

# CONTENTS

26 March 2015 / Vol 519 / Issue No 7544

## THIS WEEK

### EDITORIALS

#### 389 NEUROSCIENCE

##### Rethinking the brain

Europe's Human Brain Project must act to repair its faltering strategy

#### 389 RESEARCH

##### Applied prestige

UK research assessment highlights the positive effects of science

#### 390 PLANETARY SCIENCE

##### About time

Saturn slowly gives up its secrets

### WORLD VIEW

#### 391 Intelligent robots must uphold human rights

*Hutan Ashrafian*

We need a fourth law of robotics to add to Asimov's three — for the good of the robots themselves

### RESEARCH HIGHLIGHTS

#### 392 SELECTIONS FROM THE SCIENTIFIC LITERATURE

Watched electrons / Reprogramming leukaemic cells / Mudskipper tongue in evolution / Fix for broken science? / Speedy 3D printer / El Niño deters tornadoes / Resistant bacteria at home



### SEVEN DAYS

#### 394 THE NEWS IN BRIEF

Marine protection for Pitcairn islands / Water shortfall predicted / Grim outlook for Europe's bees / Alzheimer's drug shows promising results / Global pattern for smoking shifts towards Africa

## CAREERS

#### 495 CORE FACILITIES

##### Shared support

Centralized research services offer opportunities for those with a predilection for the latest technology

#### NATUREJOBS ADVERTISING FEATURE

Spotlight on the United Kingdom

## NEWS IN FOCUS

#### 397 ANIMAL MODELS

Watching a porcine autopsy at the first pig biobank

#### 398 ECOSYSTEMS

Tropical project aims to plug climate-model gaps



#### 400 COMPUTING

Extreme cryptography offers protection for genomic data

#### 401 SPACE

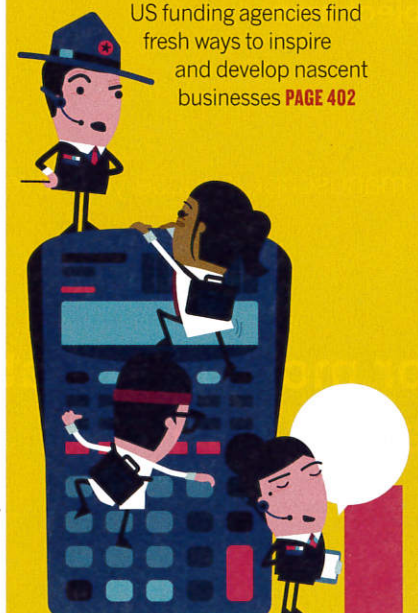
Images from Ceres hint at active ice features

## FEATURES

### INDUSTRY

## Biotech boot camp

US funding agencies find fresh ways to inspire and develop nascent businesses **PAGE 402**



## COMMENT



### CONSERVATION

## Trunk call

Sustainable management is needed to protect Europe's forests for future generations, say Silvano Fares, Giuseppe Scarascia Mugnozza, Piermaria Corona & Marc Palahí **PAGE 407**

#### 410 MEDICAL ETHICS

##### Don't edit the human germ line

*Edward Lanphier, Fyodor Urmov, Sarah Ehlen Haecker, Michael Werner & Joanna Smolenski*

A call for debate on technologies that could pose serious risks for little therapeutic benefit

### BOOKS & ARTS

#### 412 PRIMATOLOGY

##### Among the lemurs

*Henry Nicholls*

#### 413 BOOKS IN BRIEF

### CORRESPONDENCE

414 Big data must comply with privacy laws / Lessons learned from Typhoon Haiyan / Leaders for Africa / The power of celebrity / Rewarding technicians

### FUTURES

#### 498 Asymmetrical warfare

*S R Algemon*





# CONTENTS

26 March 2015 / Vol 519 / Issue No 7544

## RESEARCH

### NEW ONLINE

415 Papers published this week at nature.com

### NEWS & VIEWS

#### 416 CARDIOLOGY

##### A big-hearted molecule

Inhibition of the enzyme PDE9 mitigates heart failure in mice  
*Michaela Kuhn* SEE LETTER P.472

#### 417 PHYSICAL CHEMISTRY

##### Square ice in a graphene sandwich

An unexpected phase of water  
*Alan K Soper* SEE LETTER P.443

#### 418 MOLECULAR BIOLOGY

##### DNA replication reconstructed

The initiation of eukaryotic DNA replication *in vitro*  
*Michael Weinreich* SEE ARTICLE P.431

