

# nature

N3

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE

## The future has arrived.

Let your next discovery begin with the Ion Proton™ Sequencer

Get rapid, genome-scale benchtop sequencing at [lifetechnologies.com/proton](http://lifetechnologies.com/proton)

ion torrent  
by life technologies™



life technologies™

# CONTENTS

20/27 December 2012 / Vol 492 / Issue No 7429

## 2012 THE YEAR IN REVIEW

### ON THE COVER

*Nature* takes stock of the highs, lows and newsmakers of the past twelve months in its round up of 2012.

Image: Chris Labrooy

### NEWS

#### 324 2012 in review

Big data make their mark in biology and particle physics

#### 328 Images of the year



### FEATURES

#### 335 *Nature's* 10

Who were the people who made a mark on the past 12 months?

### NEWS & VIEWS

#### 366 Editors' choice

A look back at some of the highlights from this year's News & Views

### FUTURES

#### 462 Review of the year: 2062

John Gilbey

**366 DAYS:**  
*the year in science*

[www.nature.com/2012](http://www.nature.com/2012)

## THIS WEEK

### EDITORIALS

#### 311 DRUG REGULATION

##### The limits of free speech

Off-label use of drugs needs controls

#### 311 HEALTH

##### A burden weighed

Getting to grips with disease and disability

#### 312 PHYSICS

##### Head of the line

Japan deserves support for its bid to host the International Linear Collider

### WORLD VIEW

#### 313 Time to stop relying on things past

David Goldston

Faced with austerity, US science advocates need a Plan B

### RESEARCH HIGHLIGHTS

#### 314 SELECTIONS FROM THE SCIENTIFIC LITERATURE

Kuiper comets / Antibiotic resistance on the loose / Plant-insect interactions / Species are in it together / 'World's rarest whale' beached / RNA clock

### SEVEN DAYS

#### 316 THE NEWS IN BRIEF

GRAIL hits the Moon / LHC prepares for a pause / Ivory haul seized

## NEWS IN FOCUS

#### 319 ASTRONOMY

ALMA reveals first results

#### 320 HIGHER EDUCATION

Russia's universities face shake up

#### 321 GENOMICS

Amgen gains access to deCODE's data

#### 322 HEALTH

The global disability burden is quantified

#### 323 BUSINESS

Patent wrangles hamper China's firms

## CAREERS

#### 457 COLUMN

##### Guiding lights

Philip Campbell

The winners of *Nature's* mentoring awards discuss their methods

#### 459 TURNING POINT

Nanomaterials researcher Julia Greer on a key decision

#### 459 CAREER BRIEFS

**nature events**

Your guide to global scientific events and courses in 2013

## COMMENT

#### 345 SECURITY

##### Self-censorship is not enough

David Kaiser & Jonathan D Moreno

History has lessons relevant to the furore surrounding the 2012 publication of 'dangerous' flu virus data

#### 348 PUBLISHING

##### Open access must enable open use

Cameron Neylon

It is not enough for public research to be freely available — it should be free for reuse

### BOOKS & ARTS

#### 351 VITICULTURE

##### Fruity with a hint of drought

Jamie Goode

#### 354 NATURAL HISTORY

##### Diamonds in the rough

Ewen Callaway

#### 355 NUTRITION

##### Sugar caned

David Katz

### CORRESPONDENCE

356 Latin loses its lustre for botanists / NIH funding / 4G should help fund science / Data links for references



# CONTENTS

20/27 December 2012 / Vol 492 / Issue No 7429

## RESEARCH

### NEW ONLINE

357 Papers published this week at nature.com

### NEWS & VIEWS

#### 358 THERMAL PHYSICS

##### Quantum interference heats up

Verification of a quantum thermal effect  
*Raymond W Simmonds*

SEE LETTER P.401

#### 359 NEURODEVELOPMENTAL DISORDERS

##### Signalling pathways of fragile X syndrome

Identification of messenger RNAs targeted by the FMRP protein  
*Sabarinath Jayaseelan*

