



SCIENCE ADVANCES

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ONLINE COVER: Transmission electron microscopy image of the marine cyanobacteria *Prochlorococcus*. Earth System Models (ESMs) often simplify biological processes, hampering our ability to predict how biology is impacted by climate change. How changing ocean phytoplankton physiology affects global ecosystems remains elusive. Régimbeau *et al.* embedded genome-scale models...

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SOCIAL AND INTERDISCIPLINARY SCIENCES AND PUBLIC HEALTH

Diversity and longitudinal records: Genetic architecture of disease associations and polygenic risk in the Taiwanese Han population

BY TING-YUAN LIU, HSING-FANG LU, YU-CHIA CHEN, CHI-CHOU LIAO, YING-JU LIN, JIA-SING YANG, WEN-LING LIAO, WEI-DE LIN, SHIH-YIN CHEN, YU-CHUEN HUANG, [...] **+23 authors** • 04 JUN 2025

A hospital-based genetic resource captures disease risk in the Taiwanese Han population through longitudinal records.

ABSTRACT

Predicting therapeutic clinical trial enrollment for adult patients with low- and high-grade glioma using supervised machine learning

BY MUKLI MEHARI, GAYATHRI WARRIER, ABRAHAM DADA, AYMEN KABIR, ADEN P. HASKELL-MENDOZA, ARUSHI TRIPATHY, ROHAN JHA, EDWIN NIEBLAS-REDOLLA, JOSHUA D. JACKSON, ARIEL T. GONZALEZ, [...] SHAWN L. HERVEY-JUMPER • **+17 authors** • 04 JUN 2025

Supervised machine learning models were designed and externally validated to predict glioma therapeutic clinical trial enrollment.

ABSTRACT

NEUROSCIENCE

Adolescent maturation of cortical excitation-inhibition ratio based on individualized biophysical network modeling

BY AMIN SABER, KEVIN J. WISCHNEWSKI, KYESAM JUNG, LEON D. LOTTER, H. LINA SCHAARE, TOBIAS BANASCHKEWIK, GARETH J. BARKER, ARJUN L. W. BOKDE, SYLVAIN DESRIVIÈRES, HERTA FLÖR, [...] SOFIE L. VALK • **+26 authors** • 04 JUN 2025

Individualized simulations reveal a decrease in excitation-inhibition ratio in association areas throughout adolescence.

ABSTRACT

Diversity and complexity of auditory representation in the hearing systems of *Aedes aegypti* mosquitoes

BY TAKURO S. OHASHI, YIFENG Y. J. XU, SHUNSUKE SHIGAKI, YUKIO NAKAMURA, TAI-TING LEE, YUMIN M. LOH, EMI MISHIRO-SATO, DANIEL F. EBERL, MATTHEW P. SU, AZUSA KAMKOUCHI • **04 JUN 2025**

Male *Aedes aegypti* auditory processing is substantially more complex at multiple levels than conspecific females.

ABSTRACT

Type II kinase inhibitors that target Parkinson's disease-associated LRRK2

BY NICOLA D. BAI, KATHERINE J. BURRIDGE, MARTA SANC-MUÑOZ, VERENA DEGENER, ANDREAS KRÄMER, MARTIN P. SCHWALM, NICOLAS M. LATTAL, LEWIS ELSOK, DEEP CHATTERJEE, SEBASTIAN MATTHEA, [...] STEFAN KNAPP • **+3 authors** • 04 JUN 2025

LRRK2 type II kinase inhibitors stabilize the inactive kinase form, offering tools to study and treat Parkinson's disease.

ABSTRACT

A cell-type-specific epigenetic mechanism encodes social investigatory behavior via *Lrhcn1* and *Hcn1*

BY PENGWEI QIN, WANTING ZHAO, XIAOTING ZHOU, YIQING GUO, LANFANG LI, ZHIQIANG LIU, XIYA SHEN, CHUNQING YANG, XIAOMEI TANG, DIAN YU, [...] YOUMING LU • **+10 authors** • 04 JUN 2025

A group of specific neurons may regulate your extroverted or introverted personality.

