

# CONTENTS

7 August 2014 / Vol 512 / Issue No 7512

## THIS WEEK

### EDITORIALS

#### 5 POLICY

##### Home-brew tests need regulation

The FDA's bid to regulate medical diagnostics deserves support

### WORLD VIEW

#### 7 Europe needs a research leader who will lead

Colin Macilwain

The next research commissioner will have an opportunity to change the mood music for Europe's science sector

### RESEARCH HIGHLIGHTS

#### 8 SELECTIONS FROM THE SCIENTIFIC LITERATURE



Ring the Milky Way / TV gets into the brain / Iceberg audio / Transparent rodents / Burning the trash / Genome functionality debated / Sizing up Kepler-93b

### SEVEN DAYS

#### 10 THE NEWS IN BRIEF

Paper linking flu vaccine and narcolepsy is retracted / US energy department makes research open access / Neutrino detector to be built in China / Stem-cell scientist Yoshiki Sasai dies / Anti-gay law repealed in Uganda



## CAREERS

#### 105 MATERIALS RESEARCH

##### Batteries warm up

The market for energy-storage systems is booming, and that means more work for chemists and others

#### 106 CAREER BRIEFS

## NEWS IN FOCUS



#### 13 ASTRONOMY

Binary star system offers tantalizing glimpse of early Universe

#### 14 VACCINES

Pneumococcal vaccine helps quell resistance to antibiotics



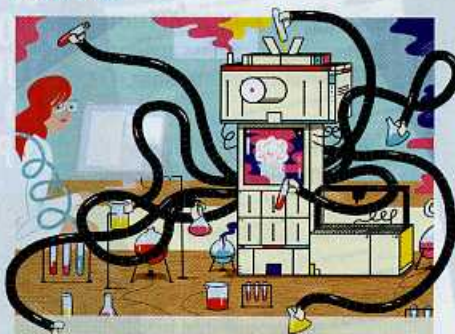
#### 17 PUBLISHING

Directory of open-access journals gets tough over predatory publications

#### 18 HEALTH CARE

Aspirin and heart disease form focus of US big-data health initiative

## FEATURES



### ORGANIC SYNTHESIS

## The robo-chemist

In search of the ultimate synthesis machine **PAGE 20**

## COMMENT



### POLAR RESEARCH

## Antarctic science

A road map for the next two decades  
Mahlon C Kennicutt II, Steven L Chown,  
John J Cassano, Daniela Liggett,  
Rob Massom, Lloyd S Peck,  
Steve R Rintoul, John W V Storey,  
David G Vaughan, Terry J Wilson &  
William J Sutherland **PAGE 23**

## BOOKS & ARTS

#### 26 CULTURE

##### Artistic alchemy

Philip Ball

#### 27 BOOKS IN BRIEF

## CORRESPONDENCE

28 Open access to fossils / Computer-driven psychotherapy / Looking after lab animals / Early life and disease susceptibility / Broad entry for PhDs



### FUTURES

108 Your application for eternal life has been partially approved

James Wesley Rogers



# CONTENTS

7 August 2014 / Vol 512 / Issue No 7512

## RESEARCH

### NEW ONLINE

29 Papers published this week at nature.com

### NEWS & VIEWS

#### 30 MATERIALS CHEMISTRY

##### Seeds of selective nanotube growth

A polyaromatic precursor enables the growth of a single nanotube species  
*James M Tour* **SEE LETTER P.61**

#### 31 CANCER

##### Directions for the drivers

Altered transcriptional regulation in colorectal cancer  
*Greg Gibson* **SEE LETTER P.87**

#### 32 NEURODEGENERATION

##### Alzheimer's disease under strain

The conformation of amyloid- $\beta$  aggregates confers disease phenotypes  
*Adriano Aguzzi*

#### 34 ASTROPHYSICS

##### Portrait of a doomed star

Detection of the probable progenitor of supernova SN 2012Z  
*Stephen Justham* **SEE LETTER P.54**

#### 35 HIV

##### Early treatment may not be early enough

Evidence from macaques that viral reservoirs are seeded rapidly  
*Kai Deng & Robert F Siliciano*  
**SEE LETTER P.74**

