



SCIENCE ADVANCES
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ONLINE COVER: Freely floating ice in calm waters. Predicting ice dynamics remains crucial to understanding Earth's climate, but analysis of small bodies of ice has generally been overlooked. Using real-time tracking, Noto and Ulta revealed the transient processes that govern the melting of freely floating ice and developed a theoretical model for the melt rate of small ice bodies...

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 BIOMEDICINE AND LIFE SCIENCES

SOCIAL AND INTERDISCIPLINARY SCIENCES AND PUBLIC HEALTH

Spatial and racial/ethnic disparities in cardiovascular mortality attributable to PM_{2.5} components in the contiguous United States
 BY YING HU, LINDSEY CHOI, STEFANO BENNETTI, SARAH ZANEL, LUDWIG OPIKA, YUSUF LULU, BRIGGS S. SPATZ, HARLAN M. KRUMHOLTZ, KAC CHEN • 28 JAN 2024
 Regional and racial/ethnic disparities in PM_{2.5} components-attributable CVD mortality highlight need for targeted interventions.
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Neuroimmune activation in temporal lobe epilepsy patients with worsening seizure following the COVID-19 pandemic: A TDP-43 PET/MR study
 BY LING XIAO, LI JIN, TAO JIANG, MINQI DU, MANUELA HOU, YONGRANG TANG, SHAO HU, LI FENG • 28 JAN 2024
 TSP0 PET and inflammatory markers reveal spread neuroinflammation in temporal lobe epilepsy with seizure worsening after COVID-19.
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RIN3 mutations impairing binding of the Alzheimer's disease-associated protein BIN1 lead to RAB5 hyperactivation and endosomal pathology
 BY HANNA LAMMICHIOCCO, ANDRÉS C. SOLÍS, VISHVAK SINGH, SHREYAS BHASKAR, HARJ P. SAINI, WALTER P. C. CURTIZ, SE HOON CHOI, DAVIDY PROKOPCHUK, RUSLAIN E. TANGI, RAJA BHATTACHARYA • 28 JAN 2024
 Disrupted BIN1-RIN3 interaction drives RAB5 hyperactivation and endosomal pathology, revealing a key mechanism in AD.
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α-Synuclein expression is required for somatodendritic dopamine release and immediate early gene induction
 BY SE JOON CHOI, ANKA FRANK, MANU BENJOU, SOUMI TAVEL, JONAS BENDIS, STAVROS PANOUKAKIS, BELLAHMI O. HOBSON, NADEENOR RAJAKULINGAM, ULF DETHMER, ELLEN KANTER, I. J. EUGENE V. MOGRIADY • +1 authors • 28 JAN 2024
 L-type calcium channel activity is reduced in cells lacking α-synuclein, leading to compromised synaptic plasticity.
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The gut-brain vagal axis governs mesolimbic dopamine dynamics and reward events
 BY JONAH O'NEILL, SHANTONU JAYAKUMAR, TONGYU LI, SHUNJI PANG, JULIEN CASTEL, ANTHONY FANGSAL, SERGIO BERTHINI, BELLAHMI HARBIB, CHARLIE DE ALMEIDA, LEONOR BAI, I. J. EUGENE V. MOGRIADY • +5 authors • 28 JAN 2024
 Gut-brain vagal signals gate dopamine ensembles, reshaping reward and motivation beyond a brain-centric view.
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Complementary cortical and thalamic contributions to cell type-specific striatal activity dynamics during movement
 BY INDIA SLOAN, RAM DUTTA BHATTI, HANLIN LIU, SHAGUN SHARMA, XINLEI LIN, KEELIN O'NEIL, OSCAR M. ARROYO, SUN WOO HONG, HANNAH KIM, JEFFREY LIU, I. J. TAKAKU KODAYAMA • +3 authors • 28 JAN 2024
 Cell type-specific striatal activity during movement is shaped by cortical and thalamic inputs with complementary roles.