ABSTRACT

EARTH, ENVIRONMENTAL, ECOLOGICAL, AND SPACE SCIENCES

Unveiling the link between phytoplankton molecular physiology and biogeochemical cycling via genome-scale modeling

BY ANTOINE RÉGIMBEAU, OLIVIER ALMONT, CHRIS BOWLER, LIONEL GUILLET, GEORGE A. JACKSON, ERIC KARSENTI, LAURENT MEMERY, ALESSANDRO TAGLIAPIETRA, DAMIEN VÉLARD • **04 JUN 2025**

A genome-enabled ESM built on genomic data assesses physiological acclimation and biogeochemical effects through nutrient stress.

ABSTRACT

Subduction-like process in Europa's ice shell triggered by enhanced eccentricity periods

BY MARTIN KIKHOLELO, GAEL CHOULET, GABRIEL TOBIÉ, KLÁRA KALOUSOVÁ, ODRÉJ GÁDEK • **04 JUN 2025**

Subduction in the ice shell of Jupiter's icy moon Europa might be triggered by variations in the moon's orbital eccentricity.

ABSTRACT

Subpolar North Atlantic cooling reinforced by colder, drier atmosphere with a weakening Atlantic meridional overturning circulation

BY YIFEI FAN, DUO CHAN, EUGENE E. CLOTHAUX, PENGFEI ZHANG, LAIFANG LI • **04 JUN 2025**

Weakened AMOC cools the subpolar North Atlantic Ocean via radiative effects of colder and drier atmosphere.

ABSTRACT

The most energetic transients: Tidal disruptions of high-mass stars

BY JASON J. HINKLE, BENJAMIN J. SHAPPEE, KATIE AUCHETTEL, CHRISTOPHER S. KOCHANEK, JACK M. M. NEUSTADT, ABIGAIL POLIN, JAY STRADER, THOMAS W.-S. HOLODEN, MARK E. HUBER, MICHAEL A. TUCKER, [...] ANNA V. FAYNE • **+5 authors** • 04 JUN 2025

ENTs, the most energetic transients, will provide a unique probe of the properties of massive black holes in the early universe.

ABSTRACT

The Fe-Ni phase diagram and the Earth's inner core structure

BY LIANGRU WU, ZEPENG WU, KAI-MING HO, RENATA M. WENTZOWITZ, YANG SUN • **04 JUN 2025**

Fe-Ni phase diagram simulations under Earth's core conditions suggest complex inner core structures beyond past assumptions.

ABSTRACT

Ice-related flooding in the lower Yellow River driven by atmospheric teleconnections over the past 160 years

BY SHI-YONG YU, LIANG ZHOU, WENJIA LI, CHUNHAI LI, XUEFENG YU, JÖRG FRANK • **04 JUN 2025**

Climate warming shifted ice-jam hot spots and reduced flood frequency in the Yellow River, demanding adaptive water strategies.

ABSTRACT

PHYSICAL AND MATERIALS SCIENCES

Magnetic brightening and its dynamics of defect-localized exciton emission in monolayer two-dimensional semiconductor

BY YUEI XIANG, KESUKE SHINOKITA, KENJI WATANABE, TAKASHI TANIGUCHI, KAZUNARI MATSUDA • **04 JUN 2025**

The light emission with single-photon characteristics exhibits enhanced brightness under a magnetic field in monolayer WSe₂.

ABSTRACT

Hollow-core fiber made of ultralow expansion glass: Toward the ultimate stability for room-temperature fiber optics

BY MENG DING, JIAN A. DAVIDSON, GREGORY JASON, BO SHI, JOHN R. HAYES, PETER C. SCHULTZ, DAVID J. RICHARDSON, FRANCESCO POLETTI, RADAN SLAVIK • **04 JUN 2025**

A hollow-core fiber made of ultralow expansion glass shows near-zero thermal sensitivity.

ABSTRACT

Self-powered artificial vibrissal system with anemotaxis behavior

BY MENG QI, YANYUAN REN, TAO SUN, RUNZE XU, ZIYU LV, YE ZHOU, SU-TING HAN • **04 JUN 2025**

The artificial vibrissal system provides a feasible approach for the anemotaxis behavior of neural robots.

ABSTRACT

Machine reading and recovery of colors for hemoglobin-related bioassays and bioimaging

BY SANG MOK PARK, BEOM KWON, YUJUN LI, HARIPRIYA SATHYVEL, JUNG WOO LEE, YUNSIANG KWAN, JONATHAN HUANG, GEORGE T.-C. CHUI, ANDREW R. O'BRIEN, RAYMOND L. KONGER, [...] YOUNG L. KIM • **+1 authors** • 04 JUN 2025

Machine color reading and learning enable color-based digital diagnostics.

