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Family secrets

The cover captures an aerial gathering of Nobel Song Dragonflies (*Rhyothemis resplendens*). Rats are extraordinary creatures — they are the only mammal capable of powered flight, have remarkable disease resistance, use echolocation for navigation, hibernate and have longer than expected lifespans for their size. Our knowledge of that evolution and their remarkable adaptations is far from complete. In this week's issue, Xiuyue Zhang, Michael Hiller, Liliana Davalos, Irene Ruiz-Arava, Xiaodi Yao and Nels Elde (Lead Author Collection) present genomes for 130 bat species, representing ... Show all

Cover image: Rosie Ji and Shen Yanbao.

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AI-powered medical devices must be tested in real-world settings

Each time a new clinical decision-making engine (service assessment) is processed used to approve drugs and self-driving cars.

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Beware sham scientific societies: the research community must be more vigilant

As economic rules fuel scams harder to spot, a policy of superstition must increase without wasting hard.

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Nepal's floods expose issues with climate-disaster funding – former policies are needed fast

The UN's climate-loss and damage fund needs to consider how to make decisions about finance fairly and quickly, after disappointing low-resource options.

Chiran Babu Shrestha

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Why AI companies can't be trusted to self-regulate

From aviation to banking, high-risk industries are subject to independent oversight and meaningful penalties. AI companies should be no exception.

Andy Kitchur

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Huge hoard of metal bars hints at vast iron Age trade

One tonne cache of iron is the largest ever found — and enough to make roughly 500 swords.

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Youthful fans of YouTube sports videos stick to the sofa

Viewing academic and sports videos online can be active, but gaming videos trigger participation in exercise.

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Dust in the wind is on the decline

The global decrease is atmospheric dust might be affecting Earth's temperature.

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Bumblebees don't mind a little plastic in their honeypots

Insects show off their adaptability by incorporating pollinator construction materials to build honey storage vessels.

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Will AI really kill us all? The science behind the hype

Nature examines whether the technology might spell the end for humans, and why AI companies are calling for a moratorium.

Elizabeth Gibney

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Chinese companies doubled down on science after US tech restrictions

Affected Chinese companies adapted their sources of knowledge to stay competitive.

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How fast are you ageing? Ask AI

A new suite will help scientists to refine large-language models for longevity research and clarify 'biological' age.

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Europe pushes for space independence amid geopolitical rifts

The European Union is seeking to reduce its US space infrastructure — and scaling to grow its satellite and launch operations.

Jonathan O'Callaghan

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Gravitational tug of war inside Earth is changing the length of our days

A battle of forces, driven by the motion of Earth's core, can cause small variations in the planet's rotation, study finds.

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First fat RNA therapy: mass with rare motor neuron disease improves after treatment

Gene-targeting treatments could be used to treat other people with rare forms of amyotrophic lateral sclerosis (ALS).

Rachel Fieldhouse

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There's a new form of bronze — and it's really weird

A boron phase prepared under pressure is a million times more conductive than chemists expected, and can be stretched.

Elissa Shevinsk

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The super STINGs is cooking coral reefs – can holobiotes and probiotics save them?

Researchers are trying everything they can to help coral reefs to survive severe heat stress from climate change, including empty-sounds antidotes.

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Stephen Hawking biography explores an 'exceptionally clear, uncluttered mind'

An elegant account of the physicist's unusual life may highlight the relationships that inspired him.

Neil Turok

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How to put people first in cyberspace

Digital technologies increasingly shape everyday life. Computer scientist Frances Bernat tells Nature that stronger safeguards are required to protect the public from harm.

Chris Stokel-Walker

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The roots of astrology, the mysterious nature of time and more: Books to brief

Andrew Robinson reviews five of the best science picks.

Andrew Robinson

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AI can widen science – but only if institutions stop rewarding the already-measurable

Funders, journals and universities must embed the creation of new scientific ties in their ranking of all practice.

Guowei Huang, Hang Hu ... Zhuoling Lin

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Vaping in childhood has bigger health risks than we'd thought

Use of e-cigarettes makes it more likely that young people will experience mental health disorders and take up smoking. Governments must act.

William D. Carroll & Francis J. Gilchrist

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PhD training should encourage ethical dissent

Kun Wan Lee, Nicholas Fouad & Anna Wilkinson Schnabel

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From Tyrian horses to AI-proof exams: how professors are tackling students' AI use

Academics worldwide are rethinking their assessment approaches — from developing exams that artificial intelligence tools can't pass to crowding hidden AI prompts into tasks to catch cheating students.

Katarina Zimmer

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Bigger than CRISPR? A guide to the latest genome editors

Gene-editing techniques could soon allow researchers to replace entire genes and engineer complex cellular circuits — if the systems can be delivered safely into cells.

Heidi Ledford

Technology Feature: CRISPR and the genome

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Gravitational forces inside Earth drag some decades out — and make others fly by

Variations in the length that rotate the solid Earth have been measured over several by gravitational coupling between Earth's inner core and its solid mantle.

