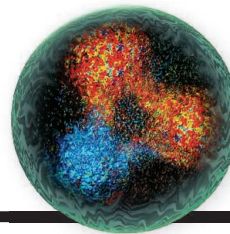


# CONTENTS



363

The inner life of the proton

23 JANUARY 2015 • VOLUME 347 • ISSUE 6220

## NEWS

### IN BRIEF

**356** Roundup of the week's news

### IN DEPTH

#### **358 COMET CLOSE-UP REVEALS A WORLD OF SURPRISES**

Diverse landscape of 67P suggests an unexpectedly complicated origin

*By E. Hand*

► CATCHING A COMET SECTION P. 387

#### **359 SURVEYS REVEAL STATE OF AFGHAN POPULATION**

From fertility to mortality, new data will help guide aid efforts *By M. Hvistendahl*

#### **361 JAPAN'S NUCLEAR RENAISSANCE DOGGED BY WASTE CHALLENGE**

Nuclear reprocessing is years late; repository is in limbo *By D. Normile*

#### **362 MALARIA MAY ACCELERATE AGING IN BIRDS**

Infection erodes telomeres and life spans—hinting that there are no benign parasites *By G. Vogel*

► REPORT P. 436

### FEATURES

#### **363 PROBING THE PROTON**

A newly upgraded accelerator explores the seething maelstrom at the heart of matter *By A. Cho*

#### **366 THE INSURGENT**

Animal rights activist Justin Goodman is using science's own tools to combat animal research *By D. Grimm*

## INSIGHTS

### PERSPECTIVES

#### **370 PLAY IT AGAIN, SAM**

Lasers shine new light on the drying of Mars while reviving the mystery of methane

*By K. Zahnle*

► REPORTS PP. 412 & 415

#### **371 FLEXIBILITY FOR SPECIFICITY**

Human T cells show remarkable differentiation plasticity in responding to pathogens

*By M. M. Davis*

► RESEARCH ARTICLE P. 400

#### **373 UNDERSTANDING ARTEMISININ RESISTANCE**

Genetic studies provide clues to how malaria parasites become drug resistant *By C. H. Sibley*

► REPORTS PP. 428 & 431

#### **375 SMOKE AND FIRE OVER E-CIGARETTES**

As nations adopt regulatory measures for e-cigarettes, it is imperative to understand how approaches to risk, cost-benefit, and trade-offs have shaped interpretations of evidence

*By A. L. Fairchild and R. Bayer*



#### **377 BRAZIL'S SOY MORATORIUM**

Supply-chain governance is needed to avoid deforestation *By H. K. Gibbs et al.*

### BOOKS ET AL.

#### **379 THE ALTRUISTIC BRAIN**

*By D. W. Pfaff, reviewed by F. B. M. de Waal*

#### **380 THE NEW MATH**

*By C. J. Phillips, reviewed by J. Kilpatrick*

### LETTERS

#### **382 CARNIVORE COEXISTENCE: VALUE THE WILDERNESS**

*By J. J. Gilroy et al.*

#### **382 CARNIVORE COEXISTENCE: AMERICA'S RECOVERY**

*By M. E. Gompper et al.*

#### **383 CARNIVORE COEXISTENCE: TROPIC CASCADES**

*By T. M. Newsome and W. J. Ripple*

#### **383 FERNS TO FULFILLMENT**

*By L. Reynolds*

### DEPARTMENTS

#### **355 EDITORIAL**

Rethink the Nicaragua Canal

*By Jorge A. Huete-Perez et al.*

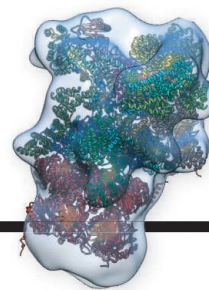
#### **450 WORKING LIFE**

Teaming up against tsunamis

*By Elisabeth Pain*

Science Staff .....	354
New Products .....	443
Science Careers .....	444





## SPECIAL SECTION

### Catching a comet

#### INTRODUCTION

**387** Rosetta begins its comet tale  
*M. G. G. T. Taylor et al.*

#### RESEARCH ARTICLE ABSTRACTS

On the nucleus structure and activity of comet 67P/Churyumov-Gerasimenko  
*H. Sierks et al.*

