

# CONTENTS

1 October 2015 / Vol 526 / Issue No 7571

## THIS WEEK

### EDITORIALS

#### 5 ENVIRONMENT

##### Testing times

The Volkswagen scandal highlights the importance of regulatory science

#### 5 GENOMICS

##### Variety of life

It's the end of the beginning for the 1000 genomes project

#### 6 POLICY

##### Goals galore

The hunt is on for policies to help deliver the UN sustainable development goals



### WORLD VIEW

#### 7 Science must prepare for impact

Guy Poppy

Researchers need to be flexible and adaptable in the face of societal needs

### RESEARCH HIGHLIGHTS

#### 8 SELECTIONS FROM THE SCIENTIFIC LITERATURE

Clean air means melting ice / Better sunscreen / Adaptable bees / Women in science / Diet and the gut / Robots with a soft touch

### SEVEN DAYS

#### 10 THE NEWS IN BRIEF

India's ASTROSAT takes off / Salt water on Mars / Nigeria declared polio-free / Shell halts search for oil off Alaska

## CAREERS

#### 151 GENETICS

##### Fluent in DNA

Advances in medical genetics have created an important new role — that of the genetic counsellor

#### 153 TURNING POINT

A late start — and a spell in the construction industry — proved just the job for synthetic chemist Hosea Nelson

### NATUREJOBS ADVERTISING FEATURE

Spotlight on Switzerland

## NEWS IN FOCUS

#### 13 ENVIRONMENT

China launches cap-and-trade system to combat emissions

#### 14 HYDROLOGY

California faces drought-filled future

#### 16 AUSTERITY

Economic slump stifles Brazilian science

#### 17 MOLECULAR BIOLOGY

Protein discovery promises CRISPR enhancements

#### 18 GENETIC ENGINEERING

Gene-edited micropigs on sale as pets

#### 19 ANCIENT TECHNOLOGY

Working version of Archimedes' model Universe unveiled

#### 20 NUMBER THEORY

Erdős discrepancy problem gets solved

## FEATURES



### TECHNOLOGY

## Bitcoin and beyond

The bid to build a better digital currency **PAGE 21**

#### 24 ASTRONOMY

##### Mountain battle

Plans for the Thirty Meter Telescope have divided opinion in Hawaii

## TOOLBOX

#### 145 AUTHORSHIP

##### Badges of distinction

Colour-coding could help to show which author did what

#### 146 PUBLISHING

##### The journal that publishes no papers

*Discrete Analysis* takes its pick of arXiv

## TECHNOLOGY

#### 147 NEUROBIOLOGY

##### Connectomes make the map

Plotting how parts of the brain join up

## COMMENT

#### 29 HUMAN GENOME PROJECT

##### Twenty-five years of big biology

Eric D Green, James D Watson & Francis S Collins

Lessons for consortium-based science

#### 32 MODELLING

##### Build imprecise supercomputers

Tim Palmer

Time to rethink the processor

## Autumn books

#### 34 NUTRITION

##### Dominions of fizz

David Katz

#### 36 EVOLUTION

##### Parsing the cycles of change

Mark Buchanan

#### 36 NEW IN PAPERBACK

#### 37 PHYSICS

##### Two shades of physics

Robert P Crease

#### 38 GEOENGINEERING

##### Journey into geopoetry

Jane C S Long

#### 40 COSMOLOGY

##### A story of cosmic proportions

Michael S Turner

#### 41 NEUROSCIENCE

##### The mechanics of mind

Daniel Bor

## CORRESPONDENCE

43 'Transparency' threatens environment / Climate data in the city / Beware fuel lock-in / Equipment costs in China / Wegener's drift