Dominique Jault & Mark Person

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Genome project opens the next chapter for studying bat evolution

A hundred collection of bat genomes will help researchers learn about the evolution of one of the world's most unusual groups of mammals.

Liselle Sofia

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A widespread agricultural practice is an unexpected CO2 sink

Ploughing of agricultural soils has been considered a source of carbon, but in North America's largest river basin, it has resulted in net capture of atmospheric carbon.

E. Phillip Robertson & Stephen K. Hamilton

Collection: Carbon Dioxide Removal

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A new chapter in targeting kinase enzymes in cancer

Inhibitors of enzymes these enzymes have been considered to produce cancer treatments. Now, targeted protein degraders could reshape therapeutic options.

Alice T. Shaw

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The cost of lost labour on a warming planet

Researchers quantify the economic damage caused by climate change-related heat stress on the global workforce.

Kelly Levin

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Brain fields are organized into zones — and reorganized during pregnancy

A map of the cortex for whole-brain-level models could architecture that differs from that seen in gene expression and protein diffusion.

Xiao Wang Liu

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Writing in development and lost in ageing: the grammar of cellular identity

Ageing affects progressive deterioration of cell identity, where the barriers of epigenetic barriers gradually become written during development.

N. Ozgün Fındı, Adrian Molder & Saskia M. Sanders

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Scalable decision-making for games of imperfect information

Combining search and learning has yielded superhuman performance in perfect-information games, but extending search that is effective under large amounts of hidden information, a longstanding challenge in the field of strategic decision-making.

Samuel Sokota, Eugene Vinitsky ... Gabriele Farina

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Lu^{+} optical frequency references with accuracy verified at the $19th$ digit

The metastable $^{3}P_{0}$ state in ultracold $^{176}Lu^{+}$ has a fractional frequency uncertainty near 10^{-19} and a quiet at 1.1×10^{-18}, allowing precise timekeeping

K. J. Arnold, M. S. S. Loo ... M. D. Barrett

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Anomalous metal and superconducting phases in rhombohedral graphene

Observations of rhombohedral graphene in a new configuration of two-dimensional electron systems, requires time and current indicate the presence of regions of gate-gaun with zero resistance superconductivity alongside others with finite saturation resistance.

Tian Xie, Zhongdong Han ... Matthew Yankowitz

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Stacking-induced dimer band gaps in CVD-grown 1H MoS2 bilayers

Atomically aligned 1H bilayer MoS2 exhibits a direct band gap, enhanced excitonic emission and stronger valley polarization, establishing its potential for advanced optoelectronics and valleytronic applications.

Yin H. Yang, Ji Tong Chen ... Yeru Wen Lan

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Electroluminescent photocrystals extending lithographic scaling to OLEDs

Electroluminescent photocrystals with a 2D photonic crystal structure are developed to achieve high efficiency for ultrawide and electron-beam lithography, and used to fabricate microOLEDs, ultrathin displays with leading-edge resolution and more.

Zhao Wei Lu, Syed B. Dhanekhand ... Chih-Jen Shih

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Defect passivation and optical management of trioctylphosphine oxide for efficient perovskite solar cells

A passivating molecule and antireflection coating are introduced to perovskite solar cells to achieve certified efficiencies up to 25.23%, enhancing scalable high-performance photovoltaics.

Ye Yu, Zhijie Wang ... Wenqi Chen

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Programmable remodelling of carbon–nitrogen connectivity in amines

Tertiary hydroamines can be transformed into stable, scaffolds into programmable platforms for molecular diversification through catalytic remodelling of their C–N bonds.

James D. Robinson, François Brunel ... Matthew J. Gaunt

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Diels–Alder synthesis through heteroatom homolytic substitution

Diels–Alder reactions are among the most powerful and widely used synthetic methods for the construction of six-membered rings. Here, a radical variant is described, providing the ring for multiple different and heteroatom bonds with pharmaceutical applications.

Johannes J. Großkopf, Johnny Z. Wang ... Daniel W. C. MacMillan

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Agricultural liming is a carbon sink in the Mississippi River Basin

Carbon sink records of agricultural liming and its potential to modify inputs for the Mississippi River Basin show that agricultural liming has acted as a net carbon sink over the past century.

Tim Kowal Sutherland, Christopher T. Reinhard ... Noah J. Planavsky

Collection: Carbon Dioxide Removal

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Gravitational tuning drives multifocal radial variations in length of day

Multifocal fluctuations in Earth's rotation rate are driven by gravitational torques of the Sun and moon and revealed by electromagnetic and topographic forces, improving our understanding of the natural properties and dynamics of Earth's deep interior.

Yuefeng Zhang & Mathieu Dumberry

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The nutritional value of invertebrate aquatic foods

Aquatic invertebrates are exceptionally nutrient dense, supplying five expandable annual vitamin B_{12} and selenium requirements for over 3 billion people.

