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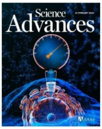

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NEUROSCIENCE

A non-Hebbian code for episodic memory

BY RICH PANG, STEFANO RECANATESI • 21 FEB 2025

Fast, non-Hebbian plasticity rules can encode paths through complex state spaces in an episodic memory model.

ABSTRACT

Artificial intelligence–powered 3D analysis of video-based caregiver-child interactions

BY ZHENZHEN WENG, LAURA BRAVO-SÁNCHEZ, ZEYU WANG, [...] SERENA YEUNG-LEVY +8 authors • 19 FEB 2025

HARMONI enables study of caregiver-child interactions with automatic 3D and audio analysis, accelerating behavioral research.

ABSTRACT

Reinstatement and transformation of memory traces for recognition

BY ELIAS M. B. RAU, MARIE-CHRISTIN FELLNER, REBEKKA HEINEN, [...] NIKOLAI AXMACHER +16 authors • 19 FEB 2025

Direct brain recordings in humans show reinstatement and transformation of item-specific memory traces for recognition.

ABSTRACT

EARTH, ENVIRONMENTAL, ECOLOGICAL, AND SPACE SCIENCES

Convective potential and fuel availability complement near-surface weather in regulating global wildfire activity

BY HONGXUAN SU, YAN YU, WEIDONG GUO, JIAFU MAO • 19 FEB 2025

In addition to near-surface weather, atmospheric convection and fuel availability are key to wildfire forecast and prediction.

ABSTRACT

Large closed-basin lakes sustainably supplied phosphate during the origins of life

BY CRAIG R. WALTON, JIHUA HAO, MARIA SCHÖNBÄCHLER, OLIVER SHORTTLE • 19 FEB 2025

Large closed-basin lakes offer a sustainable source of phosphate that may have met the strict demands of prebiotic chemistry.

ABSTRACT

A 1600-year record of extreme rainfall in northern Arabia

BY SAM J. PURKIS, STEVEN N. WARD, BOLTON J. HOWES, [...] MATTIE RODRIGUE +7 authors • 21 FEB 2025

ABSTRACT

Accelerated internal tides in a warming climate

BY YANKUN GONG, ZHIWU CHEN, JIEXIN XU, [...] SHUQUN CAI +2 authors • 19 FEB 2025

Internal tides are accelerating globally due to intensified stratification from climate warming.

ABSTRACT

THIS WEEK' S PODCAST

20 FEB 2025 BY SARAH CRESPI, SANDEEP RAVINDRAN, MARTIN ENSERINK

Shrinking AI for use in farms and clinics, ethical dilemmas for USAID researchers, and how to evolve evolvability

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Particle-associated N_2 fixation by heterotrophic bacteria in the global ocean

BY SUBHENDU CHAKRABORTY, KEN H. ANDERSEN, AGOSTINO MERICO, LASSE RIEMANN • 19 FEB 2025

Heterotrophic bacteria fix N_2 in more diverse environments than previously thought, critical for the oceanic nitrogen cycle.

ABSTRACT

Atlantification advances into the Amerasian Basin of the Arctic Ocean

BY IGOR V. POLYAKOV, ANDREY V. PNYUSHKOV, MATTHEW CHARETTE, [...] JAEILL YOO +6 authors • 21 FEB 2025

Contrary to the global climate model projections, atlantification has already spread into the Amerasian Basin of the Arctic Ocean.

ABSTRACT

Rift-inversion orogens are potential hot spots for natural H_2 generation

BY FRANK ZWAAN, SASCHA BRUNE, ANNE C. GLERUM, [...] ERIC C. GAUCHER +3 authors • 19 FEB 2025

Rift-inversion orogens are promising sites for large-scale occurrence of natural H_2, a clean energy source for the future.

ABSTRACT

Chromatic acclimation shapes phytoplankton biogeography

BY FRANCESCO MATTEI, ANNA E. HICKMAN, JULIA UITZ, [...] STEPHANIE DUTKIEWICZ +4 authors • 19 FEB 2025

Chromatic acclimation is an advantageous evolutionary trait and influences phytoplankton competition and global distribution.