#### 420 DEVELOPMENTAL BIOLOGY

##### Earn your wings

A molecular switch controls development of the brown planthopper  
*Nathalie Le Bot* SEE LETTER P.464

#### 420 QUANTUM PHYSICS

##### Atomic doughnuts from single photons

A single photon creates entanglement between about 3,000 atoms  
*James K Thompson* SEE LETTER P.439

#### 422 SYSTEMS BIOLOGY

##### Defiant daughters and coordinated cousins

Mathematical modelling explains paradoxical cellular inheritance laws  
*Andreas Hilfinger & Johan Paulsson* SEE LETTER P.468

#### 423 GALAXY FORMATION

##### When the wind blows

How active galactic nuclei launch and propel gas through galaxies  
*James E Geach* SEE LETTERS P.436

### ARTICLES

425 **CELL BIOLOGY** MAP4K4 regulates integrin-FERM binding to control endothelial cell motility  
*P Vitorino et al.*

431 **BIOCHEMISTRY** Regulated eukaryotic DNA replication origin firing with purified proteins  
*J T P Yeeles, T D Deegan, A Janska, A Early & J F X Diffley* SEE N&V P.418



ON THE COVER

## Wind power

A representation of a galaxy with large-scale outflows originating from its nuclear regions. A powerful accretion disk wind with a mildly relativistic velocity has been observed in the X-ray spectrum of IRAS F11119+3257, a nearby ultraluminous infrared galaxy. The energetics of these winds support the theory that they affect the evolution of supermassive black holes and their host galaxies. **PAGES 423 & 436**

### LETTERS

436 **ASTROPHYSICS** Wind from the black-hole accretion disk driving a molecular outflow in an active galaxy  
*F Tombesi et al.* SEE N&V P.423

439 **QUANTUM PHYSICS** Entanglement with negative Wigner function of almost 3,000 atoms heralded by one photon  
*R McConnell, H Zhang, J Hu, S Čuk & V Vuletić* SEE N&V P.420

443 **PHYSICAL CHEMISTRY** Square ice in graphene nanocapillaries  
*G Algara-Siller et al.* SEE N&V P.417

446 **FLUID DYNAMICS** Vapour-mediated sensing and motility in two-component droplets  
*N J Cira, A Benusiglio & M Prakash*

451 **CLIMATE SCIENCE** Increases in tropical rainfall driven by changes in frequency of organized deep convection  
*J Tan, C Jakob, W B Rossow & G Tselioudis*

455 **NEUROSCIENCE** The paraventricular thalamus controls a central amygdala fear circuit  
*M A Penzo et al.*

460 **NEUROSCIENCE** A temporal shift in the circuits mediating retrieval of fear memory  
*F H Do-Monte, K Quiñones-Laracuente & G J Quirk*

464 **DEVELOPMENTAL BIOLOGY** Two insulin receptors determine alternative wing morphs in planthoppers  
*H-J Xu et al.* SEE N&V P.420

468 **CELL BIOLOGY** Lineage correlations of single cell division time as a probe of cell-cycle dynamics  
*O Sandler et al.* SEE N&V P.422

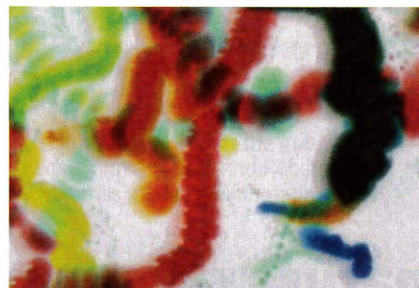
472 **CELL BIOLOGY** Phosphodiesterase 9A controls nitric-oxide-independent cGMP and hypertrophic heart disease  
*D I Lee et al.* SEE N&V P.416

477 **CELL BIOLOGY** SLC38A9 is a component of the lysosomal amino acid sensing machinery that controls mTORC1  
*M Rebsamen et al.*

482 **RNA MODIFICATION** N<sup>6</sup>-methyladenosine marks primary microRNAs for processing  
*C R Alarcón, H Lee, H Goodarzi, N Halberg & S F Tavazoie*

486 **STRUCTURAL BIOLOGY** Structural imprints *in vivo* decode RNA regulatory mechanisms  
*R C Spitale et al.*

491 **STRUCTURAL BIOLOGY** hiCLIP reveals the *in vivo* atlas of mRNA secondary structures recognized by Staufen 1  
*Y Sugimoto et al.*



FLUID DYNAMICS

## Drop zone

Mix water and propylene glycol, then watch the droplets dance. **PAGE 446**