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EARTH, ENVIRONMENTAL, ECOLOGICAL, AND SPACE SCIENCES

Kilometer-scale convection-allowing model emulation using generative diffusion modeling
 BY JOSEPH PATAK, VIKRANT PRAKASH, PETER HARRINGTON, NIKHIL BENDAPATI, SUDIP DUTTA, MERTCELA MARQUES, JACOB HANSEN, SHOBHANA S. KATHA, KALYANATH, MICHAEL PETROVICH • 28 JAN 2024
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 BY FENGHONG LIU, ENRICO HUANG, JINLONG DU, WENTAO MA, ZHONGHUI LIU, LUCA J. LOURENS, JUN TIAN • 28 JAN 2024
 Continental weathering and shelf-basin carbonate partitioning regulate Oligocene-Miocene carbon cycling on orbital timescales.
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Melting dynamics of freely floating ice in calm waters
 BY SHIBU NOTO, HOSU N. ULTA • 28 JAN 2024
 Floating ice drifts and melts with quiet grace yet sits surrounding waters at an unexpected pace.
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Seismic and mineralogical evidence for an iron-rich mega-ultralow-velocity zone beneath Hawai'i
 BY KYOTEN KIM, JUNG-HO KONG, YANLIE V. DOMBROVAJLIVE, VEDRAN LONČIĆ • 28 JAN 2024
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Absence of dehydration during water to superionic transition at Earth's core-mantle boundary
 BY YU HE, WEI ZHANG, QINGYANG HUI, SHOUKAM BHAL, JIAZI HU, DASHONG LIU, LI ZHOU, LIJING DAI, DUCK YOUNG KIM, SHAOA T. REIFERN, I. J. HOKKAWA MARI • +2 authors • 28 JAN 2024
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Single-particle surface-enhanced coherent anti-Stokes Raman scattering: Nanoparticle design and mechanism
 BY SHOUJIAO WANG, CHENG YONG, YONGJIAN LI, DEJIAN LIU, JINGJIE LI, SHIYI CHEN, YONGJIAN WANG, JINHA HE, BRUNO S. CARVALHO, DEBEN N. SUDIP, HANNAH C. SCHROEDER, I. J. ZACHARY D. SCHWARTZ • +3 authors • 28 JAN 2024
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 BY BENJAMIN CROCKETT, NICOLA MONTAUDO, JAMES VAN HOVE, PETER KUTZOSKI, YANG LIU, ROBIN HELFERT, WEI ZHANG, ROBERTO MORANDOTTI, JOSÉ AZARÁ • 28 JAN 2024
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 BY HONGJIE CHENG, HONG LIU, YUE LI, ZHIGANG HAO, GUANGHONG ZHANG, ZHANG PAN, QINGBAO KONG, XIAODONG LI, DEWU RAHBE • 28 JAN 2024
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Advancing quantum imaging: Electrical tunability enabled by versatile liquid crystals
 BY DONG ZHANG, SHUNJI DING, RUI SUN, ZHANG LI, WEN CHEN, YIYANG ZHANG, SHI JIA LIU, YIYANG WANG, FANGTIAN CHEN, PENG CHEN, YAN ZHOU • 28 JAN 2024
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ML-automated microfluidic circuit design
 BY HENRIET VERBAE, BERTHE VERBAE, ANNE WILHELM, SHIBU O'NEILL, ABDELHAKIM HADJILAKH, VIVIAN O'NEILL, NIKHIL TADOKILI • 28 JAN 2024
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 BY CHENG ZHANG, JINHAO ZHANG, JUNYI KANG, MATTHEW DAVE, MATTHEW REDDER, ARTHUR OETIKER, THOMAS HOTTIG • 28 JAN 2024
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In situ anchoring 2D hexagonal Zn-MOF on MXene toward robust anode-less 5 V-class Li metal batteries
 BY YUAN TIAN, ZHANG PEI, DEYAN LUAN, JIANG WEN, DAVID LOU • 28 JAN 2024
 2D hexagonal Zn-MOF is in situ anchored on MXene as a host for robust anode-less 5 V-class Li metal batteries.