## FUTURES

#### 156 Corridors

Rahul Kanakia



# CONTENTS

1 October 2015 / Vol 526 / Issue No 7571

Our Selection Speaks Volumes

## RESEARCH

### NEW ONLINE

45 Papers published this week at nature.com

### NEWS & VIEWS

#### 46 ASTROPHYSICS

##### Primordial stars brought to light

Evidence for population III stars in a galaxy of the reionization era

Bethan James

#### 47 NANOTECHNOLOGY

##### Platelet mimicry

Biomimetic nanoparticles improve drug delivery

Omid C Farokhzad **SEE LETTER P.118**

#### 48 PHENOLOGY

##### Spring greening in a warming world

Leaf emergence may be becoming less sensitive to temperature

Trevor F Keenan **SEE LETTER P.104**

#### 50 NEURODEVELOPMENTAL DISEASE

##### A molecular tightrope

Phosphorylation of a threonine residue alters the activity of UBE3A

Ype Elgersma

#### 51 CONDENSED-MATTER PHYSICS

##### Flat transistor defies the limit

An ultra-thin transistor operating at a record-low voltage

Katsuhiro Tomioka **SEE LETTER P.91**

#### 52 HUMAN GENOMICS

##### The end of the start for population sequencing

Analyses of 2,504 human genomes from 26 populations

Ewan Birney & Nicole Soranzo

**SEE ARTICLES P.68 & P.75**

### REVIEW

#### 55 MICROBIOLOGY CRISPR-Cas

##### immunity in prokaryotes

L A Marraffini

### ARTICLES

#### 62 MATERIALS SCIENCE The origins of high hardening and low ductility in magnesium

Z Wu & W A Curtin

#### 68 GENOMICS A global reference for human genetic variation

The 1000 Genomes Project Consortium

**SEE N&V P.52**

#### 75 GENOMICS An integrated map of



### ON THE COVER

## End of the beginning

Two papers report on the third and final phase of The 1000 Genomes Project. Begun in 2008, the project has developed an open resource with data from over 2,500 individuals from 26 global populations. The main report describes key features of all 88 million genetic variants identified, while an analysis from the Structural Variation Analysis Group considers larger and more complex variants. The data are available via [www.1000genomes.org/](http://www.1000genomes.org/) data. **PAGES 52, 68 & 75**

#### structural variation in 2,504 human genomes

P H Sudmant et al. **SEE N&V P.52**

#### 82 GENOMICS The UK10K project identifies rare variants in health and disease

The UK10K Consortium

### LETTERS

#### 91 MATERIALS SCIENCE A subthermionic tunnel field-effect transistor with anatomically thin channel

D Sarkar et al. **SEE N&V P.51**

#### 96 BIOINORGANIC CHEMISTRY Binding of dinitrogen to an iron-sulfur-carbon site

I Ćorić et al.

#### 100 GEOMORPHOLOGY Observed latitudinal variations in erosion as a function of

#### glacier dynamics

M Koppes et al.

#### 104 PHENOLOGY Declining global warming effects on the phenology of spring leaf unfolding

Y H Fu et al. **SEE N&V P.48**

#### 108 GENOME EVOLUTION New genomic and fossil data illuminate the origin of enamel

Q Qu, T Haitina, M Zhu & P E Ahlberg

#### 112 POPULATION GENETICS Whole-genome sequencing identifies *EN1* as a determinant of bone density and fracture

H-F Zheng et al.

#### 118 NANOTECHNOLOGY Nanoparticle biointerfacing by platelet membrane cloaking

C-M J Hu et al. **SEE N&V P.47**

#### 122 VIROLOGY The soft palate is an important site of adaptation for transmissible influenza viruses

S S Lakdawala et al.

#### 126 STEM CELLS Deep imaging of bone marrow shows non-dividing stem cells are mainly perisinusoidal

M Acar et al.

#### 131 CANCER Single-cell analysis reveals a stem-cell program in human metastatic breast cancer cells

D A Lawson et al.

#### 136 MICROBIOLOGY Multiple mechanisms for CRISPR-Cas inhibition by anti-CRISPR proteins

J Bondy-Denomy et al.

#### 140 STRUCTURAL BIOLOGY *In situ* structural analysis of the human nuclear pore complex

A von Appen et al.

#### 144 CORRIGENDUM Fatty acid carbon is essential for dNTP synthesis in endothelial cells

S Schoors et al.

#### 144 CORRIGENDUM Progesterone receptor modulates ER $\alpha$ action in breast cancer

H Mohammed et al.

#### 144 CORRIGENDUM Bipolar seesaw control on last interglacial sea level

G Marino et al.

CAHIER ARCHIVE/CORBIS