

HOME > SCIENCE ADVANCES > VOL. 11, NO. 21



SCIENCE ADVANCES

VOLUME 11 | ISSUE 21 | 23 MAY 2025

ONLINE COVER: Visual representation of an AI-assisted biomimetic system modeled after arthropod vision. Arthropods, such as amphipods and butterflies, possess intricate compound eyes that exhibit exceptional visual capabilities. Long *et al.* present an AI-assisted biomimetic approach that combines the strength of digital imaging with the features of natural arthropod visual...
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SOCIAL AND INTERDISCIPLINARY SCIENCES AND PUBLIC HEALTH

The impact of tropical cyclone exposure on infant mortality in low- and middle-income countries

BY ZETANYU WANG, RENZI JING, SAM HEFTNEAL, AARON CLARK-GINSBERG, DEBARATI GUHA-SAPRI, ERAN BENDAVI, ZACHARY WAGNER • 21 MAY 2025

Tropical cyclones increase infant mortality across seven low- and middle-income countries with uneven country-specific effects.

ABSTRACT

Socioeconomic and temporal heterogeneity in SARS-CoV-2 exposure and disease in England from May 2020 to February 2023

BY CHRISTIAN MORSENFELDER, THOMAS RAWSON, WES HINSELEY, PABLO N. PEREZ GUZMAN, SAMIR BHATT, NEIL M. FERROUSAN • 21 MAY 2025

Deprivation and ethnicity influenced COVID-19 outcomes, revealing health inequalities and vaccine effectiveness in the pandemic.

ABSTRACT

NEUROSCIENCE

Neuronal lipofuscinosis caused by Kufs disease/CLN4 DNAJC5 mutations but not by a CSP α /DNAJC5 deficiency

BY SANTIAGO LÓPEZ-BEORNE, NOHA BOKJUN, ANGELA LAVADO-ROLÁN, CRISTINA MESA-CRUZ, FABIOLA MARILLANO, YERA I. WIERBMA, FÁTIMA RUBIO-PASTOR, EMANUELA TUMINI, CARMEN PARADELA-ALCALÁ, MARÍA L. CHICLANA-VÁLCARCEL, [...] RAFAEL FERNÁNDEZ-CHACÓN • 21 MAY 2025

Pathological function of a mutated molecular co-chaperone causes adult-onset autosomal dominant neuronal ceroid lipofuscinosis.

ABSTRACT

Communication of perceptual predictions from the hippocampus to the deep layers of the parahippocampal cortex

BY OLIVER WARRINGTON, NADINE N. GRAEDEL, MARTINA F. CALLAGHAN, PETER KOK • 21 MAY 2025

High-resolution neuroimaging reveals stimulus-specific predictions sent from hippocampus to the neocortex during perception.

ABSTRACT

Astrocyte-derived CCL5-mediated CCR5⁺ neutrophil infiltration drives depression pathogenesis

BY HANG YAO, SI-YUAN JIANG, YING-YING JIAO, ZHI-YONG ZHOU, ZHU ZHU, CONG WANG, KE-ZHONG ZHANG, TENG-FEI MA, GANG HU, REN-HONG DU, MING LIU • 21 MAY 2025

Astrocyte-derived CCL5 mediates brain infiltration of CCR5⁺ neutrophils that drives depression progression.

ABSTRACT

Diversity of omission responses to visual images across brain-wide regions

BY NOAM NITZAN, GYÖRGY BUDZSÁKI • 21 MAY 2025

Omission of visual stimuli does not trigger spiking in visual cortical neurons, but certain nonvisual areas respond to omission.

ABSTRACT

EARTH, ENVIRONMENTAL, ECOLOGICAL, AND SPACE SCIENCES

Personal care products disrupt the human oxidation field

BY NORIKAZU KANAKI, PASCALE S. J. LAKEY, YOUNGBO WON, MANABU SHIRAIWA, DONGHYUN RIM, CHARLES J. WESCHLER, NIJING WANG, TATJANA ARNOLD-MEADOWS, LISA ENLE, ANYWHERE TOSKANURUNU, [...] JONATHAN WILLIAMS • 21 MAY 2025

Personal care products substantially suppress a human's production of OH radicals.

ABSTRACT

Individual clown anemonefish shrink to survive heat stress and social conflict

BY MELISSA A. VERSTEEG, CHANCEY MACDONALD, MORGAN F. BENNETT-SMITH, PETER M. BUSTON, THERESA RUEGER • 21 MAY 2025

Clown anemonefish survive heatwaves by shrinking together with their breeding partner.

