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Volume 640 Issue 8058, 10 April 2025

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Cortex in context

Understanding how the brain works means understanding the function of neurons and the synaptic architecture in which they sit. That goal edges closer with seven papers in this week's issue from the MICrONS (Machine Intelligence from Cortical Networks) consortium. Together these papers present not only a map of 523 million synapses between 200,000 cells in the visual cortex of a mouse, but also functional imaging of around 75,000 of those neurons captured while the mouse viewed a range of visual stimuli. In the flagship paper, the teams of Sebastian Seung, Clay Reid, Andreas Tolias, Xaq Pitkow, Jacob Reimer, Forrest Collman and Nuno Maçarico da Costa introduce the data set (pictured on the cover). — show all

Cover image: Forrest Collman

Table of Contents

- This Week
- News in Focus
- Books & Arts
- Opinion
- Work
- Research
- Amendments & Corrections
- Nature Outlook

This Week

Editorial

Editorial
09 Apr 2025

Why it's time the United Nations is led by a woman

With efforts towards gender equality stalling, voting in a first female head of the UN would provide powerful representation for half the world's population — and be good for all of it.

Collection: The Beijing Declaration: 30 years of progress

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Editorial
08 Apr 2025

Asilomar conference took courage and foresight — today, inclusivity would also be crucial

The 50th anniversary of a landmark biosafety conference is an opportunity to ensure its spirit lives on in today's scientists.

World View

World View
07 Apr 2025

Why more AI researchers should collaborate with governments

Academics can drive policy innovation — but they must shift their focus from publishing papers to creating practical products.

Mohamed Ibrahim

World View
08 Apr 2025

'Now is not the time for despair' — how scientists can take a stand against political interference

Lessons from environmental and other social movements can help researchers to protect scientific integrity from attack.

Fernando Tormos-Aponte

Collection: How Trump 2.0 is reshaping science

Research Highlights

Research Highlight
01 Apr 2025

El Niños that linger are becoming less of a rarity

Multi-year episodes of the climatic pattern are much more frequent now than they were seven millennia ago.

Research Highlight
04 Apr 2025

Revealed: where rare and giant starfish hide from an enigmatic killer

The sunflower star, which can be bigger than a hubcap, escapes a wasting disease by hunkering down in fjords.

Research Highlight
03 Apr 2025

Solar cells made of Moon dust could power up a lunar base

Lunar soil processed to form 'moonglass' allows the creation of efficient, radiation-resistant solar panels.

Research Highlight
02 Apr 2025

What if human blood were toxic to mosquitoes? A drug can make it so

A single dose of the drug nitisinone could render a person's blood lethal to mosquitoes for five days, modelling suggests.

Top of page ⤴

News in Focus

News

News
01 Apr 2025

'One of the darkest days': NIH purges agency leadership amid mass lay-offs

In shock move, four institute directors at the US biomedical agency are removed from their posts.

Max Kozlov

Collection: How Trump 2.0 is reshaping science

News
28 Mar 2025

Can trauma from violence be genetically inherited? Scientists debate Syria refugee study

Study finds genetic imprints in three generations of Syrian refugees. Researchers urge caution in interpreting findings and call for replication.

Miryam Naddaf

News
31 Mar 2025

Brain implant translates thoughts to speech in an instant

Improvements to brain–computer interfaces are bringing the technology closer to natural conversational speed.

Miryam Naddaf

News
01 Apr 2025

Deadly Myanmar earthquake was probably a rare rupture, scientists say

'Supershear' quake moved fast and far, amplifying the damage and human toll.

Alexandra Witze

News
27 Mar 2025

AlphaFold is running out of data — so drug firms are building their own version

Thousands of 3D protein structures locked up in big-pharma vaults will be used to create a new AI tool that won't be open to academics.

Ewen Callaway

News
27 Mar 2025

75% of US scientists who answered *Nature* poll consider leaving

More than 1,600 readers answered our poll; many said they were looking for jobs in Europe and Canada.

