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SCIENCE ADVANCES
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ONLINE COVER: *Digitalis purpurea*, or the common foxglove, displays vibrant bell-shaped petals and is the natural source of the cardiac drug digoxin. Foxglove plants are one of at least 17 plant orders that contain cardenolides, steroid hormones that can act as an anti-herbivore defense for plants by influencing the central nervous system of mammals. Xu *et al.* found that foxglove...

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FOCUS

Addressing equity and validity in faculty career advancement
BY CENTER FOR EXCELLENCE IN FACULTY ADVANCEMENT, JOHAN M. MADERA, CHRISTIANE SPITZMULLER • 15 APR 2026

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Expression at the edge: Free speech boundaries amidst the Gaza crisis
BY RAN ABRAHIMTZKY, GUY ORDESMAN, YPPIFACH-LEKES, HANI MANSSOUR, TAMAR MITTS • 15 APR 2026

Students draw campus speech lines using shared principles, yet perceived harm and ideological alignment shape who gets protected.

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NEUROSCIENCE

C. elegans somatostatin/allatostatin C signaling regulates sleep, metabolism, survival, and memory via a sleep-active neuron
BY EYONATAN PANK, LARA MOCHER, INKA BOGARD, LAURA UHLMIG, LORENZO ROSSI, SILL POLLMEIER, ELLEN DEENE, MAJIDUL HANIF, STRIBAN, SAJAL MANDAL, RESHA DOMING SAVIO, HENRIK BRINGSMANN • +2 authors • 15 APR 2026

A conserved somatostatin pathway regulates sleep and physiology through a sleep-active neuron.

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Intracortical brain-computer interface for navigation in virtual reality in macaque monkeys
BY SPYRIDON SOTIROPOULOS, SOPHIE DE SCHRIJVER, JESSIE BONDIA-RAMIREZ, THOMAS DEGRANDT, PETER JANSEN • 15 APR 2026

Decoded brain signals enabled monkeys to navigate virtual reality without physical movement.

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Observational constraints project a ~50% AMOC weakening by the end of this century
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Combining observations and climate models suggests a 60% stronger weakening of the Atlantic circulation than using models alone.

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Strain accumulation associated with locked subduction megathrusts revealed by deep-ocean borehole observations
BY TIANHONGHE SUN, EARL E. DAVIS • 15 APR 2026

Deep-sea borehole data show evidence for strain accumulation of locked subduction faults in advance of earthquakes or slow slip.

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Underestimated agricultural losses due to flooding
BY SHIGEO ZHANG, LIMING ZHOU, HONGBIN LIANG, QIMAJIAN QIUKASIM, YONGJUN DAI • 15 APR 2026

Flood-induced agricultural losses are underestimated in current crop models and may rival or even exceed those caused by droughts.

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Broad presence of ferromagnetism in bees and relationship to phylogeny, natural history, and sociality
BY LAURA RUDD, CALLEN ALLEN, CAMERON S. JORDENSEN, LIZABETH GUSLEY, C. CHARLOTTE BUCHANAN, MICHAEL WINNHOFFER, SEAN D. BRADY, LAURENCE PROCKER, ANNE MURRAY, GUSTIN A. GILBERT • 15 APR 2026

Ferromagnetism, and likely magnetoreception, is widespread and predates the phylogenetic origin of the bees.

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Uncovering the rapidly evolving orbits of the dynamic TOI-201 system
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A rare co-orbiting system with a super-Earth, warm Jupiter, and brown dwarf is visibly evolving on human-observable timescales.

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Enhancing biomedical optical volumetric imaging via self-supervised orthogonal learning
BY YUNHANG DU, YUJIN WANG, ANSO SOON, JIHOPEUNG WANG, LUYI WANG, LIU ZHANG, HONGJIAN LI, YAO HUI, JUN CHANG, ZHU LIU, BOHUN KONG • 15 APR 2026

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Low-field hyperpolarized MRI is used to study cellphone-band microwave propagation and absorption through tissue mimics.

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Ion trap membrane with confined bind-jump strategy for high-efficiency direct lithium extraction
BY YAOJIAN DU, DA LIU, LICHENG ZHANG, XIAO DU, BAOLIANG LIU, ZHONG LIU • 15 APR 2026

Covalent organic framework-based ion trap membranes with efficient monovalent cation separation for direct lithium extraction.

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Multimodal operando characterization unravels polaron accumulation and ion dynamics in high-stability ambipolar OECTs
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A balanced ion exchange in a conducting polymer film prevents degradation and boosts organic transistor stability.

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Bioresorbable acoustic patch for simultaneous sealing and early detection of gastric leakage
BY JUNHAO HUI, JIAQIANG XU, HAOZONG MENG, KANGDI GUAN, YUTONG LI, ZHONGYU LIU, GUOCHEN SHEN • 15 APR 2026

An implantable acid-responsive hydrogel that seals gastric leaks while amplifying ultrasonic signals for early detection.

