

Volume 649 Issue 8096, 8 January 2026

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Branch management

From tree branches to blood vessels, physical networks are often thought of as one-dimensional wires connecting points. In this view, the need to keep the overall 'wire length' to a minimum is thought to help shape the network's layout. But the functional requirements of 3D networks such as the vascular system or the brain's connectome should quickly overtake the need for length optimization, making their growth hard to predict. In this week's issue, [Albert-László Barabási](#) and colleagues explore such tree-like, branched networks and find that a different — [about all](#)

Cover image: Péter Puklus

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This Week

Editorial

Editorial

06 Jan 2026

Defossilize our chemical world

Achieving net zero means eliminating fossil fuels, not carbon — the chemical element has a crucial part to play in powering the modern world.

Research Highlights

- Research Highlight**

17 Dec 2025

Biobanks reveal genetic complexity in human evolution

Tiny genetic variations between humans, Neanderthals and Denisovans might not be all they were cracked up to be.
- Research Highlight**

19 Dec 2025

Oddly cool super-hot planet has an atmosphere it shouldn't

It's a mystery why TOI-561 b's blanket of gases hasn't boiled off.
- Research Highlight**

18 Dec 2025

Hot spot: plants use infrared signals to say they're ready to reproduce

Some cycads warm up their reproductive organs to attract specially equipped pollinating beetles in the dark.
- Research Highlight**

17 Dec 2025

How the Romans built their empire of concrete

A unique archaeological site at Pompeii, Italy, reveals the secrets of peculiarly durable Roman building materials.

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News in Focus

News

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19 Dec 2025

AI and quantum science take centre stage under Trump — but with little new proposed funding

The US administration is banking on public-private partnerships and an expanded workforce to deliver progress, but critics say that this strategy could be offset by other US policies.

Jenna Ahart

Collection: [How Trump 2.0 is reshaping science](#)
- News**

09 Dec 2025

AI is saving time and money in research — but at what cost?

Artificial-intelligence tools are boosting researchers' productivity, but some worry about the effect of a growing reliance on them.

Rachel Fieldhouse
- News**

15 Dec 2025

More than half of researchers now use AI for peer review — often against guidance

A survey of 1,600 academics found that more than 50% have used artificial-intelligence tools while peer reviewing manuscripts.

Miryam Naddaf
- News**

16 Dec 2025

Scientists skip key US meetings — and seize on smaller alternatives

Researchers are devising creative ways to get together as Trump's policies curb travel to US gatherings.

Alexandra Witze

Collection: [How Trump 2.0 is reshaping science](#)
- News**

15 Dec 2025

NSF softens grant review rules to cope with backlog

Agency staff members say that the changes are reasonable, but they are worried about the potential effects on review.

Dan Garisto

Collection: [How Trump 2.0 is reshaping science](#)
- News**

17 Dec 2025

Restoring youth to old immune cells: mRNA therapy turns back the clock

Testing in mice suggests that rejuvenating T cells could make vaccines and some cancer therapies more effective.

Heidi Ledford

Features

- News Feature**

07 Jan 2026

'I rarely get outside': scientists ditch fieldwork in the age of AI

In the race to embrace new technologies, some ecologists fear their field is losing touch with nature.

Aisling Irwin
- News Feature**

06 Jan 2026

Why cancer can come back years later — and how to stop it

Researchers are targeting dormant tumour cells that might explain why some cancers reappear long after successful treatment.

Amanda Heidt

Collection: [Cancer at Nature Portfolio](#)

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Books & Arts

Book Review

- Book Review**

05 Jan 2026

These women helped to shape quantum mechanics — it's time to recognize them

An astute book redresses our collective perception of a field that became known as 'boys' physics'.

Indianara Lima Silva
- Book Review**

18 Dec 2025

Living water and whispering rocks: Books in brief

Andrew Robinson reviews five of the best science picks.