Alexandra Witze

Collection: How Trump 2.0 is reshaping science

News
31 Mar 2025

Incredible close-up of colourful crab spiders — March's best science images

The month's sharpest science shots, selected by *Nature*'s photo team.

Emma Stoye

News Q&A
01 Apr 2025

How Europe aims to woo US scientists and protect academic freedom

The European Union's new research chief Ekaterina Zaharieva speaks to *Nature* about attracting disaffected US scientists and cutting grant bureaucracy.

David Matthews

Features

News Feature
08 Apr 2025

Cells are swapping their mitochondria. What does this mean for our health?

Researchers are studying why the energy factories are moving between cells and whether the process can be harnessed to treat cancer and other diseases.

Gemma Conroy

Collection: Cancer at Nature Portfolio

News Feature
09 Apr 2025

Microbial warfare brought us CRISPR. What big breakthroughs could be next?

Gene editing and many other useful biotechnology tools came from studies of bacteria fighting off viral invaders. But scientists have only begun to unlock the secrets of this ancient arms race.

Amber Dance

Advertisement Feature
How AI and materials science feed into each other
AI and materials science have a symbiotic relationship, with each helping advance the other. Robots are generating the materials data AI needs.

Top of page ⤴

Books & Arts

Arts Review

Arts Review
09 Apr 2025

The life aquatic: this board game lets you dip into marine ecology

Finspan is visually stunning and brilliantly captures the intricacies of the ocean's ecosystems.

Angela Chuang & Orlando Schwery

Top of page ⤴

Opinion

Comment

Comment
07 Apr 2025

Why an overreliance on AI-driven modelling is bad for science

Without clear protocols to catch errors, artificial intelligence's growing role in science could do more harm than good.

Arvind Narayanan & Sayash Kapoor

Comment
08 Apr 2025

Science's big problem is a loss of influence, not a loss of trust

Evidence shows that science and scientists remain highly trusted. But genuine scientific voices are not shouting loud enough over the noise to hold sway.

Heidi J. Larson & David M. Bersoff

Correspondence

Correspondence
08 Apr 2025

Countries must consider their global footprint when using natural resources

Éva Plagányi

Correspondence
08 Apr 2025

Europe needs to step up on epidemic preparedness

Jonathan Ewbank

Correspondence
08 Apr 2025

The US is against the world on sustainable development

Guillaume Lafortune & Jeffrey D. Sachs

Correspondence
08 Apr 2025

Europe must grasp chance to become a scientific powerhouse

Oskar MacGregor & Maurice Lamb

Top of page ⤴

Work

Feature

Career Feature
07 Apr 2025

AI for research: the ultimate guide to choosing the right tool

Curious about using artificial intelligence to boost your research? Here are the programs you shouldn't miss.

Amanda Heidt

Technology Feature

Technology Feature
07 Apr 2025

Where do proteins go in cells? Next-generation methods map the molecules' hidden lives

Spatial proteomics is helping biologists to uncover how cells work by mapping where proteins operate.

Ariana Remmel

Collections: NatureTech, Spatial Proteomics

Where I Work

Where I Work
07 Apr 2025

Studying seabirds with a cactus as a research assistant

Ecologist Cecilia Soldatini tracks the movements of magnificent frigatebirds.

Ugo Mellone

Top of page ⤴

Research

News & Views

News & Views
09 Apr 2025

A map of neural signals and circuits traces the logic of brain computation

A large consortium of scientists adds functional data to neuronal wiring maps, seeking to crack the computational circuitry of the mouse brain.

Mariela D. Petkova & Gregor F. P. Schuhknecht

News & Views
08 Apr 2025

Cannabis studies were informing fundamental neuroscience in the 1970s

Research on cannabis was hotting up 50 years ago, and accessible lectures on the physics of matter from Nobel laureate William Bragg, in this week's dip into *Nature*'s archive.

News & Views
09 Apr 2025

Skin wound healing measured remotely through molecular flux

A non-contact wearable device measures the skin's 'microclimate' for continuous, real-time monitoring of wounds and wound healing.