Jessica Zenkovich-Moore, Nicky Wakefield ... Christopher D. Golden

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Earliest alphacaris bearing cephalopod from the early Cambrian

Early Cambrian chimerian alphacaris gen. et sp. nov. preserves eyes and a mandible resembling a primordial siphuncle, extending cephalopod origins and revealing early assembly of chelicerate with earlier biramous appendage.

Zichen Song, Bing Pan ... Haoyi Wan

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Reference genomes and fossils evoke bat family phylogeny and biogeography

An updated phylogeny of bats is presented based on new genome assemblies and many ancient fossils and including all known bat families.

Siddhesh S. Mhaske, Nia Cang ... Emma C. Teeling

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Insights into longevity and virus-driven adaptation from Myotis bat genomes

Comparative genomics of Myotis bats reveals the evolutionary basis of adaptation in one extraordinary primary and longevity-associated pathways, linking mechanisms of DNA repair.

Juan M. Vazquez, M. Ellie Lauterbur ... Peter D. Sudmant

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Neural basis of compositional context

Behaviour of human participants in a two-step task is best explained by a model-based reinforcement learning algorithm, which incorporates estimating latent states, attention-dependent value orchestrating policy switches and relationships when updating value-based contextualization rather than altering continuous policy learning.

Nicola Ferrante, Justin M. Fine ... Benjamin Y. Hayden

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Asymmetric prefrontal representations for leader–follower dynamics

Neural representations in the prefrontal cortex reflect the leading, coordinated, and the medial prefrontal cortex encodes these role dynamics and an asymmetric social hierarchy during joint action.

Yuan Chang, Yuxi Chen ... Norbert Zheng Wu

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A cholinergic hub in the nucleus accumbens gates reward learning

Cell-type-specific circuit dissection reveals that cholinergic interneurons in the nucleus accumbens bidirectionally encode learning without impacting analgesia and decouples reward-dependent dopamine elevations from anticipatory behaviours, suggesting circuit changes in cholinergic tone to rapidly select reward acquisition.

S. Kyarie Nuwabaliwe, Haidan Yan ... Michael R. Tadross

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Functional role of skull-bumpkind structures in CNS immunosurveillance

Functional lymphoid structures within the skull bone marrow mediate central nervous system immunity and shape immune responses to brain disease.

Jong Kyun Park, Daniel Mastorakos ... Jonathan Kipnis

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The holobiontic architecture of the mouse brain

A spatial Epigraph atlas of the mouse brain reveals how the 3D architecture of holobiontic that mirror cell types and connectivity, capture oligodendrocyte heterogeneity and anchorage complex and spatial gene expression.

Luca Fusar Bassini, Fabrizio Heinrich Schaub ... Giulio La Manno

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Maternal influences on infant gut microbiome and health

The maternal gut microbiome is a predictor of infant outcome.

Yoshie Saita, Tatsuhiro Bouchard ... Arnold Alexander

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Membrane-rich peptide programs immunogenic cell death for cancer therapy

The peptide-based nanoparticle PEPITEM (PEP) induces immunogenic membranolytic cell death in tumour cells, robustly potentiating immune checkpoint blockade therapy.

Yuding Yuan, Lifang Gong ... Mengfeng Wang

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TRE-611, a selective, brain-penetrant molecular glue degrader of KLF4

TRE-611 reduces the degradation of KLF4 but not common neosubstrates and exhibits CNS-exclusive toxicity, and its preclinical anti-tumour activity highlights TRE-611 as a potential new way of treating KLF4-positive non-small cell lung cancer.

Andrew R. Cuozzo, Daniel S. Liu ... Eric J. Martinez-Martin

Collection: Cancer as Nature Portfolio

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Rational design of disordered proteins for sequence–function investigation

IDOLON enables the design and testing of thousands of disordered protein region sequences to reveal distinct sequence-to-function relationships.

Alex Holehouse, Tanmoy Mondal ... Rohit V. Pappu

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Sequential reading of a cysteine-shortened peptide immobilized on nanopore

A nanopore-based chip that measures individual sequences peptides and identifies amino acids by using enzymatic digestion to progressively shorten the N-terminal peptide sequence with stepwise differences in sensing.

Wei Chen, Haohao Zhang ... Hagan Bayley

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Structural mechanism governing the directionality of tRNA recombination

Cryo-electron microscopy structures of the tRNA ligase CYP20 reveal recombinase mediates tRNA excision, explaining its tailored preferences for insertion and informing the design of programmable ribosomal tRNA ligase technologies.

Masahiro Nakamori, Jeroen S. Wickramasinghe ... Hiroshi Nishimasu

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CRISPR and the genome

When Jennifer Doudna and Emmanuelle Charpentier worked out the fundamentals of the bacterial antiviral system known as CRISPR — and how it could be reprogrammed — they kicked off a biotechnology revolution.

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Precision medicine

At the heart of precision medicine is a complex question: how does the interplay between genetic and environmental factors shape disease risk?

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