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Computational rational design of unpecific peroxxygenase for C-H oxidation
 BY RICHEN DAI, XIAOYI FU, ZHENGLIN LI, ZHANG WANG, GUANJIAN LI, JUN QI, FRANK HOLLYLANDER, ZHANGFENG WANG, WEIYONG LIU, XIAOLONG WU • 28 JAN 2024
 Computational design delivers CvUPO with 13-fold higher C-H oxidation activity and ~99% ee.
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One-stop strabismus digital diagnosis via AI-integrated skin-like and wearable "Electronics"
 BY YONG YONG, JIN LI, JIANJIA TANG, HENRY DU, JINGJIE ZHANG, YUNTAO WANG, YONGHONG JIANG, YIYANG CHEN, XUE FENG • 28 JAN 2024
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A synthetic *Antrodia cinnamomea* galactomannan library by frameshift unveils a potent immunoregulatory octasaccharide domain
 BY QISHAN LI, XIAOLAN ZHANG, JIAN LIU, PENG WANG, HONGJIE GAO, ALLAN HEE HEN HO, YUAN GAO, HAN DING, XUE HUI LIU, MIN LI • 28 JAN 2024
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Synergizing network topology and solvent compatibility for gels with hyperelasticity and omniadhesion
 BY QIQI XUE, SHUO HE, JINGCHEN LI, WEI HONG, CANHU YANG • 28 JAN 2024
 A general principle of synergizing network topology and solvent compatibility is proposed for hyperelastic and omniadhesive gels.
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From light to sound: Seeing and hearing the placenta in health and disease
 BY DOMINIQUE LEE, JINGJIE XIE, JINGCHEN LI, WENHONG JIANG, SHIYANG CHANG, WENHONG CHEN, CHANGHONG WU, ZHENYU WU • 28 JAN 2024
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BIOMEDICINE AND LIFE SCIENCES

Monitoring glioblastoma extracellular vesicle evolution using a nanodiagnostic platform to detect glioma stem cell driving recurrent disease
 BY ZHEN ZHANG, RICHARD J. LOBE, PAUL TONNEY, JING WANG, REBECCA LAKE, GUAN ZHOU, XUEBIN HU, SHAI FALKNER, OUN AL-DEBARI, BRIAN W. GAY, I. J. MATT TRAU • +3 authors • 28 JAN 2024
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CATSPER2 extracellular domains are essential for sperm calcium channel assembly and activity modulation
 BY JAY YOUNG HANDEL, HENRIETTA WANG, JINHAO ZHANG, JINHAO ZHANG, JINHAO ZHANG, WELLES S. SOKKESBEEK, JIAN JI CHANG • 28 JAN 2024
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Longitudinal monitoring of type 1 diabetes progression to disease onset
 BY JESSICA L. KING, JUSTIN RYAN, RICHARD S. OBER, ELIZABETH BRADLEY, JULY DRISCOLL, LARA RAO, SCOTT A. GOLDENSHLUGER, LEWIS S. SHEA • 28 JAN 2024
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A genetic screen for modifiers of cohesin clustering identifies regulators of genome folding
 BY WENJIE XIAO, DANIEL S. PARK, SON C. NGUYEN, RACHEL YANG, ERIC F. JOYCE, RAJAN JAIN • 28 JAN 2024
 A large-scale imaging study identified factors involved in protein modification and gene regulation as genome folding regulators.
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Multimodal social context modulates larval behavior in *Drosophila*
 BY ANHILA MOURADOU, ÉLÉNE ZAROUK-GIBÉ, KATHIA VOÏT • 28 JAN 2024
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Inhibition of focal adhesion kinase impairs tumor formation and preserves hearing in a murine model of NF2-related schwannomatosis
 BY JAMES K. MATHIAS, PAUL B. BRITTON, LI JIANG, HENRY HARRIS, MATHYAN S. BUCKLER, SHAOHONG LI, QINGBO LU, SHAOJIAN GAO, SHI YONG, SARAH K. BARKER, I. J. DAVID CLAPP • +11 authors • 28 JAN 2024
 Inhibition of focal adhesion kinase (FAK) impairs schwannoma formation and preserves hearing in an NF2 mouse model.
