

174
N28/e

nature

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE



Mechanism
of E and O
mating-type
inheritance in
Paramecium

PAGES 430 & 447

TYPE CAST

REPRODUCTIVE MEDICINE

IS THREE A CROWD?

Implications of three-parent embryos

PAGE 414



MENTAL HEALTH

SUICIDE RESEARCH

End neglect of major cause of death

PAGE 421

ADDICTION

WITHDRAWAL SYMPTOMS

How cocaine targets brain plasticity

PAGE 459

NATURE.COM/NATURE

22 May 2014 £10

Vol. 509, No. 7501



CONTENTS

22 May 2014 / Vol 509 / Issue No 7501

THIS WEEK

EDITORIALS

399 GENETICS

Still much to learn about mice

Mutant rodents need careful husbandry

399 FOOD

Not on the label

Scientists must be heard in the debate on genetically modified foods

400 ASTRONOMY

Out with a bang

Big stars face an explosive end

WORLD VIEW

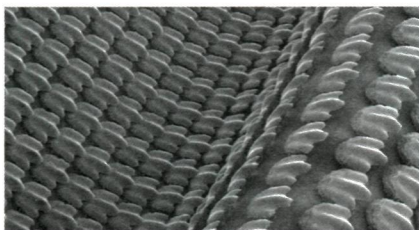
401 A Longitude Prize for the twenty-first century

Martin Rees

How a 300-year-old idea could spur scientific innovation

RESEARCH HIGHLIGHTS

402 SELECTIONS FROM THE SCIENTIFIC LITERATURE



Making magnetars / Natural product synthesis made easy / Biomimetic shark skin / Genomics versus family history / Doomed Antarctic glaciers / Native American descent

SEVEN DAYS

404 THE NEWS IN BRIEF

Statin claims withdrawn / Russia severs ties on space station / HAARP faces closure / Chinese academy backs open access / Winners of slime mould race

CAREERS

521 TECHNOLOGY

Building opportunities

It's early days for 3D printing but engineering and biomedical applications are starting to emerge

523 CAREER BRIEFS

NEWS IN FOCUS



407 PLANETARY SCIENCE

Astronomers scramble to find target for New Horizons probe

408 OCEANOGRAPHY

Demise of Nereus submersible leaves researchers floundering

410 TECHNOLOGY

US seeks to harness predictive power for research success

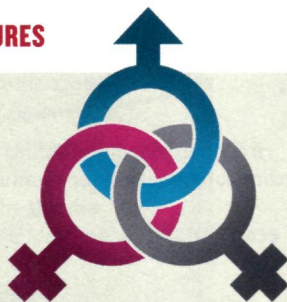
411 GENOMICS

Comb jelly genome reveals unique nervous system

412 PUBLIC HEALTH

Global Fund under fire for tiered pricing of drugs

FEATURES



REPRODUCTIVE MEDICINE

The power of three

Techniques that produce offspring with three biological parents edge towards the clinic **PAGE 414**

418 DEFORESTATION

Carving up the Amazon

Road construction wreaks havoc in the forest

COMMENT



MENTAL HEALTH

Suicide prevention

André Aleman & Damiaan Denys
Public-health authorities, clinicians and researchers need to cooperate to tackle high suicide rates **PAGE 421**

BOOKS & ARTS

424 EVOLUTIONARY BIOLOGY

Darwin and the women

Sarah S Richardson

425 INFORMATION TECHNOLOGY

Forgotten prophet of the Internet

Philip Ball

CORRESPONDENCE

427 Act on European smog / Looking after the soil / Chinese vaccines OK / New approach to Campania's waste / Patents and innovation