ABSTRACT

Overcoming the data limitations in landslide susceptibility modeling

BY JACOB B. WOODARD, BENJAMIN B. MIRUS • 21 FEB 2025

Reliable landslide susceptibility maps can be developed in areas without landslide data.

ABSTRACT

The Rise of Algae promoted eukaryote predation in the Neoproterozoic benthos

BY DANIEL B. MILLS, AURÈLE VUILLEMIN, KATHARINA MUSCHLER, [...] WILLIAM D. ORSI +1 authors • 19 FEB 2025

The rise of marine algae stimulated microbial predation at the seafloor, rerouting carbon and energy to the earliest animals.

ABSTRACT

PHYSICAL AND MATERIALS SCIENCES

Exchange-selective excitation pulses for dynamic magnetic resonance

BY JACOB R. LINDALE, WARREN S. WARREN • 19 FEB 2025

Specific shaped pulses only excite exchanging spins, not static ones.

ABSTRACT

Switching polariton screening in MoS_2 microcavity toward polaritonics

BY ASHOK MONDAL, CHANDAN BISWAS, PRAMOD GHISING, [...] YOUNG HEE LEE +2 authors • 21 FEB 2025

A spectrum of multiple polaritons and its switching by the gate bias within TMD microcavities are explored.

ABSTRACT

Non-Hermitian singularities in scattering spectra of Mie resonators

BY FAN ZHANG, NIKOLAY S. SOLODOVCHENKO, HANGKAI FAN, [...] ANDREY A. BOGDANOV +3 authors • 21 FEB 2025

Exploring the non-Hermitian singularities in the scattering spectra of Mie resonators reveals new paths for field manipulation.

ABSTRACT

General strategy for boosting the performance of speed-tunable rotary molecular motors with visible light

BY JINYU SHENG, CARLIJN L. F. VAN BEEK, CHARLOTTE N. STINDT, [...] BEN L. FERINGA +6 authors • 19 FEB 2025

Formylation improves all aspects of the performance of second-generation overcrowded alkene – derived molecular motors.

ABSTRACT

Tunable pure interference colors of 2D titania liquid crystal with ultrasensitive electroresponse

BY RUI GONG, SIYUAN TIAN, YUKUN LEI, [...] BAOFU DING +8 authors • 19 FEB 2025

A 2D TiO_2 liquid crystal electrochromic device achieves vibrant, tunable interference colors under ultralow electric fields.

ABSTRACT

Weaving liquid crystal elastomer fiber actuators for multifunctional soft robotics

BY HUXIAO YANG, XIAOFENG YIN, CHAO ZHANG, [...] YAN XU +2 authors • 19 FEB 2025

A simple but universal design strategy inspired by traditional rope artistry was proposed to develop weaving LCE fiber actuators.

ABSTRACT

Polarization-entangled Bell state generation from an epsilon-near-zero metasurface

BY WENHE JIA, GRÉGOIRE SAERENS, ÜLLE-LINDA TALTS, [...] YUANMU YANG +4 authors • 21 FEB 2025

Pairs of polarization-entangled photons are realized using a metasurface strongly coupled to an epsilon-near-zero material.

ABSTRACT

Microenvironment perturbations driving methanol low-temperature conversion over zeolite

BY FENGQING LIU, XIANFENG YI, TANGKANG LIU, [...] ANMIN ZHENG +5 authors • 19 FEB 2025

Acetone facilitates methanol low-temperature conversion to dimethyl ether over zeolite.

ABSTRACT

Sequential multidimensional heteroepitaxy of chalcogen-sharing 3D ZnSe and 2D MoSe_2 with quasi van der Waals interface engineering

BY SUHYUN KIM, SAEYOUNG OH, SEUNG JAE KWAK, [...] KIBUM KANG +14 authors • 21 FEB 2025

An atomically sharp 3D ZnSe/2D MoSe_2/3D ZnSe epitaxial heterointerface provides insights into advanced device architectures.