Kellen Chen & Geoffrey C. Gurtner

News & Views
19 Mar 2025

Mutations that accrue through life set the stage for stomach cancer

Comprehensive maps of mutations in healthy and diseased gastric tissue give clues about how cancer arises and could inform early-detection strategies.

Callum Oddy & Marnix Jansen

News & Views
09 Apr 2025

Photonic chips provide a processing boost for AI

Computer processors that exploit both electricity and light could improve the performance of artificial-intelligence systems while consuming less energy.

Anthony Rizzo

News & Views
19 Mar 2025

What is the best type of tree to use for forest restoration?

In forest experiments, tree species capable of high rates of photosynthesis grow more slowly than species with lower maximum rates of photosynthesis — with implications for tree-planting projects.

Pieter A. Zuidema & Madelon Lohbeck

News & Views
19 Mar 2025

Bird brains help scientists to unveil the secrets of speech

Neural recordings from parrots and songbirds reveal the ways in which vocal production is encoded in the brain, highlighting remarkable similarities between how parrots and humans learn to produce sounds.

Joshua Neunuebel

Perspectives

Perspective
09 Apr 2025

Intersectional analysis for science and technology

This Perspective offers a guide for researchers, peer-reviewed journals and funding agencies to make quantitative intersectional approaches a standard part of science and technology research design, where relevant, in efforts to enhance precision in science, and ultimately global equity and environmental sustainability.

Mathias Wullum Nielsen, Elena Gissi ... Londa Schiebinger

Articles

Article
Open Access
02 Apr 2025

Acoustic modes in M67 cluster stars trace deepening convective envelopes

Measuring acoustic oscillations in 27 stars within the M67 cluster presents evidence of a rapidly evolving convective zone as stars evolve from subgiants to red giants.

Claudia Reyes, Dennis Stello ... Timothy R. Bedding

Article
Open Access
26 Mar 2025

Certified randomness using a trapped-ion quantum processor

Certifiably random bits can be generated using the 56-qubit Quantinuum H2-1 trapped-ion quantum computer accessed over the Internet.

Minzhao Liu, Ruslan Shaydulin ... Marco Pistoia

Article
Open Access
12 Mar 2025

Unconventional magnons in collinear magnets dictated by spin space groups

Spin space group theory is applied to identify more than 200 collinear magnets with unconventional magnons; high-throughput calculations with spin–orbit coupling find that most of these unconventional magnets are dictated by the Heisenberg exchange interaction.

Xiaobing Chen, Yuntian Liu ... Qihang Liu

Article
19 Mar 2025

Fluctuating magnetism and Pomeranchuk effect in multilayer graphene

Itinerant magnetism in rhombohedral multilayer graphene shows a large excess entropy from magnetic fluctuations above its critical temperature—typically only associated with local moments—which implies the decoupling of charge and isospin degrees of freedom, and results in the isospin Pomeranchuk effect.

Ludwig Holleis, Tian Xie ... Andrea F. Young

Article
Open Access
09 Apr 2025

An integrated large-scale photonic accelerator with ultralow latency

A large-scale photonic accelerator comprising more than 16,000 components integrated on a single chip to process MAC operations is described, demonstrating ultralow latency and reduced computing time compared with a commercially available GPU.

Shiyue Hua, Erwan Divita ... Yichen Shen

Article
09 Apr 2025

Universal photonic artificial intelligence acceleration

A photonic processor capable of running advanced artificial intelligence models with near-electronic precision is introduced, marking a substantial step towards post-transistor computing technologies.

Sufi R. Ahmed, Reza Baghdadi ... Nicholas C. Harris

Article
09 Apr 2025

A non-contact wearable device for monitoring epidermal molecular flux

A non-contact wearable device that defines and modulates a microclimate adjacent to the skin can measure incoming and outgoing streams of vapourized substances, offering valuable insights into physiological health, wound healing and environmental exposures.

Jaeho Shin, Joseph Woojin Song ... John A. Rogers

Article
26 Mar 2025

Deconstruction of rubber via C–H amination and aza-Cope rearrangement

Deconstruction of rubber is achieved using C–H amination and aza-Cope rearrangement to provide precursors for epoxy resins.