ABSTRACT

Poorly quantified trends in ammonium nitrate remain critical to understand future urban aerosol control strategies

BY RYAN K. WARD, HAROOLA D. BALAKA, BENJAMIN C. SCHULZE, GAIGE H. KERR, JOHN D. CROUSE, SINA HASHEMINASSAB, ROYA BARRENI, ANN M. DILLNER, ARMISTEAD RUSSELL, NOA L. NO, [...] JOHN H. BENFIELD • 21 MAY 2025

Regulatory monitors fail to measure ammonium nitrate aerosol, masking its importance as a top aerosol pollutant in Los Angeles.

ABSTRACT

Variable mantle redox states driven by deeply subducted carbon

BY MINGDI QAO, YU WANG, STEPHEN F. FOLEY, YI-GANG XU • 21 MAY 2025

Subducted carbonates exert distinct effects under mantle redox conditions in plume versus nonplume environments.

ABSTRACT

The end-Cretaceous mass extinction restructured functional diversity but failed to configure the modern marine biota

BY STEWART M. EDIE, KATIE S. COLLINS, DAVID JABLONSKI • 21 MAY 2025

The end-Cretaceous mass extinction permanently disrupted the distribution of biodiversity among ecological functions.

ABSTRACT

PHYSICAL AND MATERIALS SCIENCES

2D material exciton-polariton transport on 2D photonic crystals

BY XIN XIE, GUANG LI, CHEN LI, TUO LI, CHULWON LEE, KAI SUN, HUI DENG • 21 MAY 2025

Two-dimensional material polaritons in photonic crystals transport over long distances.

ABSTRACT

Tunneling spectroscopy of Andreev bands in multiterminal graphene-based Josephson junctions

BY WOODHAN JUNG, SEYOUNG JIN, SEIN PARK, SEUNG-HYUN SHIN, KENJI WATANABE, TAKASHI TANIGUCHI, GIL YOUNG CHO, GIL-HO LEE • 21 MAY 2025

Graphene-based multiterminal Josephson junctions reveal topological transitions in the Andreev band structure.

ABSTRACT

Downward terrestrial gamma-ray flash associated with collision of lightning leaders

BY YUKIO WADA, TAKESHI MORIMOTO, TING WU, DAQING WANG, HIROSHI KIRIKI, YOSHITAKA NAKAMURA, EICHI YOSHIKAWA, TOMOO USHIO, HARUFUMI TSUCHIYA • 21 MAY 2025

An intense gamma-ray flash occurred when two lightning paths were extended from a thundercloud and the ground and were colliding.

ABSTRACT

Seeing through arthropod eyes: An AI-assisted, biomimetic approach for high-resolution, multi-task imaging

BY YAN LONG, BO DAI, CHENLIANG CHANG, NEIL UPRETI, LI WEI, LULU ZHENG, SONGLIN ZHUANG, TONY JUN HUANG, DAWEI ZHANG • 21 MAY 2025

AI-assisted biomimetic arthropod visual system enables full-color high-resolution panoramic imaging and visual cognition.

ABSTRACT

Amphiphilic nanoprobes that condense undersaturated water vapor and exude water droplets

BY BAEKMIN Q. KIM, ZACHARIAH VICARS, MATE FÜREDI, LILIA F. ESCOBEDO, R. BHARATH VENKATESH, STEFAN GULDIN, AMISH J. PATEL, DAEYOUNG LEE • 21 MAY 2025

Amphiphilic nanopores condense water vapor and exude water droplets under isothermal and undersaturated conditions.

ABSTRACT

Control of ultrafast hot electron dynamics in epsilon-near-zero conductive oxide thin films

BY SUDIP GUPTA, SUBHJIT BEJ, QUNYI DANG, AMBARISH SAHOO, ALEKSEI ANOPCHENKO, ZHENHUA YI, ALEXEI V. SOKOLOV, ANDREA MARINI, HO WAI HOWARD LEE • 21 MAY 2025

Laser power and mode excitation control hot electron relaxation, enabling ultrafast optical nonlinearity.

ABSTRACT

Realization of inverse-design magnonic logic gates

BY NOORA ZENBA, FABIAN MÜLLEN, CLAUSS ALBERT, FLORIAN BRÜCKNER, NORBERT J. MAUSER, THOMAS SCHREIF, QI WANG, DIETER BUESE, ANDRIJ CHUMAK • 21 MAY 2025

Inverse design enables reconfigurable magnonic logic gates with high contrast ratios for fully magnonic data processors.

ABSTRACT

Terahertz stimulated parametric downconversion of a magnon mode in an antiferromagnet

BY ZHUQUAN ZHANG, YU-CHEN CHEN, MAN TONG WONG, FRANK Y. GAO, ZI-JIE LIU, XIAOXUAN MA, SHOUN CAO, EDUARDO BALDINI, KEITH A. NELSON • 21 MAY 2025

Two-dimensional terahertz spectroscopy unveils stimulated parametric downconversion of a coherent magnon.