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Structural insight into the glucose-6-phosphate transport by G6PT1 and inhibition mechanism of CGA
 BY QINGBO CHEN, PU YUAN, RENJIE LI, XIAOYI DU, FLEI XU, YAN ZHANG • 28 JAN 2024
 G6PT1 structures reveal its transport and inhibition mechanisms, aiding drug design for sugar metabolic diseases.
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An electrophilicity-engineered magnetic sensor for MRI detection of dormant tumor cell clusters
 BY ZETUO LIANG, BO ZHANG, JUN LIU, LIN XIAO, SHAOHEI HE, HUI DU, QIYU WANG, FANGYUAN LI, DASHENG LIANG • 28 JAN 2024
 An electrophilicity-engineered magnetic nanosensor enables in vivo MRI detection of tumor cell clusters at sub-100-μm scale.
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Induction of collective behavior by β-1,3-glucans in microalgae
 BY LIAN HANSEN, RICHARD D. CORTELLI, MARTINE BRUNO • 28 JAN 2024
 Alongside their known roles as CO₂ storage molecules in the oceans, β-1,3-glucans induce collective behavior in green algae.
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Efflux pumps control intracellular drug-target kinetics by limiting rebinding in bacteria
 BY SUBRATA DEB, REHANA STEVENSON, DALE M. MURPHY • 28 JAN 2024
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 BY YUEL LIEBEL, ANNE S. GUPTA, VICTORIA CHEVÉ, URI ALON, DAVID S. BONDEUR • 28 JAN 2024
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Cryo-EM structure of human AQP11 reveals a trimeric architecture with a large pore
 BY SHIYA SUZUKI, AKIHO KANEKAWA, SAISHI KODAI, KOJI NISHIKAWA, KATSUKASA IRIE, YOSHINOBU FUKUYAMA • 28 JAN 2024
 The trimeric structure of AQP11 forms a wide pore for water and solutes and offers a previously unknown drug target.
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LIMCH1-enriched extracellular vesicles promote vascular permeability in early-onset preeclampsia
 BY SHUN SUZUKI, SHUN SUZUKI, TAKAYUKI UCHIDA, HISAKI YOSHIDA, HIROHITO SUZUKI, MASAHITO KITAHARA, SHUNJI KAWAGUCHI, HISAYUKI YAMADA, RIKKA MIKI, SHIYUKI ITOH, YOSHINOBU FUKUYAMA • +5 authors • 28 JAN 2024
 LIMCH1-enriched extracellular vesicles promote endothelial permeability, which is a central pathology of preeclampsia.
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The root nodule symbiosis regulator NIN exhibits broad DNA binding specificity conferred by an NLP-inherited motif
 BY SHOHEI NISHIKI, MICHIOKA NISHI, HIROHITO ONO, MOTOYUKI TADA, TAKA SUZUKI • 28 JAN 2024
 Acquisition of a motif was a prerequisite for NODULE INCEPTION to function in transcriptional control of symbiotic genes.
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Pyruvate kinase muscle 2 (PKM2) promotes CD4 T cell survival by regulating pyruvate oxidation during homeostasis and expansion
 BY JEFF J. BURLESON, ERIN M. PALMER, JESSICA C. WALLS, STEVEN HUI, JIAN A. BETTENEDER, TRISTRAN R. BOWEN, SCOTT K. DURUM, DANIEL W. MCCOY • 28 JAN 2024
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Structural basis of transcription-coupled H3K36 trimethylation by FACT
 BY YOSHITA KALLALA, HARSHAD BHARA, TOMOHITO ITO, MASAHITO HIRAI, ERINO OYA, TAKESHI KOBAYASHI, SHUNICHI ENOME, HIROSHI KURAMIZAKA • 28 JAN 2024
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