Sydney E. Towell, Maxim Ratushnyy ... Aleksandr V. Zhukhovitskiy

Article
02 Apr 2025

Formation and composition of Earth's Hadean protocrust

A modelling study shows that the trace-element composition of Earth's Hadean protocrust is similar to that of the current average continental crust, severely compromising geochemical arguments for when and how plate tectonics began.

Simon Turner, Bernard Wood ... Bernard Bourdon

Article
19 Mar 2025

Widespread slow growth of acquisitive tree species

Under field conditions, acquisitive tree species generally grow slowly, whereas conservative species show generally higher realized growth, owing to their ability to tolerate unfavourable environmental conditions.

L. Augusto, R. Borelle ... M. Charru

Article
Open Access
26 Feb 2025

Humans in Africa's wet tropical forests 150 thousand years ago

The identification of tools dated to the time of *Homo sapiens* associated with microfloral evidence of wet tropical forests indicates that West African forests were occupied by humans much earlier in human evolution than previously thought.

Eslem Ben Arous, James A. Blinkhorn ... Eleanor M. L. Scerri

Article
Open Access
22 Jan 2025

Leveraging a phased pangenome for haplotype design of hybrid potato

A phased pangenome of potato constructed from 60 wild and cultivated haplotypes shows that substantial hybridization occurred during domestication and enables identification of many putative deleterious variants, providing a basis for the design of improved inbred lines.

Lin Cheng, Nan Wang ... Sanwen Huang

Article
Open Access
19 Mar 2025

The somatic mutation landscape of normal gastric epithelium

Whole-gene sequencing of microdissected gastric glands from individuals with and without gastric cancer reveals distinct patterns of somatic mutations and provides insights into influences on the somatic evolution of the gastric epithelium.

Tim H. H. Coorens, Grace Collord ... Michael R. Stratton

Article
19 Mar 2025

Convergent vocal representations in parrot and human forebrain motor networks

Using advanced brain-recording techniques, parrots were found to have a brain organization for vocal control similar to humans, making them an important model for studying speech and for developing potential treatments for communication disorders.

Zetian Yang & Michael A. Long

Article
Open Access
09 Apr 2025

Functional connectomics spanning multiple areas of mouse visual cortex

Dense calcium imaging combined with co-registered high-resolution electron microscopy reconstruction of the brain of the same mouse provide a functional connectomics map of tens of thousands of neurons of a region of the primary cortex and higher visual areas.

J. Alexander Bae, Mahaly Baptiste ... Chi Zhang

Collection: The MICrONS Project

Article
Open Access
09 Apr 2025

Inhibitory specificity from a connectomic census of mouse visual cortex

Using volumetric electron microscopy, the authors map and analyze the structure of cortical inhibition with synaptic resolution across a column of visual cortex.

Casey M. Schneider-Mizell, Agnes L. Bodor ... Nuno Maçarico da Costa

Collection: The MICrONS Project

Article
Open Access
09 Apr 2025

Functional connectomics reveals general wiring rule in mouse visual cortex

The MICrONS mouse visual cortex dataset shows that neurons with similar response properties preferentially connect, a pattern that emerges within and across brain areas and layers, and independently emerges in artificial neural networks where these 'like-to-like' connections prove important for task performance.

Zhuokun Ding, Paul G. Fahey ... Andreas S. Tolias

Collection: The MICrONS Project

Article
Open Access
09 Apr 2025

Foundation model of neural activity predicts response to new stimulus types

A foundation model trained on neural activity of visual cortex from multiple mice accurately predicts responses to video stimuli and cell types, dendritic features and connectivity within the MICrONS functional connectomics dataset.

Eric Y. Wang, Paul G. Fahey ... Andreas S. Tolias

Collection: The MICrONS Project

Article
Open Access
09 Apr 2025

Perisomatic ultrastructure efficiently classifies cells in mouse cortex

An analysis demonstrates that quantitative measurements of perisomatic ultrastructure features of neurons can be used to categorize them into cell types.