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Direct observation of muonic molecules in resonance states critical to muon catalyzed fusion
BY Y. TOHYAMA, T. AZUMA, O. A. BENNETT, W. B. DORRISSE, M. S. DURBIN, J. W. FOWLER, J. D. GARG, T. HASHIMOTO, R. HAYAKAWA, Y. ICHINOHE, J. T. YAMASHITA • +28 authors • 15 APR 2026

High-resolution x-ray spectroscopy with a cryogenic detector reveals long-ignored resonance states driving muon catalyzed fusion.

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A miniature magnetic switch unlocking multimodal, chip-free, and batteryless airway sensing
BY YUJING WANG, MILEE RIKK, HANFEN FAN, RUIJIAN GE, DARREN WANG, FABIAN MALDONADO, CAITLIN DENAREST, YONGJIAO ZHOU, HAOGUANG DONG • 15 APR 2026

A miniature magnetic switch allows multiplexing in chip-free sensory devices for sensing airway physiological properties.

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Drawn-on-skin electronic tattoo as a closed-loop sensing-stimulation system for the muscles
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Electronic tattoos can precisely sense and stimulate target muscles, enabling advanced rehabilitation and motor control.

ABSTRACT

Breaking the activity-stability limit in acidic oxygen evolution reaction with dual-iridium active sites
BY LETANG, YONGJIAN TU, MINYONG ZHANG, YAN YAN, SHIBO XU, YAN LUAL, YUJIAN LUO, JAVIER PEREZ-AMARIZ, ZHOU LIN • 15 APR 2026

Lattice-confined Ir patches boost acidic OER by preventing dissolution and enabling dual active sites for activity and stability.

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Multitissue, multi-time point transcriptomic atlas of aging in mice and rats
BY TEA BHASKARASE, YAN YONG, ROSARIO DOMINGUEZ, GORILLA MCKERLIN, APRILASH DAVIS, MATTHEW BINKAL, HORTER SALAZAR, JACOB TRENBERT, ELIAS PHELIPPOULE, LARRY PROCTOR, J. DAVID J. SLADIS • +9 authors • 15 APR 2026

Gene expression changes in multiple tissues throughout the life of mice and rats, suggesting mechanisms for age-related diseases.

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Cross-species prediction reveals chromatin regions with increased accessibility in humans
BY LUNYAO WANG, YURUI LI, DONGMEI HAN, ZHEN WANG • 15 APR 2026

Cross-species prediction reveals human increased chromatin accessibility regions that drive human evolution.

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Steering semi-flexible molecular diffusion model for structure-based drug design with reinforcement learning
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Matrix plasticity and the molecular basis of extracellular filament assembly in *Bacillus cereus*
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BY JUSTIN E. WELLS, CHAN Y. PARKER, DANJIAN LI, JAKE D. PRISHE, JOSE GHEBT, GAJAH ROBINSON, KIMBERLY S. WENZEL, VANISHA GOEL, LAURA JANK, LUSHENG HE, J. MARTINE F. ROUSSEL • +4 authors • 15 APR 2026

Tumor organoids from embryonal brain tumors can be used for functional and translational assays to accelerate clinical trials.

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Correlation of CheY-P concentration and motor behavior during attractant adaptation in single *E. coli* cells
BY TATSUYA YAMAGUCHI, YUKI TAKEDA, TAKUMA NAKAGAWA, SHIJI UEDA, YOSHIO UCHIDA, YOSHISUKI CHE, AKIHO SHIRAKAWA, HIROSHI FUKUDA • 15 APR 2026

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Multimics profiling and experiments in preclinical models revealed RAD51-IN-1 as a synergistic potentiator of anlotinib sensitivity
BY HUANQIANG MENG, QIANJING CHANG, YASHIANG ZHANG, JINLIANG REN, HONGYU GUO, LIANG YU, CHENG QIAN, YI JIANG, LIN ZHANG, WEIJIAN CHENG • 15 APR 2026

Combining RAD51-IN-1 with anlotinib represents a therapeutic strategy in ovarian cancer.

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Mammalian-like steroidogenesis in plants gives rise to endocrine-mimetic cardenolides
BY MENGJUN XU, DAVID W. KAESTNER, WELLIANG LUO, FU-SHANG LI, PETER MÜLLER, YULIN SUN, WENTAO HSIAO, CHRISTOPHER M. SILKNERMAN, MORGAN GUEMPFL, HEATHER J. KULIK, JING-KE MENG • 15 APR 2026

Plants carry out mammalian-like steroidogenesis that generates endocrine-mimetic cardenolides.

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Mucoadhesive tumor-penetrating nanomedicine for intravesical chemo-immunotherapy against bladder cancer
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Peaceful queen succession in the naked mole rat
BY SHANES C. ABEYWARDENA, ALEXANDRIA M. SCHRAMMAN, VICTOR DELGADO CUEVAS, JANELLE S. AYRES • 15 APR 2026

Queen succession in naked-mole rats can occur peacefully, maintaining colony stability without conflict.

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