ABSTRACT

Hybrid electromagnetic toroidal vortices

BY REN WANG, BEIER YING, SHUAI SHI, [...] YIJIE SHEN +3 authors • 21 FEB 2025

Toroidal electromagnetic pulses are upgraded to host vortex streets, skyrmion topology, and transverse orbital angular momentum.

ABSTRACT

Flexible circuit-free system via passive modulated ultrasound for wireless thoracic pressure monitoring

BY MUYAO WANG, LU JIA, XINYUAN JIA, [...] XUE FENG +1 authors • 19 FEB 2025

Passive modulated ultrasound enables physiological monitoring without integrating circuits and batteries in implantable devices.

ABSTRACT

Atomic Sn–incorporated subnanopore-rich hard carbon host for highly reversible quasi-metallic Li storage

BY TONG JIN, XIN YU ZHANG, SHUAI YUAN, LE YU • 21 FEB 2025

Subnanopore-rich carbon spheres decorated with Sn single atoms are designed as hosts for reversible quasi-metallic Li storage.

ABSTRACT

Deformation-tolerant, wireless-charging microbatteries for seamlessly integrated omnidirectional stretchable electronics

BY YING WANG, YANG ZHAO, LI YU, [...] LIANGTI QU +8 authors • 19 FEB 2025

Deformable wireless-charging microbatteries seamlessly integrate with stretchable electronics by stretch-contraction strategy.

ABSTRACT

Nonreciprocal chirality conversion in spatiotemporal evolutions of nematic colloidal entanglement

BY JING ZHANG, WENTAO TANG, ZHAWURE ASILEHAN, [...] CHENHUI PENG +5 authors • 21 FEB 2025

Nonreciprocal chirality conversion is demonstrated by manipulating spatiotemporal evolutions of nematic colloidal entanglement.

ABSTRACT

Metal-to-metal charge transfer for stabilizing high-voltage redox in lithium-rich layered oxide cathodes

BY MIN-HO KIM, HAESEONG JANG, EUNRYEOL LEE, [...] HYUN-WOOK LEE +12 authors • 19 FEB 2025

Metal-to-metal charge transfer suppresses oxygen redox activity, thereby stabilizing high-voltage redox reactions.

ABSTRACT

Simultaneous transmission of information and key exchange using the same photonic quantum states

BY DONG PAN, YU-CHEN LIU, PENGHAO NIU, [...] GUI-LU LONG +6 authors • 21 FEB 2025

A world record–breaking quantum secure direct communication rate of 2.38 kbp has been achieved over a 104.8-km fiber.

ABSTRACT

Exploring molecular superfluidity in hydrogen clusters

BY HATSUKI OTANI, SUSUMU KUMA, SHINICHI MIURA, [...] TAKAMASA MOMOSE +3 authors • 21 FEB 2025

Experiments reveal superfluidity in hydrogen clusters at 0.4 K, highlighting unique quantum behaviors of molecular hydrogen.

ABSTRACT

Nitrene-mediated glycosylation with thioglycoside donors under metal catalysis

BY ZIQIAN BAI, ZENGHUI WEI, SHIYANG ZHU, [...] GONG CHEN +2 authors • 21 FEB 2025

A nitrene-mediated glycosylation uses readily available glycosyl donors under the catalysis of both base and noble metals.

ABSTRACT

BIOMEDICINE AND LIFE SCIENCES

Deep profiling of B cells responding to various pathogens uncovers compartments in IgG memory B cell and antibody-secreting lineages

BY MATHIEU CLAIREAUX, GEORGE ELIAS, GIUS KERSTER, [...] S. MARIEKE VAN HAM +20 authors • 19 FEB 2025

Deep profiling of B cells responding to various pathogens uncovers immune memory B cells and plasmablast lineages.