ABSTRACT

Gradual labeling with fluorogenic probes: A general method for MINFLUX imaging and tracking

BY LONGFANG YAO, DONGJUAN SI, LIWEN CHEN, SHU LI, JIAJIN GUAN, QIMING ZHANG, JING WANG, JIONG MA, LU WANG, MIN GU • 21 MAY 2025

GLF-MINFLUX achieves 2.6-nm imaging and 200- μ s live tracking in crowded cellular structures.

ABSTRACT

Moiré cavity quantum electrodynamics

BY YU-TONG WANG, QI-HANG YE, JUN-YONG YAN, YUFEI QIAO, YU-XIN LIU, YONG-ZHENG YE, CHEN CHEN, XIAO-TIAN CHENG, CHEN-HUI LI, ZI-JIAN ZHANG, [...] FENG LIU • 21 MAY 2025

Tunable cavity quantum electrodynamics are enabled by moiré flatband photonic crystals.

ABSTRACT

Controlled reversible methionine-selective sulfimination of peptides

BY ZHEJIAN HE, XUFANG ZHAO, WENYAN GAO, GUANGJUN BAO, YIPING LI, QUAN ZUO, XINYI SONG, LING-YUN MOU, WANGSHENG SUN, RUI WANG • 21 MAY 2025

Site-specific methionine sulfimination and glutathione concentration-dependent deconjugation in peptides were disclosed.

ABSTRACT

Fast quantum interferometry at the nanometer and attosecond scales with energy-entangled photons

BY COLIN P. LUALDI, SPENCER J. JOHNSON, MICHAEL VAYNINGER, KRISTINA A. MEIER, SWETAPADMA SAHOO, SIMION I. BOGDANOV, PAUL O. KIWIAT • 21 MAY 2025

Quantum entanglement enables contactless measurements at the nanometer scale that tolerate optical loss and background.

ABSTRACT

BIOMEDICINE AND LIFE SCIENCES

When less is more: Counterintuitive stoichiometries and cellular abundances are essential for ABC transporters' function

BY HIBA GASEEM ABDULLAH, NURIT LYVAT LEVANON, MICHAEL PERACH, MOTI GRUPEER, TAMAR ZIV, ODED LEWINSON • 21 MAY 2025

Unexpected stoichiometries in *E. coli* ABC importers reveal design principles linking protein abundance to transporter function.

ABSTRACT

CD8⁺ T cell–derived CD40L mediates noncanonical cytotoxicity in CD40-expressing cancer cells

BY PHILIP SCHÖLE, ALBERTO SAGA, JAPY REGINA STARK, JOHANNA J. SATTELBERG, CHRISTOS NIKOLAIDIS, GERSON KORNHUBER, PARIYA ABBASI, NINA DING, STANISLAV ROSNIEV, STEFAN MENKE, [...] MARCO FRENDSCH • 21 MAY 2025

CD40L/CD8⁺ T cells reveal an unconventional way to kill cancer cells, offering the potential to boost immunotherapy effectiveness.

ABSTRACT

Genome-wide analyses of cell-free DNA for therapeutic monitoring of patients with pancreatic cancer

BY CAROLYN HRUBAN, DANIEL C. BRUHAR, IRINA M. CHEN, SHASHIKANT KOUTI, ANSHAYA V. ANNAIPRASADA, NICHOLAS A. VALDESOL, SARAH SHORE, SUBRANI THEIL, KAVYA BOYAPATI, BAHAR ALIPANAH, [...] VICTOR E. VELGULESCU • 21 MAY 2025

Noninvasive mutation-based and fragmentation-based cfDNA approaches can identify response to therapy in pancreatic cancer.

ABSTRACT

Functional divergence of plant SCAR/WAVE proteins is determined by intrinsically disordered regions

BY SABINE BRUMM, ALEXANDER GAVRIN, MATTHEW MACLEOD, GUILLAUME CHESNEAU, ANNKA USLANDER, SEBASTIAN SCHORNACK • 21 MAY 2025

Intrinsically disordered regions in SCAR/WAVE proteins drive diverse functions in root hair and leaf trichome development.

ABSTRACT

Single-molecule analysis reveals the mechanism of chromatin ubiquitylation by variant PRC1 complexes

BY ALEXANDRA TESELENKO, BEAT FIEZ • 21 MAY 2025

Single-molecule experiments show that active conformation formation controls chromatin ubiquitylation kinetics by variant PRC1.