Leila Elabbady, Sharmishtaa Seshamani ... Forrest Collman

Collection: The MICrONS Project

Article
Open Access
09 Apr 2025

NEURD offers automated proofreading and feature extraction for connectomics

Neural Decomposition (NEURD) is a software package that decomposes neuronal data from high-resolution electron microscopy volumes into feature-rich graph representations to facilitate analysis for neuroscience research.

Brendan Celii, Stelios Papadopoulos ... Jacob Reimer

Collection: The MICrONS Project

Article
Open Access
09 Apr 2025

Connectomics of predicted *Sst* transcriptomic types in mouse visual cortex

The authors use Patch-seq and electron microscopy datasets to relate synaptic connectivity to the transcriptomic cell type of different types of inhibitory neuron.

Clare R. Gamlin, Casey M. Schneider-Mizell ... Staci A. Sorensen

Collection: The MICrONS Project

Article
Open Access
26 Mar 2025

A small-molecule SARS-CoV-2 inhibitor targeting the membrane protein

JNJ-9676—a small-molecule inhibitor targeting coronavirus M protein that shows excellent efficacy in Syrian golden hamster models—binds to and stabilizes the M protein dimer in an altered conformational state between its long and short forms, preventing the release of infectious virus.

Ellen Van Damme, Pravien Abeywickrema ... Marnix Van Loock

Article
Open Access
26 Mar 2025

A coronavirus assembly inhibitor that targets the viral membrane protein

High-throughput screening and hit optimization have led to the development of a small molecule, CIM-834, that targets the SARS-CoV-2 membrane protein and blocks assembly of the virus.

Manon Laporte, Dirk Jochmans ... Johan Neyts

Article
26 Feb 2025

Macrophages recycle phagocytosed bacteria to fuel immunometabolic responses

Phagocytosed bacteria can serve as an alternative nutrient source for macrophages, influencing their metabolic and immune responses through the recycling of microbial components, with the process regulated by nutrient-sensing mechanisms and bacterial viability.

Juliette Lesbats, Aurélia Brillac ... Johan Garaude

Article
Open Access
19 Feb 2025

Cooperative nutrient scavenging is an evolutionary advantage in cancer

Nutrient-starved tumour cells cooperate by secreting aminopeptidases that digest oligopeptides in the microenvironment, creating a shared pool of free amino acids.

Gizem Guzelsoy, Setiembre D. Elorza ... Carlos Carmona-Fontaine

Article
26 Feb 2025

Extensive mutual influences of SMC complexes shape 3D genome folding

Orthogonal acute inducible degradation cell lines are used to delineate the mechanisms of how extrusive cohesin, cohesive cohesin and condensin interact to remodel chromosome architecture from interphase to mitosis.

Han Zhao, Lirong Shu ... Haoyue Zhang

Top of page ⤴

Amendments & Corrections

Author Correction
Open Access
20 Mar 2025

Author Correction: Spatially resolved multiomics of human cardiac niches

Kazumasa Kanemaru, James Cranley ... Sarah A. Teichmann

Author Correction
Open Access
21 Mar 2025

Author Correction: Heritable polygenic editing: the next frontier in genomic medicine?

Peter M. Visscher, Christopher Gyngell ... Julian Savulescu

Author Correction
Open Access
21 Mar 2025

Author Correction: AI models collapse when trained on recursively generated data

Ilia Shumailov, Zakhar Shumaylov ... Yarin Gal

Publisher Correction
Open Access
21 Mar 2025

Publisher Correction: A metagenomic 'dark matter' enzyme catalyses oxidative cellulose conversion

Clelton A. Santos, Mariana A. B. Morais ... Mario T. Murakami

Top of page ⤴

Nature Outlook

Nature Outlook
09 Apr 2025

Sleep

Birds do it. Bees do it. Babies do it less than their frazzled parents would like. But sleep remains a mysterious process.

Top of page ⤴

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Articles by subject
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Scientific editing
Nature Masterclasses
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Advertising & partnerships
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