ABSTRACT

Vector atom accelerometry in an optical lattice

BY CATIE LEDESMAN, KENDALL MEHLING, MURRAY HOLLAND • **04 JUN 2025**

The interference of matterwaves in a programmable 3D optical lattice is used to realize a precision multi-axis quantum sensor.

ABSTRACT

Hyperselective carbon membranes for precise high-temperature H₂ and CO₂ separation

BY GAURAV M. IYER, CHING-EN KUI, CHEN ZHANG • **04 JUN 2025**

Unprecedented H₂/CO₂ selectivities were achieved in a carbon molecular sieve membrane for precise high-temperature H₂ separation.

ABSTRACT

Hypermultiplexed integrated photonics-based optical tensor processor

BY SHAOYUAN QIU, XIAOWEN XUE, LIAN ZHOU, CHUN-HO LEE, ALEXANDER SLUDS, RYAN HAMERLY, KE ZHANG, HANKE FENG, YUE YU, RESHMA KOPPARAPU, [...] ZHAUN CHEN • **+4 authors** • 04 JUN 2025

Space-time-wavelength multiplexing with microlasers and lithium niobate photonics achieves energy-efficient scalable computing.

ABSTRACT

Deciphering co-ion and counterion transport in polyamide desalination membranes reveals ion selectivity mechanisms

BY YUN QIU, JINLONG HE, JUNWEI ZHANG, MENG SHENG, ZHIWEI WANG, MENACHEM ELMELICH, LI WANG • **04 JUN 2025**

Salt selectivity in polyamide desalination membranes is primarily governed by selective partitioning of co-ions.

ABSTRACT

Waveform-dependent air fluorescence from neutral and ionic nitrogen molecules

BY HAO LIANG, MENG-SHAN TSAI, CHUN-CHIA TSENG, MING-CHANG CHEN, UWE THUMM, MENG HAN • **04 JUN 2025**

Waveform-dependent air fluorescence driven by near-single-cycle pulses is demonstrated.

ABSTRACT

Harmonic-induced plasmonic resonant energy transfer between metal and semiconductor nanoparticles

BY YUEMING YAN, NATHAN J. SPEAR, ADAM J. CUMMING, KARINA KHUSAINOVA, JANET E. MACDONALD, RICHARD F. HAGLUND • **04 JUN 2025**

Near-field ultrafast plasmonic interactions reveal sub-picosecond upconversion dynamics.

ABSTRACT

Gradient double-twisted Bouligand structural design for high impact resistance over a wide range of loading velocities

BY SHAO-MENG WEN, WEITAO GAO, SI-CHAO ZHANG, JUN FANG, CHEN GU, HUA-LING GAO, ZHUN ZHENG, SI-MING CHEN, SHU-HONG YU • **04 JUN 2025**

A bioinspired double-twisted Bouligand structure with gradient composition exhibits wide-spectrum impact resistance.

ABSTRACT

Frequency-tunable sound amplification in a conch-like cavity with graphene thermoacoustic resonance

BY YU-HONG WEI, ZHAN-FENG GUO, YUN-FAN WANG, TAO LIN, WEI-WEI HOU, SHU-WEN DUAN, LU-QI TAO, HE TIAN, YI YANG, TIAN-LING REN • **04 JUN 2025**

A graphene-integrated 3D cavity overcomes sound performance limitations, boosting SPL by 39 dB at 5.4 kilohertz.

ABSTRACT

BIOMEDICINE AND LIFE SCIENCES

Bioceramics-enhanced patch activates epicardial epithelial-to-mesenchymal transition via Notch pathway

BY CHENGSHIN DING, CHEN QIN, YAN SUN, YUEYANG LIU, GUOFENG TANG, ZHEBIN LIAO, CHAOHAN ZHAO, CHENJIE WU, LEYU WANG • **04 JUN 2025**

An engineered cardiac patch containing bioceramics activates epicardial epithelial-to-mesenchymal transition.