ABSTRACT

The mutational landscape and functional effects of noncoding ultraconserved elements in human cancers

BY RECEP BAYRAKTAR, YITAO TANG, MIHNEA P. DRAGOMIR, [...] GEORGE A. CALIN +46 authors • 19 FEB 2025

Perfectly conserved genomic regions between human, mouse, rat, dog, or cow are mutated in cancer and play functional roles.

ABSTRACT

A modular cell-free protein biosensor platform using split T7 RNA polymerase

BY MEGAN A. MCSWEENEY, ALEXANDRA T. PATTERSON, KATHRYN LOEFFLER, [...] MARK P. STYCZYNSKI +3 authors • 21 FEB 2025

A split polymerase is used to develop a plug-and-play cell-free biosensor platform for point-of-care protein detection.

ABSTRACT

NAT10-mediated mRNA N^4-acetylation is essential for the translational regulation during oocyte meiotic maturation in mice

BY LU CHEN, WEN-JING WANG, SHAO-YUAN LIU, [...] HENG-YU FAN +6 authors • 21 FEB 2025

ac^{4}C plays a critical role in oocyte meiotic maturation, demonstrated by a low-input ac^{4}C LACE-seq.

ABSTRACT

Wnt signaling modulates mechanotransduction in the epidermis to drive hair follicle regeneration

BY ALLEN S. W. OAK, AMRIT BAGCHI, MATTHEW J. BRUKMAN, [...] GEORGE COTSARELIS +11 authors • 19 FEB 2025

Wnt signaling manipulates the molecular machinery of mechanotransduction to generate a conducive environment for regeneration.

ABSTRACT

SUMO2/3 conjugation of TDP-43 protects against aggregation

BY ENZA MARIA VERDE, FRANCESCO ANTONIANI, LAURA MEDIANI, [...] SERENA CARRA +22 authors • 21 FEB 2025

During oxidative stress, TDP-43 is SUMO2/3-ylated by the SUMO E3 ligase PIAS4 to prevent its aggregation inside stress granules.

ABSTRACT

Active microtubule-actin cross-talk mediated by a nesprin-2G–kinesin complex

BY NATALIE SAHABANDU, KYOKO OKADA, AISHA KHAN, [...] RICHARD J. MCKENNEY +4 authors • 21 FEB 2025

Nesprin-2 Giant links the nucleus to the cytoskeleton, enabling actin transport and nuclear movement through kinesin-1 activation.

ABSTRACT

Activity-dependent regulation of microglia numbers by pyramidal cells during development shape cortical functions

BY SANJANA KUMARAGURU, JAMES MORGAN, FONG KUAN WONG • 19 FEB 2025

Decoupling of microglia and pyramidal cell interaction disrupts microglial number and function and induce cognitive deficits.

ABSTRACT

Structural basis of aquaporin-4 autoantibody binding in neuromyelitis optica

BY MEGHNA GUPTA, NITESH KUMAR KHANDELWAL, ANDREW NELSON, [...] ROBERT M. STROUD +3 authors • 21 FEB 2025

Pathogenic autoantibodies in neuromyelitis optica bind three multiply presented loops on arrays of human aquaporin-4.

ABSTRACT

Intratumoral antigen-presenting cell activation by a nanovesicle for the concurrent tertiary lymphoid structure de novo neogenesis

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Engineered nanovesicles can effectively induce tertiary lymph node formation within tumors.

ABSTRACT

Disabling leading and lagging strand histone transmission results in parental histones loss and reduced cell plasticity and viability

BY LEONIE KOLLENSTART, ALVA BIRAN, NICOLAS ALCARAZ, [...] ANJA GROTH +5 authors • 19 FEB 2025

Losing parental histones during DNA replication fork passage challenges differentiation competence and cell viability.

ABSTRACT

A galactose-tethered tetraphenylethene prodrug mediated apoptosis of senescent cells for osteoporosis treatment

BY XIN GAO, YICHEN HU, YINGFEI ZHANG, [...] DEQING ZHANG +4 authors • 19 FEB 2025

A molecular therapy for osteoporosis treatment selectively eliminates senescent cells through noninflammatory apoptosis.