OBITUARY

428 Adolf Seilacher (1925–2014)

Derek E G Briggs

FUTURES

526 Trials

John Frizell



CONTENTS

22 May 2014 / Vol 509 / Issue No 7501

RESEARCH

NEW ONLINE

429 Papers published this week at nature.com

NEWS & VIEWS

430 EPIGENETICS

Keeping one's sex

RNA-guided gene silencing maintains mating type in *Paramecium*

Douglas L Chalker

SEE ARTICLE P.447

431 ASTROPHYSICS

Windy stars that go with a bang

A supernova with a probable Wolf-Rayet-star progenitor

John J Eldridge SEE LETTER P.471

432 PHYSIOLOGY

Double function at the blood-brain barrier

Mfsd2a regulates lipid transport and transcytosis across endothelial cells

Christer Betsholtz

SEE LETTERS P.503 & P.507

434 MATERIALS CHEMISTRY

Selectivity from flexibility

A flexible metal-organic framework with high molecular selectivity

Ryotaro Matsuda

435 CANCER

Darwinian tumour suppression

Competition between T-cell progenitors suppresses tumour formation

Eduardo Moreno SEE ARTICLE P.465

436 EARTH SCIENCE

Fertile fields for seismicity

Crustal uplift driven by groundwater extraction in central California

Paul Lundgren SEE LETTER P.483

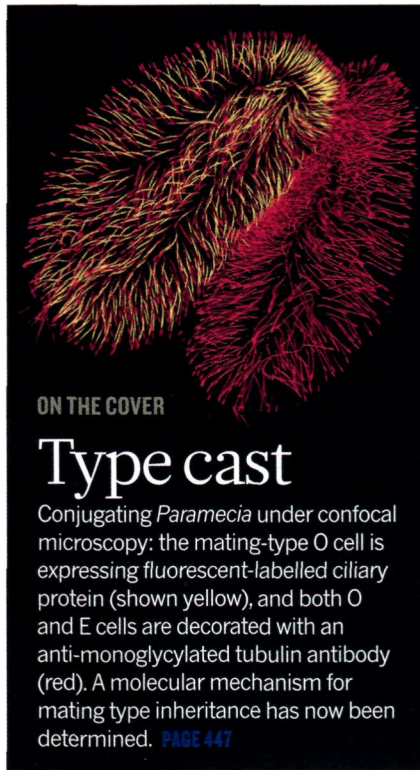
REVIEW

439 **CELL BIOLOGY** The role of senescent cells in ageing
J M van Deursen

ARTICLES

447 **EPIGENETICS** Genome-defence small RNAs exapted for epigenetic mating-type inheritance
D P Singh et al. SEE N&V P.430

453 **NEUROSCIENCE** Amygdala interneuron subtypes control fear learning through disinhibition
S B E Wolff et al.



ON THE COVER

Type cast

Conjugating *Paramecia* under confocal microscopy: the mating-type O cell is expressing fluorescent-labelled ciliary protein (shown yellow), and both O and E cells are decorated with an anti-monoglycylated tubulin antibody (red). A molecular mechanism for mating type inheritance has now been determined. PAGE 447

459 **NEUROSCIENCE** Contrasting forms of cocaine-evoked plasticity control components of relapse
V Pascoli et al.

465 **CANCER** Cell competition is a tumour suppressor mechanism in the thymus
V C Martins et al. SEE N&V P.435

LETTERS

471 **ASTROPHYSICS** A Wolf-Rayet-like progenitor of SN 2013cu from spectral observations of a stellar wind
A Gal-Yam et al. SEE N&V P.431

475 **QUANTUM PHYSICS** Practical quantum key distribution protocol without monitoring signal disturbance
T Sasaki, Y Yamamoto & M Koashi

479 **CLIMATE SCIENCE** Future increases in Arctic precipitation linked to local evaporation and sea-ice retreat
R Bintanja & F M Selten

483 **EARTH SCIENCE** Uplift and seismicity driven by groundwater depletion in

central California

C B Amos et al. SEE N&V P.436

487 **FUNCTIONAL GENOMICS** High-throughput screening of a CRISPR/Cas9 library for functional genomics in human cells
Y Zhou et al.

492 **CANCER** Copper is required for oncogenic BRAF signalling and tumorigenesis
D C Brady et al.

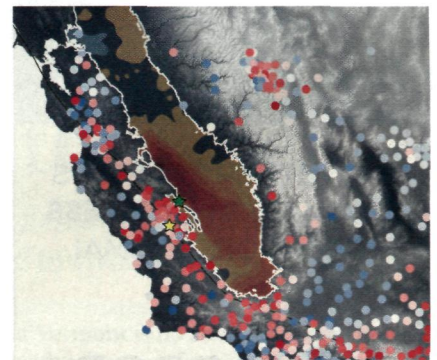
497 **IMMUNOLOGY** Protective mucosal immunity mediated by epithelial CD1d and IL-10
T Olszak et al.

503 **PHOSPHOLIPIDS** Mfsd2a is a transporter for the essential omega-3 fatty acid docosahexaenoic acid
L N Nguyen et al. SEE N&V P.432

507 **PHOSPHOLIPIDS** Mfsd2a is critical for the formation and function of the blood-brain barrier
A Ben-Zvi et al. SEE N&V P.432

512 **STRUCTURAL BIOLOGY** Structure of the AcrAB-TolC multidrug efflux pump
D Du et al.

516 **STRUCTURAL BIOLOGY** Structural basis of Sec-independent membrane protein insertion by YidC
K Kumazaki et al.



EARTH SCIENCE

Water power

Small earthquakes on the San Andreas Fault may be affected by groundwater depletion. PAGE 483