ABSTRACT

Sphingolipid synthesis in tumor-associated macrophages confers immunotherapy resistance in hepatocellular carcinoma

BY XIAOZHEN ZHANG, MENGDI LAO, KANG SUN, HANSHEN YANG, LIHONG HE, XINYUAN LIU, LINYUE LI, SIRUI ZHANG, CHENXIANG GUO, SICHENG WANG, [...] TINGBO LIANG • 21 MAY 2025

NEK2 in TAMs promotes HCC via SIP, and targeting NEK2/SIP enhances T effector activity and improves immunotherapy efficacy.

ABSTRACT

Immunopeptidomics-guided discovery and characterization of neoantigens for personalized cancer immunotherapy

BY YANGYANG CAI, MANYU GONG, MENGQIAN ZENG, FENG LENO, DEZHONG LV, JIYU GUO, HAO WANG, YAPENG LI, QUAN LIN, JING JING, [...] YONGSHENG LI • 21 MAY 2025

Immunopeptidomics-guided MaNeo pipeline identifies canonical and noncanonical neoantigens for cancer immunotherapies.

ABSTRACT

Increased maize chromosome number by engineered chromosome fission

BY YIZHENG ZENG, MINYU WANG, JONATHAN I. GENT, R. KELLY DAVE • 21 MAY 2025

A synthetic centromere was used to divide one maize chromosome into two chromosomes, and both functioned normally.

ABSTRACT

Macrophage hitchhiking nanomedicine for enhanced β -element delivery and tumor therapy

BY SHUYING CHEN, YONGJIAN LI, ZHONGJIAN ZHOU, QIMANJIE SADING, YIMING ZHANG, SOOHWAN AHN, MUHAMMAD MUHAMMAD KHAN, XIAOYUAN LI, JIURUI QIAO, WEI TAG, [...] TIAN XIE • 21 MAY 2025

β -element-loaded GeS nanosheets use macrophage hitchhiking and ultrasound synergy for enhanced cancer therapy.

ABSTRACT

EXPRESSION OF CONCERN

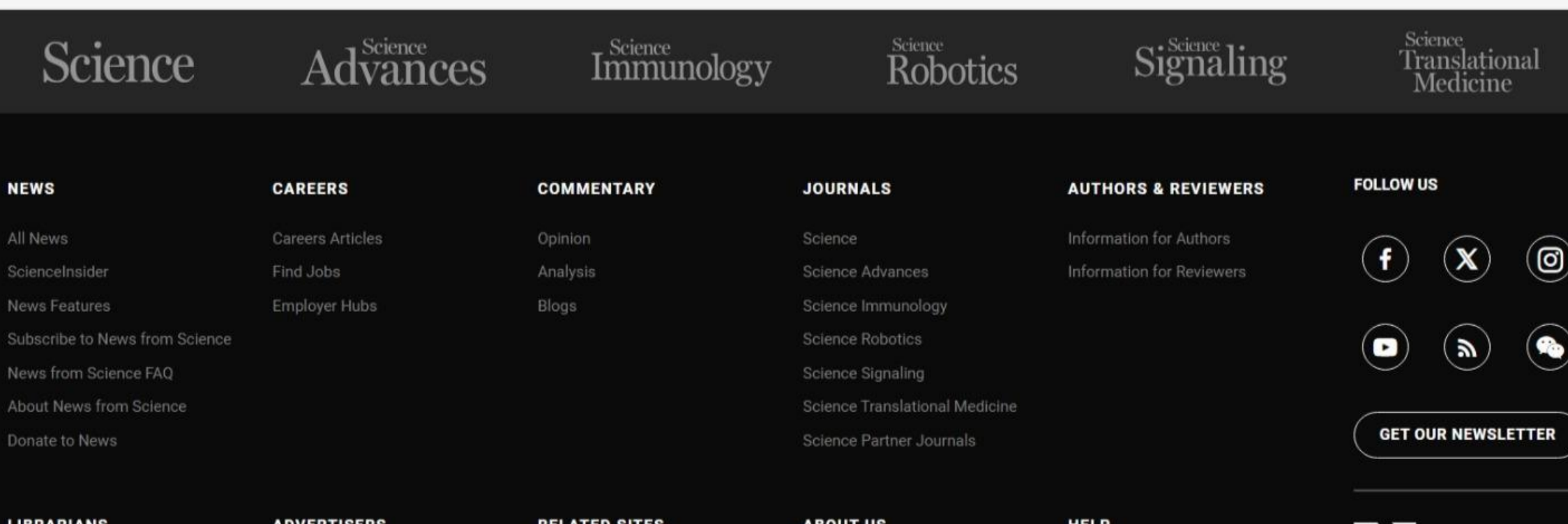
Editorial expression of concern

BY H. HOLDEN THORP • 21 MAY 2025

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