ABSTRACT

Fecal metabolite profiling identifies critically ill patients with increased 30-day mortality

BY ALEXANDER P. DE PORTO, NIKHILAS P. DYLLE, MATTHEW STUTZ, HUAYING LIN, MARIAM KHALID, MICHAEL W. MULLOWNEY, JESSICA LITTLE, AMBER ROSE, DAVID MORAN, MARY MC MILLIN, [...] BHAKTI K. PATEL • **+16 authors** • 04 JUN 2025

Fecal metabolic dysbiosis is independently associated with 30-day mortality in critically ill patients.

ABSTRACT

HDAC7 promotes renal cancer progression by reprogramming branched-chain amino acid metabolism

BY HYETUNG NAM, ANIRBAN KUNDU, SUMAN KARRI, RICHARD L. KIRKMAN, DARISHAN S. CHANDRASEKHAR, JEREMY B. FOTTE, GUOFANG ZHANG, WENTAO HE, SOORYANARAYANA VARMAKALLY, HAN-FEI DING, SUNIL SUDARSHAN • **04 JUN 2025**

Epigenetic suppression of branched-chain amino acid catabolism by HDAC7 promotes renal tumor progression.

ABSTRACT

Splenic fibroblastic reticular cells orchestrate dendritic cell maturation and facilitate CD8⁺ T cell priming and protective memory

BY YANNICK O. ALEXANDRE, NIKITA POTEMKIN, DOMINIK SCHENSTOCK, BAPTISTE DUCHAMP, ANNICKA POCH, SUSAN N. CHRISTO, SHIHAN LI, LEI QIN, LYNETTE BEATTIE, DANIEL T. UTZSCHNEIDER, [...] SCOTT N. MUELLER • **+3 authors** • 04 JUN 2025

Fibroblastic reticular cells of the spleen coordinate inflammation for optimal antiviral T cell responses and protective memory.

ABSTRACT

Low-dose radiation for radiopharmaceutical therapy enhances GD2 TRAC-CAR T cell efficacy in localized neuroblastoma

BY QIAOVIN H. SODU, AMANDA SHEA, DAN CAPPABIANCA, MATTHEW H. FORSBERG, JENS C. EICHGOTT, MALICK BIO (IDRISIO), ANDY S. OLLENDORFF, OHYUN KWON, IRENE M. ONG, REINER HERNANDEZ, [...] ZACHARY S. MORRIS • **+5 authors** • 04 JUN 2025

Pretreating neuroblastoma with low-dose radiation by a radiopharmaceutical agent before CAR T cells eradicates neuroblastoma.

ABSTRACT

Volumetric printed biomimetic scaffolds support in vitro lactation of human milk-derived mammary epithelial cells

BY AMELIA HASENAUER, KAJETANA BEVC, MAXWELL C. MCCABE, PARTH CHANSORIA, ANTHONY J. SAVOLA, KIRK C. HANSEN, KAREN L. CHRISTMAN, MARCY ZENBI-WONG • **04 JUN 2025**

3D-printed breast tissue models pave the way for cutting-edge lactation research.

ABSTRACT

Inhibition of virally induced TFEB proteasomal degradation as a host-centric therapeutic approach for coronaviral infection

BY TRAVIS B. LEWIS, MADIS B. LARSEN, BO LIN, BENJAMIN R. TREAT, QING CAO, AINE N. BODUREAU, KARINA C. LOCKWOOD, IRENE ALFARAS, JASON R. KENNERDELL, LAURA SALMERIN, [...] YUAN LIU • **+16 authors** • 04 JUN 2025

Pharmacological prevention of DCAF7-mediated TFEB protein degradation opposes coronaviral infection.

ABSTRACT

Precision-controlled sequential drug release via electrochemical corrosion of liquid metal nanopen, linkers

BY JIE QI, CHAO XIE, MIAN CHEN, CHEN HANG, LINGMIN ZHANG, XINYU JIANG • **04 JUN 2025**

A drug delivery system using drug-loaded liquid metal particles enables programmable and sequential drug release.

ABSTRACT

Inhibition of acute lung inflammation by a neuroimmune circuit induced by vagal nerve stimulation

BY KATLIN MURRAY, MICHAEL CREMIN, EMMA TAY, KRISTINA SANCHEZ, SIERRA SCHREIBER, ELLIOTT LLOYD, INGRID BRUST-MASCHER, WESLEY LEIGH, JANNAT ASHRAF, MELANIE G. GAREAU, COLIN REARDON • **04 JUN 2025**

A lung anti-inflammatory pathway can be activated to block acute lung inflammation.

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