

# collections CONTENTS

1 January 2015 / Vol 517 / Issue No 7532

## SCIENCE IN 2015



### NEWS

- 10** From the return of the LHC to climate deals and dwarf planets, *Nature* gazes into its crystal ball to predict the headlines



### COMMENT

- 15** **New year's resolutions**  
Ellen R Stofan; Sally Davies;  
Sue Desmond-Hellmann; Yi Xie;  
Christiana Figueres; Rolf-Dieter Heuer;  
Gloria Bonder; Lanjuan Li;  
Athene Donald  
Nine scientific leaders discuss their professional and personal goals for this year

### BOOKS & ARTS

- 18** **Science in culture 2015**  
Daniel Cressey  
The plays, exhibitions, films and festivals to visit

### FEATURES

- 12** **Science in 2015**  
Meet Gradzilla — and find out how much coffee will get drunk in labs

### CAREERS

- 111** **Hopes for the year ahead**  
Young scientists reveal their resolutions

## THIS WEEK

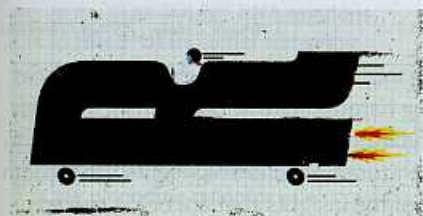
### EDITORIALS

- 5** **SCIENCE AND SOCIETY**  
**Time for the social sciences**  
Humanities and the social sciences can help boost the power of natural science



### WORLD VIEW

- 6** **The rising pressure of global water shortages**  
Jan Eliasson  
To avoid conflicts, we must engage in some hydro-diplomacy



### TOOLBOX

- 109** **PROGRAMMING TOOLS**  
**Adventures with R**  
The free statistics and visualization software that is rapidly making its mark in the lab

## NEWS IN FOCUS



- 7** **DEVELOPMENT**  
Environmentalists slam Nicaragua's plan for Grand Canal
- 8** **ASTRONOMY**  
Planet hunters seek truce in bid to find extraterrestrial life
- 9** **EBOLA**  
Transfusion trials spotlight therapy's potential for other diseases



## COMMENT

### CORRESPONDENCE

- 21** Threat of invasive species / Soot spurs action on climate / Potential pitfalls for green heating plan / Questions over Nature Index



### OBITUARY

- 22** **Paul von Ragué Schleyer (1930–2014)**  
Henry F Schaefer

### FUTURES

- 116** **Infraction**  
John Gilbey





## RESEARCH

## NEW ONLINE

- 23 Papers published this week at  
nature.com

## NEWS &amp; VIEWS

## 24 MOLECULAR BIOLOGY

**Entry signals control development**

Regulation of certain *Hox* genes during  
mammalian embryogenesis

Jonathan D Dinman **SEE ARTICLE P.33**

## 25 MATERIALS SCIENCE

**Like cartilage, but simpler**

A hydrogel that has vibration-isolating  
properties

Anne Ladegaard Skov **SEE LETTER P.68**

## 26 STRUCTURAL BIOLOGY

**Photosynthetic complex in close-up**

Crystal structure of undamaged  
photosystem II at high resolution

Ilme Schlichting **SEE LETTER P.99**

## 28 MICROBIOLOGY

**Diverted on the way to memory**

Immunodominance of *Staphylococcus*  
*aureus* protein A allows immune evasion

Gordon YC Cheung & Michael Otto

## 29 CELL CYCLE

**It takes three to find the exit**

A phosphatase-enzyme relay regulates  
the end of mitosis in fission yeast

Mathieu Bollen **SEE LETTER P.94**

## 30 EARTH SCIENCE

**Ocean circulation and rapid  
climate change**

North Atlantic Deep Water formation  
may be more stable than thought

Ellen E Martin **SEE LETTER P.73**

## ARTICLES

## 33 MOLECULAR BIOLOGY RNA regulons

in *Hox* 5' UTRs confer ribosome  
specificity to gene regulation

S Xue et al. **SEE N&V P.24**

39 STRUCTURAL BIOLOGY Architecture and  
conformational switch mechanism of  
the ryanodine receptor

R G Efremov, A Leitner, R Aebersold  
& S Raunser

## 44 STRUCTURAL BIOLOGY Structure of a

mammalian ryanodine receptor

R Zalk et al.

## 50 STRUCTURAL BIOLOGY Structure of the

## ON THE COVER

## Sands of Titan

Dunes on Titan in a Cassini radar  
image taken in December 2008  
(upper part of cover) resemble those  
in the Namib desert, seen from 283  
km altitude in NASA crew image  
STS107-E-5380 (lower left). Wind  
tunnel experiments simulating  
conditions on Saturn's moon Titan  
yield threshold wind speeds for  
particle entrainment higher than  
predicted by present models. **PAGE 60**

rabbit ryanodine receptor RyR1 at  
near-atomic resolution

Z Yan et al.

## LETTERS

## 56 ASTROPHYSICAL PLASMAS A higher-

than-predicted measurement of iron  
opacity at solar interior temperatures

J E Bailey et al.

60 PLANETARY SCIENCE Higher-than-  
predicted saltation threshold wind  
speeds on Titan

D M Burr et al.

64 QUANTUM PHYSICS Observation of  
quantized conductance in  
neutral matter

S Krinner, D Stadler, D Husmann,  
J-P Brantut & T Esslinger

68 MATERIALS CHEMISTRY An anisotropic  
hydrogel with electrostatic  
repulsion between cofacially aligned,  
nanosheets

M Liu et al. **SEE N&V P.25**

73 CLIMATE SCIENCES Strong and deep  
Atlantic meridional overturning  
circulation during the last glacial cycle

E Böhm et al. **SEE N&V P.30**

77 MOLECULAR EVOLUTION Origins of major  
archaeal clades correspond to gene  
acquisitions from bacteria

S Nelson-Sathi et al.

81 STEM CELLS Identification of  
multipotent mammary stem cells by  
protein C receptor expression

D Wang et al.

85 VIROLOGY Hepatitis A virus and the  
origins of picornaviruses

X Wang et al.

89 IMMUNOLOGY Human intracellular  
ISG15 prevents interferon- $\alpha/\beta$   
over-amplification and  
auto-inflammation

X Zhang et al.

94 CELL BIOLOGY A PP1-PP2A  
phosphatase relay controls  
mitotic progression

A Grallert et al. **SEE N&V P.29**

99 STRUCTURAL BIOLOGY Native structure  
of photosystem II at 1.95 Å resolution  
viewed by femtosecond X-ray pulses

M Suga et al. **SEE N&V P.26**

104 STRUCTURAL BIOLOGY Structure of  
an integral membrane sterol  
reductase from *Methylobacterium*  
*alcaliphilum*

X Li, R Roberti & G Blobel

## VIROLOGY

## Missing link

Hepatitis A virus — an evolutionary  
link between 'modern' picornaviruses  
and more primitive insect viruses?

**PAGE 85**