Andrew Robinson

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Opinion

Correspondence

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06 Jan 2026

To improve resilience to climate change, track what endures

Stacy-ann Robinson
- Correspondence**

06 Jan 2026

Rethink how we build AI to enable effective climate-change mitigation

Carlos Rodríguez-Pardo & Massimo Tavoni
- Correspondence**

06 Jan 2026

Help small-scale gold miners to transition away from mercury use

Shabbir Ahmad & Saleem H. Ali
- Correspondence**

06 Jan 2026

Retire 'seminal' from the scientific vocabulary

Nicole D. Senter & Christine Sprunger

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Work

Feature

- Career Feature**

05 Jan 2026

Pandemic PhDs: graduates anxious, but optimistic, about the future

Five early-career scientists from around the world share how lingering COVID-19 pandemic shadows and ripples from US academic disruptions have affected them.

Amanda Heidt

Where I Work

- Where I Work**

05 Jan 2026

I see Mozambique's baboons as windows into hominid evolution

In Gorongosa National Park in Mozambique, Rasmus Farass studies how humans came to walk on two legs.

Patricia Maia Noronha

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Research

News & Views

- News & Views**

26 Nov 2025

Land-use changes threaten the safety net for birds

Alterations in land use are found to leave bird communities with fewer backup species for key ecological roles, making ecosystems vulnerable to further species loss.

Carlos P. Carmona
- News & Views**

07 Jan 2026

Ultra-low-density exoplanets observed around a young star

Measurements of the masses of exoplanets orbiting a young star have identified a system of low-density 'super-puff' planets.

Valerio Nasimbini
- News & Views**

10 Dec 2025

SOS: RNA processing mechanism rescues genes from invasive DNA

Transposable elements can insert into genes, disrupting protein-coding potential. Researchers discover a mode of RNA processing, 'SOS splicing', that provides a quick fix.

René F. Ketting
- News & Views**

10 Dec 2025

Shared genetic risk in psychiatric disorders

Scientists have characterized the broad genetic patterns that are shared across 14 psychiatric disorders. Could it reframe how mental-health conditions are diagnosed?

Abdel Abdellou
- News & Views**

06 Jan 2026

Artificial skin mimics the octopus's art of disguise

A 'phonic skin' with controllable colour and texture brings materials science a step closer to the adaptive camouflage found in nature.

Benjamin Renz & Na Liu
- News & Views**

26 Nov 2025

Shape-shifting electrodes tune optical frequency converter

Devices made from certain materials can double the frequency of light. Programmable electrodes can tune this response to produce various light spectra.

Kartik Srinivasan
- News & Views**

06 Jan 2026

The poetic life and death of a glow worm

A peek behind the scenes at the zoo reveals animal escapades, and a glow-worm shines in a mild midwinter, in our weekly dip into *Nature's* archive.

Perspective

- Perspective**

07 Jan 2026

A framework for addressing racial and related inequities in conservation

This Perspective proposes a new framework to support the inclusion of Black, Indigenous, and people of colour in conservation initiatives.

Moreangels M. Mbitah, Tanesha Allen ... Duan Biggs

Articles

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07 Jan 2026

A young progenitor for the most common planetary systems in the Galaxy

A nine-year transit-timing campaign has measured the extremely low masses and densities of four large planets orbiting the young star V1298 Tau, which are now predicted to contract and form a typical compact super-Earth and sub-Neptune system.

John H. Livingston, Erik A. Petigura ... Lorenzo Pino
- Article**

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07 Jan 2026

Surface optimization governs the local design of physical networks

Analysis of the local branching geometries of several physical networks shows violations of predictions of length and volume minimization, leading to the hypothesis that estimating the material cost requires accounting for the full three-dimensional geometry.

Xiangyi Meng, Benjamin Piazza ... Albert-László Barabási
- Article**

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07 Jan 2026

Aharonov–Bohm interference in even-denominator fractional quantum Hall states

This study reports coherent Aharonov–Bohm interference, including statistical phase contributions, in a Fabry–Pérot interferometer at two even-denominator fractional quantum Hall states in high-mobility bilayer-graphene van der Waals heterostructures. It reported.

Jehyun Kim, Himanshu Dev ... Yuval Ronen
- Article**

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08 Dec 2025

Programmable on-chip nonlinear photonics

An optical slab waveguide with highly programmable nonlinear functionality is described, enabling the demonstration of versatile control over broadband second-harmonic generation across the spectral, spatial and spatio-spectral domains.

