang, Tao Hou & Qing Li

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Modulate adsorption via Co^{2+}-O-$Co^{\delta+}$ asymmetric pairs toward efficient upcycling of plastic waste to commodity chemicals
Electrochemical oxidation of ethylene glycol offers a sustainable route for upcycling polyethylene terephthalate waste. Here, the authors report a grain boundary-engineered asymmetric dual-site catalyst whose synergistic adsorption can be modulated, rendering it promising for plastic waste upcycling.
Xingchen Chang, Tao Yu & Chun-Chao Hou

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Error semitransparent universal control of a bosonic logical qubit
Error transparency is an alternative approach to quantum fault-tolerance relying on multi-body Hamiltonians whose evolution is unaffected - to first order - by noise. Here, the authors show a dynamic encoding subspace framework achieving universal control of Bosonic logical qubits with error semitransparent gates, correcting most single-photon loss errors in the Bosonic mode during logical gate operations.
Saswata Roy, Owen C. Wetherbee & Valla Fatemi

Article
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Universal hydrogen-free synthesis and elemental doping of two-dimensional transition metal selenides
2D transition metal selenides (TMSs) exhibit interesting (opto-)electronic properties, but their bottom-up synthesis usually requires H_2 gas, leading to safety concerns and cost implications. Here, the authors report a universal H_2-free chemical vapour deposition method to grow large-scale metal-doped 2D TMSs on various substrates.
Ping Man, Lok Wing Wong & Thuc Hue Ly

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Community-centric modeling of citation dynamics explains collective citation patterns across different knowledge systems
Science, law, and technology accumulate knowledge as people build on prior ideas through citations. Here, the authors show that shared citation patterns across these systems arise from collective exploration of a knowledge space.
Sadamori Kojaku, Robert Mahari & Yong-Yeol Ahn

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A convergent total synthesis of the ivermectin aglycon through transition metal-mediated and anionic transformations
The structural complexity and biological importance of avermectins have made them longstanding targets for chemical synthesis. Here, the authors report a convergent total synthesis of the ivermectin B1a aglycon using strategic fragment assembly and templated macrocyclization in 21 longest-linear steps.
Goh Sennari, Ryo Saito & Toshiaki Sunazuka

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Emergence of polarization in networks of large language model agents
Large language model agents can now communicate, form networks, and develop opinions, but their collective behaviour remains poorly understood. Here, the authors show that networked LLM agents can spontaneously develop polarized opinions and serve as a synthetic testbed for studying opinion dynamics.
Jinghua Piao, Zhihong Lu & James Evans

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A universal twist-slide coupling mechanism governs deformations of DNA, RNA, and RNA-DNA hybrid duplexes
Helical twist is a fundamental mechanical property of nucleic acids that governs genome stability, gene expression, and gene editing. Here, using single-molecule experiments and molecular simulations, the authors show that RNA–DNA hybrid exhibit strongly attenuated twist responses and nearly vanishing twist-stretch coupling.
Fujia Tian, Wei Wei & Xing-Hua Zhang

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Generative diffusion surrogates with analytical variance schedule
Stochastic transport often can be described using known laws for the variance evolution without knowing the distributional structure. Here, authors show how this knowledge informs the diffusion-model noise schedules so that the distributional structure can be learned only from the initial distributional data.
Patrick Reichherzer, Gianluca Gregori & Subir Sarkar

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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

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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

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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 Garcia Fernandez & Andrej Kuznetsov

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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

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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

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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

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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

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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

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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

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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 $La_{2-x}Sr_xCuO_4$, 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
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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

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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

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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
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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

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