

# CONTENTS

6 June 2013 / Vol 498 / Issue No 7452

## THE QUANTUM ATOM

### FEATURES

- 21 The quantum atom**  
*Nature* celebrates the 100th birthday of Niels Bohr's model of the atom
- 22 Extreme atoms**  
Hollow, giant, heavy ... atoms are being contorted into brand new forms as researchers explore the limits of the quantum world

### COMMENT

- 27 The path to the quantum atom**  
*John Heilbron*  
How Niels Bohr's mathematical mind



[nature.com/bohr100](http://nature.com/bohr100)

allowed him access to electron orbits

- 31 The enigmatic electron**  
*Frank Wilczek*  
Simple yet unimaginably complex, the most puzzling subatomic particle is a thing of beauty

### NEWS & VIEWS

- 40 Sizing up atoms**  
*Paul Indelicato & Alexander Karpov*  
Tackling the vexed question of just how large an atom can be

## THIS WEEK

### EDITORIALS

- 5 PUBLISHING**  
**The paper trail**  
Researchers must submit to greater scrutiny of their output
- 5 MEDICAL RESEARCH**  
**Moral authority**  
Accountability is crucial
- 6 ANNOUNCEMENT**  
**Nature papers enhanced**  
Extended Data make their debut

### WORLD VIEW

- 7 US clinical-research system in need of review**  
*Arthur J Ammann*  
Government-supported health studies urgently need an overhaul

### RESEARCH HIGHLIGHTS

- 8 SELECTIONS FROM THE SCIENTIFIC LITERATURE**  
Asymmetry in 'strange beauty' mesons / A second spruce genome / Less ozone, more rain / Net gain for seabirds / Watching atomic orbitals

### SEVEN DAYS

- 10 THE NEWS IN BRIEF**  
SESAME synchrotron gets funding boost / Moon spotted around asteroid / Mars Express maps mineral distribution

## NEWS IN FOCUS

- 13 POLICY**  
Green credentials of 'plastic wood' called into question
- 14 PUBLISHING**  
Divisions deepen as European talks on data mining falter
- 15 GENETICS**  
Plan for glowing thale cress sparks debate over synthetic biology
- 16 GENOMICS**  
Consortium paves way for data sharing
- 17 MARINE SCIENCE**  
Europe puts a stop to overfishing
- 18 HEALTH**  
World Health Organization agrees budget

## CAREERS

- 127 BIOTECHNOLOGY**  
**Virtual reality**  
Many of today's biotech companies are happy to leave the 'science bit' to others
- 129 TURNING POINT**  
An engineering background gave Hana El-Samad a novel view of biology

### NATUREJOBS ADVERTISING FEATURE

Spotlight on stem-cell research

## COMMENT

### BOOKS & ARTS



- 33 NATURE WRITING**  
**Cetacean subtleties**  
*Callum Roberts*
- 34 BIOTECHNOLOGY**  
**Genomics and us**  
*Michael Rawlins*
- 35 ECONOMICS**  
**A tale of cash and credit**  
*Martin Shubik*
- 36 ENVIRONMENT**  
**Piscine plunder**  
*Michael White*

### CORRESPONDENCE

- 37 Fern gets voted a top invader / How to revive organ transplantation / Free access to satellite data**

### FUTURES

- 132 Rondo code**  
*Tony Ballantyne*



## RESEARCH

### NEW ONLINE

39 Papers published this week at nature.com

### NEWS & VIEWS

#### 40 FORUM: THEORETICAL PHYSICS

##### Sizing up atoms

The limits of atomic and nuclear size

Paul Indelicato; Alexander Karpov

#### 41 HIGH-TEMPERATURE SUPERCONDUCTIVITY

##### The sound of a hidden order

An exotic phase of matter in a copper oxide compound

Jan Zaanen **SEE LETTER P.75**

#### 42 IMMUNOLOGY

##### An innate regulatory cell

Control of CD4<sup>+</sup> T cells by innate lymphoid cells expressing MHC class II antigens