& *Scott A Tenenbaum* SEE ARTICLE P.382

#### 360 CARDIOVASCULAR BIOLOGY

##### A boost for heart regeneration

MicroRNAs stimulate division of adult cardiomyocytes

*Mark Mercola* SEE ARTICLE P.376

#### 362 CANCER

##### Metabolism in the driver's seat

Tumour-suppressive role of SIRT6 protein

*Luisa Tasselli & Katrin F Chua*

#### 363 EPIGENETICS

##### Erase for a new start

Tet1 implicated in demethylation of meiotic genes in germ cells

*Sylvain Guibert & Michael Weber*

SEE LETTER P.443

#### 364 LOW-TEMPERATURE PHYSICS

##### Cool molecules

Strong evaporative cooling of a sample of the hydroxyl radical

*Paul S Julienne* SEE LETTER P.396

#### 365 EARTH SCIENCE

##### Go with the lows

The effects of polar lows on circulation in the northeast Atlantic

*Andrew Mitchinson*

#### 366 EDITORS' CHOICE

The News & Views highlights of 2012

### ARTICLES

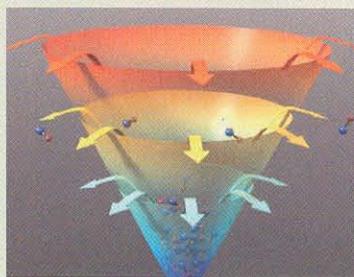
369 **GENOMICS** Seventy-five genetic loci influencing the human red blood cell  
*P van der Harst et al.*

376 **MOLECULAR BIOLOGY** Functional screening identifies miRNAs inducing

#### LOW-TEMPERATURE PHYSICS

## Cool it

Now Bose–Einstein style quantum physics goes molecular. **PAGE 396**



#### cardiac regeneration

*A Eulalio et al.* SEE N&V P.360

382 **NEUROSCIENCE** FMRP targets distinct mRNA sequence elements to regulate protein expression

*M Ascano Jr et al.* SEE N&V P.359

387 **PHARMACOLOGY** High-resolution crystal structure of human protease-activated receptor 1

*C Zhang et al.*

### LETTERS

393 **COSMOLOGY** Dynamical age differences among coeval star clusters as revealed by blue stragglers

*F R Ferraro et al.*

396 **LOW-TEMPERATURE PHYSICS** Evaporative cooling of the dipolar hydroxyl radical

*B K Stuhl et al.* SEE N&V P.364

401 **THERMAL PHYSICS** The Josephson heat interferometer

*F Giazotto & M J Martínez-Pérez*

SEE N&V P.358

406 **PHYSICS** Fractionalized excitations in the spin-liquid state of a kagome-lattice antiferromagnet

*T-H Han et al.*

411 **OPTICAL MATERIALS** Quasi-cylindrical wave contribution in experiments on extraordinary optical transmission

*F van Beijnum et al.*

415 **EARTH SCIENCES** Laboratory measurements of the viscous

#### anisotropy of olivine aggregates

*L N Hansen, M E Zimmerman & D L Kohlstedt*

419 **ECOLOGY** Flickering gives early warning signals of a critical transition to a eutrophic lake state

*R Wang et al.*

423 **GENOMICS** Repeated polyploidization of *Gossypium* genomes and the evolution of spinnable cotton fibres

*A H Paterson et al.*

428 **NEUROSCIENCE** A prefrontal cortex–brainstem neuronal projection that controls response to behavioural challenge

*M R Warden et al.*

433 **NEUROSCIENCE** Layered reward signalling through octopamine and dopamine in *Drosophila*

*C J Burke et al.*

438 **STEM CELLS** Somatic copy number mosaicism in human skin revealed by induced pluripotent stem cells

*A Abyzov et al.*

443 **DEVELOPMENT** Tet1 controls meiosis by regulating meiotic gene expression

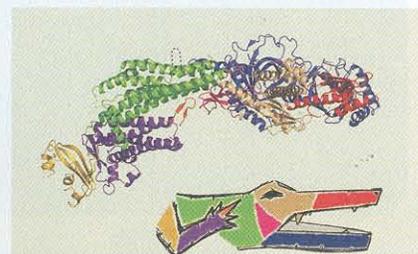
*S Yamaguchi et al.* SEE N&V P.363

448 **STRUCTURAL BIOLOGY** Structure of the Mediator head module

*L Larivière et al.*

452 **NEUROSCIENCE** Ventral tegmental area GABA projections pause accumbal cholinergic interneurons to enhance associative learning

*M T C Brown et al.*



#### STRUCTURAL BIOLOGY

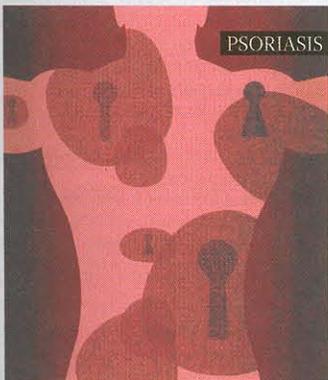
## Head case

The neck- and jaw-like structure of a key gene regulation protein. **PAGE 448**



## PSORIASIS

### natureOUTLOOK



Produced with support from:



Unlocking the skin's secrets

Turn to page 356

#### S49 EDITORIAL

**Psoriasis**  
Michelle Grayson

#### S50 DERMATOLOGY

**Psoriasis uncovered**  
There's more to this skin disease than meets the eye

#### S52 IMMUNOLOGY

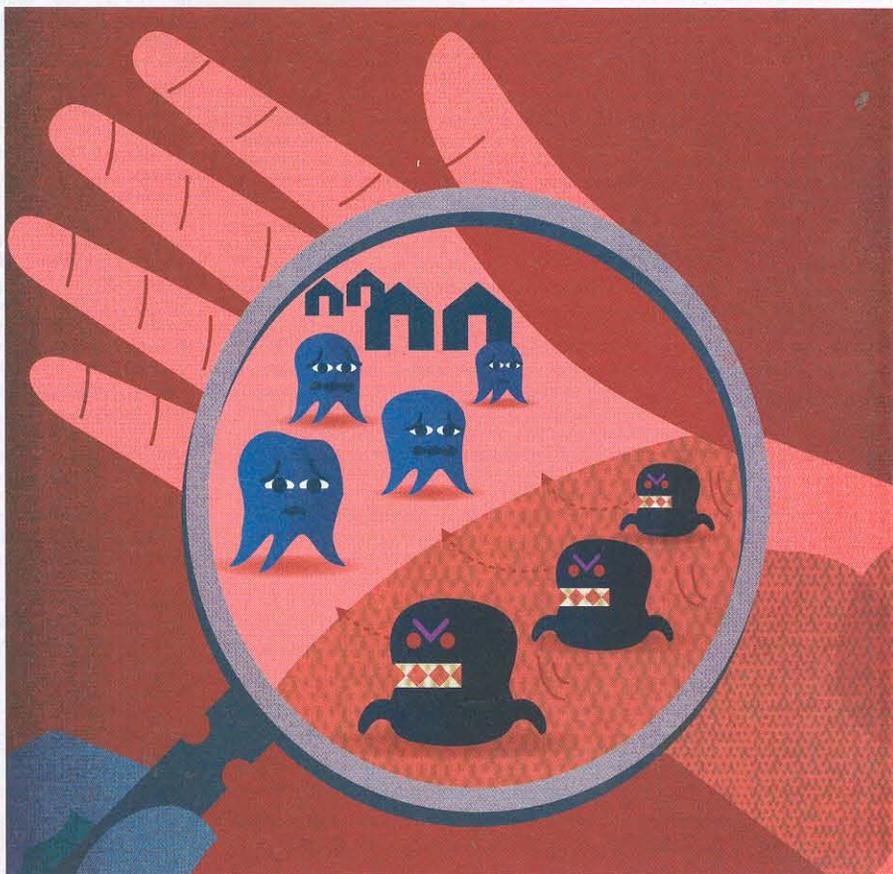
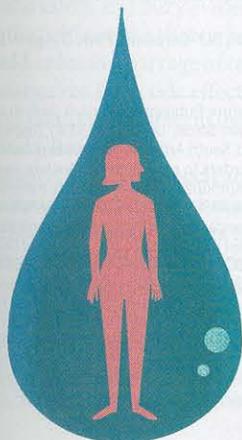
**A many layered thing**  
The skin provides more than just barrier protection

#### S55 PERSPECTIVE

**Don't be superficial**  
Henning Boehncke reveals the hidden harm psoriasis can do

#### S56 GENETICS

**Deep exploration**  
What are the underlying causes of psoriasis?



Meet the bacteria that keep your skin healthy, on page S60.

#### S58 THERAPEUTICS

**Silencing psoriasis**  
There are plenty of drugs coming through to treat severe forms of the disease

#### S60 MICROBIOME

**The surface brigade**  
Looking after the legions of bacteria that live on the skin is important for fighting disease

#### S62 PSYCHODERMATOLOGY

**An emotional response**  
There are clear links between stress and psoriasis flare-ups — but only in some patients

#### S64 Q&A

**Under their skin**  
Christopher Griffiths outlines the psychological problems that often accompany psoriasis



**MORE ONLINE**

#### NATURE.COM

● The *Journal of Investigative Dermatology* reports the latest research on cutaneous biology and skin disease, including psoriasis: [nature.com/jid](http://nature.com/jid)

#### COLLECTION

● Visit our online edition, which includes an exclusive collection of research articles on psoriasis: [go.nature.com/cygp17](http://go.nature.com/cygp17)