The morphological diversity of comet 67P/Churyumov-Gerasimenko  
*N. Thomas et al.*

Dust measurements in the coma of comet 67P/Churyumov-Gerasimenko inbound to the Sun  
*A. Rotundi et al.*

SEE ALSO ► NEWS STORY P. 358 ► PODCAST ► SLIDESHOW ► [sciencemag.org/site/special/rosetta](http://sciencemag.org/site/special/rosetta)

## REPORT ABSTRACTS

67P/Churyumov-Gerasimenko, a Jupiter family comet with a high D/H ratio  
*K. Altwegg et al.*

The organic-rich surface of comet 67P/Churyumov-Gerasimenko as seen by VIRTIS/Rosetta  
*F. Capaccioni et al.*

Time variability and heterogeneity in the coma of 67P/Churyumov-Gerasimenko  
*M. Hässig et al.*

Birth of a comet magnetosphere: A spring of water ions  
*H. Nilsson et al.*

Subsurface properties and early activity of comet 67P/Churyumov-Gerasimenko  
*S. Gulkis et al.*

## 420 MAGNETIC MATERIALS

Tilt engineering of spontaneous polarization and magnetization above 300 K in a bulk layered perovskite  
*M. J. Pitcher et al.*

## 425 MATERIALS CHEMISTRY

Composition-matched molecular “solders” for semiconductors  
*D. S. Dolzhenkov et al.*

## DRUG RESISTANCE

**428** K13-propeller mutations confer artemisinin resistance in *Plasmodium falciparum* clinical isolates  
*J. Strainier et al.*

**431** Population transcriptomics of human malaria parasites reveals the mechanism of artemisinin resistance  
*S. Mok et al.*

► PERSPECTIVE P. 373

## 436 CHRONIC INFECTION

Hidden costs of infection: Chronic malaria accelerates telomere degradation and senescence in wild birds  
*M. Asghar et al.*

► NEWS STORY P. 362

## 439 PROTEASOMES

A molecular census of 26S proteasomes in intact neurons  
*S. Asano et al.*

## ON THE COVER



View of a cliff and gravel field on the small lobe of comet 67P/Churyumov-Gerasimenko from a distance of 8 kilometers to the surface, as seen by Rosetta/OSIRIS. See pages 358 and 387 and [sciencemag.org/site/special/rosetta](http://sciencemag.org/site/special/rosetta). Image: ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

## RESEARCH

### IN BRIEF

**384** From *Science* and other journals

### REVIEW

#### 393 SEA LEVEL CHANGE

Inherited landscapes and sea level change  
*S. Cloetingh and B. U. Haq*

REVIEW SUMMARY; FOR FULL TEXT:  
[dx.doi.org/10.1126/science.1258375](http://dx.doi.org/10.1126/science.1258375)

### RESEARCH ARTICLES

#### 394 PROTEOMICS

Tissue-based map of the human proteome  
*M. Uhlen et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:  
[dx.doi.org/10.1126/science.1260419](http://dx.doi.org/10.1126/science.1260419)

#### 395 HUMAN EVOLUTION

Human-like hand use in *Australopithecus africanus*  
*M. M. Skinner et al.*

#### 400 T CELL IMMUNITY

Functional heterogeneity of human memory CD4<sup>+</sup> T cell clones primed by pathogens or vaccines  
*S. Becattini et al.*

► PERSPECTIVE P. 371

### REPORTS

#### 406 ASTROPHYSICS

The exceptionally powerful TeV  $\gamma$ -ray emitters in the Large Magellanic Cloud  
*The H.E.S.S. Collaboration*

### MARS ATMOSPHERE

**412** The imprint of atmospheric evolution in the D/H of Hesperian clay minerals on Mars  
*P. R. Mahaffy et al.*

**415** Mars methane detection and variability at Gale crater  
*C. R. Webster et al.*

► PERSPECTIVE P. 370

### 418 PLANETARY SCIENCE

Shock compression of stishovite and melting of silica at planetary interior conditions  
*M. Millot et al.*