#### 36 EVOLUTION

##### Tooth structure re-engineered

Increasing levels of EDA protein in developing teeth replays evolution  
*Zhe-Xi Luo* **SEE ARTICLE P.44**

### ARTICLES

#### 39 ECOLOGY Convergence of terrestrial plant production across global climate gradients

*S T Michaletz, D Cheng, A J Kerkhoff & B J Enquist*

#### 44 EVOLUTION Replaying evolutionary transitions from the dental fossil record

*E Harjunmaa et al.* **SEE N&V P.36**

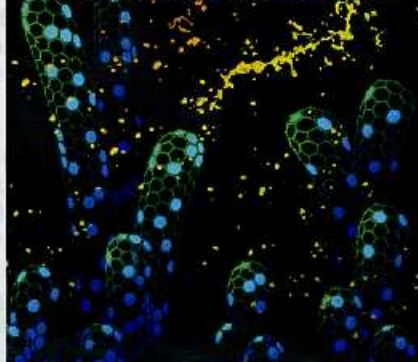
#### 49 STRUCTURAL BIOLOGY Structure of the DDB1-CRBN E3 ubiquitin ligase in complex with thalidomide

*E S Fischer et al.*

### ON THE COVER

## The cap fits...

A new route to structurally pure single-walled carbon nanotubes deposits rationally designed precursors on a platinum (111) surface to produce 'end caps' that seed tube growth. With further optimization, this strategy could provide materials for use in light detectors, photovoltaics, field-effect transistors and sensors. **PAGES 30 & 61**



### LETTERS

#### 54 ASTROPHYSICS A luminous, blue progenitor system for the type Ia supernova 2012Z

*C McCully et al.* **SEE N&V P.34**

#### 57 QUANTUM PHYSICS Tunable spin-spin interactions and entanglement of ions in separate potential wells

*A C Wilson et al.*

#### 61 MATERIALS CHEMISTRY Controlled synthesis of single-chirality carbon nanotubes

*J R Sanchez-Valencia et al.*

**SEE N&V P.30**

#### 65 MARINE CHEMISTRY A global ocean inventory of anthropogenic mercury based on water column measurements

*C H Lamborg et al.*

#### 69 IMMUNOLOGY Negative regulation of the NLRP3 inflammasome by A20 protects against arthritis

*L Vande Walle et al.*

#### 74 MICROBIOLOGY Rapid seeding of the viral reservoir prior to SIV viraemia in

### rhinus monkeys

*J B Whitney et al.* **SEE N&V P.35**

#### 78 CANCER Neuropathy of haematopoietic stem cell niche is essential for myeloproliferative neoplasms

*L Arranz et al.*

#### 82 CANCER PVT1 dependence in cancer with MYC copy-number increase

*Y-Y Tseng et al.*

#### 87 CANCER Putative cis-regulatory drivers in colorectal cancer

*H Ongen et al.* **SEE N&V P.31**

#### 91 MOLECULAR BIOLOGY Genome-scale functional characterization of *Drosophila* developmental enhancers in vivo

*E Z Kvon et al.*

#### 96 MOLECULAR BIOLOGY Enhancer loops appear stable during development and are associated with paused polymerase

*Y Ghavi-Helm et al.*

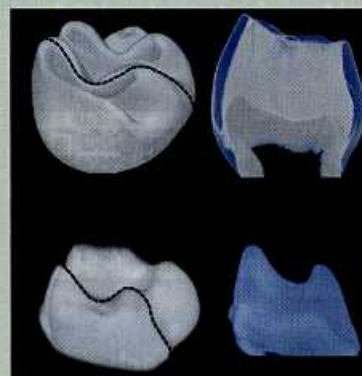
#### 101 CHEMICAL BIOLOGY Visualizing the kinetic power stroke that drives proton-coupled zinc(II) transport

*S Gupta et al.*

### EVOLUTION

## Oral history

ToothMaker models 50 million years of evolution to provide a window on how species are related. **PAGES 36 & 44**



KONSTANTIN AMISHAROV