Ryotatsu Yanagimoto, Benjamin A. Ash ... Peter L. McMahon
- Article**

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07 Jan 2026

Towards fibre-like loss for photonic integration from violet to near-infrared

Germeno-silicate used as a building material for integrated photonics circuits substantially reduces optical losses, approaching levels comparable to those in optical fibres.

Hao-ling Chen, Kellan Colburn ... Kerry Vahala
- Article**

07 Jan 2026

Soft photonic skins with dynamic texture and colour control

Inspired by dynamic textural modulation in cephalopod skin, polymer films whose colour and surface texture can be dynamically and independently controlled are developed and demonstrated using standard electron-beam patterning tools.

Siddharth Doshi, Nicholas A. Gosken ... Mark L. Brongersma
- Article**

07 Jan 2026

High-voltage anode-free sodium–sulfur batteries

A new architecture based on high-valence sulfur/sulfur tetrachloride cathode chemistry is described for manufacturing high-voltage anode-free sodium–sulfur batteries, demonstrating promise for applications in grid energy storage and wearable electronics.

Shitao Geng, Bin Yuan ... Hao Sun
- Article**

07 Jan 2026

Prulse heating and slip enhance charging of phase-change thermal batteries

A battery based on the design of a composite coating that enables slip-enhanced close-contact melting inside sealed phase-change thermal batteries to improve charging rates enables high-performance thermal energy storage over a wide range of temperatures.

Zi-Rui Li, Nan Hu ... Li-Wu Fan
- Article**

07 Jan 2026

Soft biodegradable implants for long-distance and wide-angle sensing

A soft, biodegradable, wireless lensing device can monitor pressure, temperature and strain over long distances (up to 16 cm), maintaining accuracy across varying positions and angles.

Yuyun Lan, Shuang Li ... Yewang Su
- Article**

07 Jan 2026

Small persistent humid forest clearings drive tropical forest biomass losses

A bookkeeping approach shows that disturbed tropical humid forests experienced net aboveground carbon loss during 1990–2020, primarily driven by small but persistent deforestation clearings owing to persistent land-use conversion without forest regrowth.

Yidi Xu, Philippe Clais ... Wei Li
- Article**

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26 Nov 2025

Land-use change undermines the stability of avian functional diversity

Large-scale analyses of bird species traits reveal that land-use change reduces resilience of key ecological functions more than previously thought.

Thomas L. Weeks, Patrick A. Walkden ... Joseph A. Tobias
- Article**

19 Nov 2025

Rare microbial relict sheds light on an ancient eukaryotic supergroup

The discovery of an unusual protist named *Solarion orionae*, which has a mitochondrial genome with some intriguing features, provides insight into the early radiation of eukaryotic groups.

Marek Valí, Tomáš Flínek ... Ivan Čepička
- Article**

29 Oct 2025

Plague-in strategy for leucine-rich repeat (NLR) genes in wild and cultivated potato genomes enables the identification of genes that confer protection against late blight, and provides a transgene-free strategy for engineering disease resistance in potato.

Luyao Wang, Hongbo Li ... Sanwen Huang
- Article**

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10 Dec 2025

Mapping the genetic landscape across 14 psychiatric disorders

Genomic analysis applied to 14 childhood- and adult-onset psychiatric disorders identifies five underlying genomic factors that explain the majority of the genetic variance of the individual disorders.

Andrew D. Grotzinger, Josefien Wenne ... Jordan W. Smoller
- Article**

19 Nov 2025

Connectivity underlying motor cortex activity during goal-directed behaviour

All-optical mapping of neural connectivity in motor cortex links network topology to network dynamics and computation underlying naturalistic goal-directed behaviour.

Arseny Finkelstein, Kayvon Daie ... Karel Svoboda
- Article**

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05 Nov 2025

Adenosine signalling drives antidepressant actions of ketamine and ECT

Adenosine signalling is identified as the central mechanism of action of the antidepressant effects of ketamine and electroconvulsive therapy, and newly developed analogues of ketamine exhibit improved antidepressant efficacy with reduced side effects.