Marco Colonna **SEE LETTER P.113**

#### 44 TECHNIQUES

##### Optical spectroscopy goes intramolecular

Imaging the internal structure of a single molecule

Joanna M Atkin & Markus B Raschke

**SEE LETTER P.82**

#### 45 BIOCHEMISTRY

##### The glide has landed

An ylide intermediate in a biochemical reaction

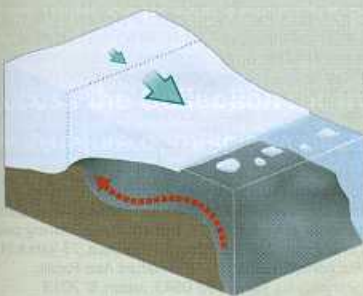
Bradley J Landgraf & Squire J Booker

**SEE LETTER P.123**

### CLIMATE SCIENCE

## Balancing act

Weighing the evidence for polar ice losses and gains. **PAGE 51**



### PALAEONTOLOGY

## Boning up

The near-complete skeleton of a tiny early primate has helped join the evolutionary dots. **PAGE 60**

#### 47 CLIMATE SCIENCE

##### Plant a tree, but tend it well

Nutrient limitation increases CO<sub>2</sub> emissions caused by land-use change

Julia Pongratz

#### 48 GENOMICS

##### A gut prediction

Metagenome-wide analysis of European women with type 2 diabetes

Willem M de Vos & Max Nieuwdorp

**SEE LETTER P.99**

### REVIEW

#### 51 CLIMATE SCIENCE Ice-sheet mass

balance and climate change

E Hanna et al.

### ARTICLES

#### 60 PALAEONTOLOGY The oldest known

primate skeleton and early haplorhine evolution

X Ni et al.

#### 65 NEUROSCIENCE Rats maintain an

overhead binocular field at the expense of constant fusion

D J Wallace et al.

#### 70 CELL SIGNALLING KAT5 tyrosine

phosphorylation couples chromatin sensing to ATM signalling

A Kaidi & S P Jackson

### LETTERS

#### 75 CONDENSED-MATTER PHYSICS Bounding

the pseudogap with a line of phase transitions in YBa<sub>2</sub>Cu<sub>3</sub>O<sub>6+x</sub>

A Shekhter et al. **SEE N&V P.41**

#### 78 PHYSICS Second sound and the

superfluid fraction in a Fermi gas with resonant interactions

L A Sidorenkov et al.

#### 82 APPLIED PHYSICS Chemical mapping

of a single molecule by plasmon-enhanced Raman scattering

R Zhang et al. **SEE N&V P.44**

#### 87 EARTH SCIENCES Argon isotopic

composition of Archaean atmosphere probes early Earth geodynamics

M Pujol, B Marty, R Burgess, G Turner & P Philippot

#### 91 BEHAVIOURAL ECOLOGY The rewards of

restraint in the collective regulation of foraging by harvester ant colonies

D M Gordon

#### 94 GENOMICS Architecture and evolution

of a minute plant genome

E Ibarra-Laclette et al.

#### 99 MICROBIOLOGY Gut metagenome

in European women with normal, impaired and diabetic glucose control

F H Karlsson et al. **SEE N&V P.48**

#### 104 NEUROSCIENCE Stepwise acquisition

of vocal combinatorial capacity in songbirds and human infants

D Lipkind et al.

#### 109 CANCER A key role for mitochondrial

gatekeeper pyruvate dehydrogenase in oncogene-induced senescence

J Kaplon et al.

#### 113 IMMUNOLOGY Innate lymphoid cells

regulate CD4<sup>+</sup> T-cell responses to intestinal commensal bacteria

M R Hepworth et al. **SEE N&V P.42**

#### 118 CARDIOVASCULAR BIOLOGY Control of

angiogenesis by AIBP-mediated cholesterol efflux

L Fang et al.

#### 123 BIOCHEMISTRY Structure-guided

discovery of the metabolite carboxy-SAM that modulates tRNA function

J Kim et al. **SEE N&V P.45**