ABSTRACT

TRAM-LAG1-CLN8 family proteins are acyltransferases regulating phospholipid composition

BY PRADEEP K. SHEOKAND, ANDREW M. JAMES, BENJAMIN JENKINS, [...] KASPARAS PETKEVICIUS +7 authors • 19 FEB 2025

TRAM–LAG1–CLN8 family proteins function as enzymes that remodel cellular phospholipids and expand the membrane lipid diversity.

ABSTRACT

SCF^{RMF}-dependent degradation of the nuclear lamina releases the somatic chromatin mobility restriction for meiotic recombination

BY XINJIE YUAN, BOWEI CAI, YUKI HAMAMURA, [...] CHAO YANG +1 authors • 21 FEB 2025

SCF^{RMF} removes the somatic barriers of nuclear organization by degrading the nuclear lamina to allow meiotic chromosome pairing.

ABSTRACT

Lignin gel emulsions for environmentally benign hair conditioning

BY FENGYANG WANG, SAJESH NITHIANANDAM, IEVGEN PYLYPCHUK, MIKA H. SIPPONEN • 21 FEB 2025

Biobased lignin gels stabilize natural oil emulsions for sustainable hair conditioning and a simplified ingredient list.

ABSTRACT

Bioengineered protein nanocarrier facilitating siRNA escape from lysosomes for targeted RNAi therapy in glioblastoma

BY YILIANG JIN, BAOLI ZHANG, JIANRU LI, [...] KELONG FAN +10 authors • 19 FEB 2025

Ferritin nanocages with inner surface and interface rationally designed to deliver siRNA for glioblastoma therapy.

ABSTRACT

Noninvasive characterization of oocyte deformability in microconstrictions

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A microfluidic measurement method translates oocyte mechanical characterization into oocyte quality assessment.

ABSTRACT

Nervous system–wide analysis of all *C. elegans* cadherins reveals neuron-specific functions across multiple anatomical scales

BY MARYAM MAJEED, CHIEN-PO LIAO, OLIVER HOBERT • 21 FEB 2025

A comprehensive analysis of cadherin genes in C. elegans reveals neuronal differentiation defects at different anatomical scales.

ABSTRACT

Sequence-dependent scale for translocon-mediated insertion of interfacial helices in membranes

BY BRAYAN GRAU, RIAN KORMOS, MANUEL BAÑÓ-POLO, [...] ISMAEL MINGARRO +8 authors • 19 FEB 2025

A biological hydrophobicity scale reveals amino acid partition preferences in water, membrane surfaces, and transmembrane regions.

ABSTRACT

Immunogenic cryptic peptides dominate the antigenic landscape of ovarian cancer

BY REMYA RAJA, KIRAN K. MANGALAPARTHI, ANIL K. MADUGUNDU, [...] MARION CURTIS +6 authors • 19 FEB 2025

Cryptic immunogenic peptides in ovarian cancer hint at their potential role in antitumor immunity.

ABSTRACT

Removal of toxic steroidal glycoalkaloids and bitterness in tomato is controlled by a complex epigenetic and genetic network

BY FENG BAI, MENGBO WU, WEI HUANG, [...] MINGCHUN LIU +7 authors • 19 FEB 2025

A complex regulatory network controls the removal of toxic steroidal glycoalkaloids during tomato ripening.

ABSTRACT

Mitochondrial translation regulates terminal erythroid differentiation by maintaining iron homeostasis

BY TATSUYA MORISHIMA, MD. FAKRUDDIN, YOHEI KANAMORI, [...] HITOSHI TAKIZAWA +11 authors • 21 FEB 2025

Mitochondrial tRNA modification regulates fetal erythropoiesis through the maintenance of intracellular iron homeostasis.

ABSTRACT

Direct ionic stress sensing and mitigation by the transcription factor NFAT5

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Intracellular ionic strength is sensed and regulated by a prion-like domain in a transcription factor.

ABSTRACT

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