Chenyu Yue, Na Wang ... Minmin Luo
- Article**

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12 Nov 2025

Ecology and spread of the North American H5N1 epizootic

The parrot of highly pathogenic H5N1 since 2021 was driven by around nine introductions into the Atlantic and Pacific flyways, followed by rapid dissemination through wild migratory birds, primarily *Anseriformes*.

Lambodar Damodaran, Anna S. Jaeger & Louise H. Monda
- Article**

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10 Dec 2025

Gene-drive-capable mosquitoes suppress patient-derived malaria in Tanzania

Engineering of local *Anopheles gambiae* under containment enables the generation of a transgenic strain equipped with non-autonomous gene drive capabilities that robustly inhibits genetically diverse *Plasmodium falciparum* isolates obtained from naturally infected children.

Tibebu Habtewold, Dickson Wilson Lwetojera ... George K. Christophides
- Article**

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20 Oct 2025

Parity and lactation induce T-cell-mediated breast cancer protection

Parity induces an accumulation of CD8⁺ T cells, including cells with a tissue-resident-memory-like phenotype within human normal breast tissue, offering long-term protection against triple-negative breast cancer.

Balaji Virasamy, Franci-Carmela ... Shereen Loi
- Article**

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12 Nov 2025

SIGLEC12 mediates plasma membrane rupture during necroptotic cell death

CRISPR-Cas9 based genome-wide screening shows that SIGLEC12 mediates plasma membrane rupture in cells undergoing necroptosis, possibly through a human-specific mechanism, indicating its potential as a therapeutic target.

Hyunjin No, Zeena Hashem ... Ayaz Nigajov
- Article**

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19 Nov 2025

Tumour-reactive heterotypic CD8⁺ T cell clusters from clinical samples

Tumour-reactive CD8⁺ T cells are enriched in functional clusters with tumour cells and/or antigen-presenting cells and can be isolated and expanded from clinical samples.

Sofía Baltez-Molero, Johanna Veldman ... Daniel S. Peepker
- Article**

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05 Nov 2025

Lymph node environment drives FSP1 targetability in metastasizing melanoma

Targeting FSP1 in lymph nodes has considerable potential for blocking melanoma progression.

Mario Palma, Milena Chauhan ... Jessalyn M. Ubellacker
- Article**

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05 Nov 2025

Targeting FSP1 triggers ferroptosis in lung cancer

The ferroptosis suppressor protein FSP1 has a critical role in ferroptosis protection of tumours across multiple in vivo models and is linked to worse prognosis in human lung adenocarcinoma, suggesting its potential as a therapeutic target in lung cancer.

Katherine Wu, Alec J. Vaughan ... Thales Papagiannakopoulos
- Article**

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10 Dec 2025

An RNA splicing system that excises DNA transposons from animal mRNAs

A new type of mRNA splicing mechanism discovered in *Ceponobolus elegans* that detects and removes inverted repeats also occurs in human cells, thereby providing another strategy to protect against the negative effects of transposable elements.

Long-Wen Zhao, Christopher Nardone ... Scott Kennedy
- Article**

12 Nov 2025

iPEX enables micrometre-resolution deep spatial proteomics via tissue expansion

Isotopic tissue magnification is integrated with matrix-assisted laser desorption/ionization mass spectrometry imaging to enable untargeted spatial proteomics at micrometre resolution and with high protein identification rates in multiple tissue types.

Fengxiang Wang, Cuiji Sun ... Yilong Zou

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Amendments & Corrections

- Author Correction**

12 Dec 2025

Author Correction: Unravelling cysteine-deficiency-associated rapid weight loss

Alan Varghese, Ivan Gusarov ... Evgeny Nudler
- Author Correction**

12 Dec 2025

Author Correction: Distinct fibroblast subsets drive inflammation and damage in arthritis

Adam P. Croft, Joana Campos ... Christopher D. Buckley
- Author Correction**

12 Dec 2025

Author Correction: Cancer SLIC43A2 alters T cell methionine metabolism and histone methylation

Yingjie Bian, Wei Li ... Weiping Zou
- Author Correction**

[Open Access](#)

11 Dec 2025

Author Correction: Conservation and alteration of mammalian striatal interneurons

Emily K. Corrigan, Michael DeBardine ... Alex A. Pollen

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