

# CONTENTS



477 & 534

Chicks, like people, count from left to right

30 JANUARY 2015 • VOLUME 347 • ISSUE 6221

## SPECIAL SECTION THE END OF PRIVACY



### INTRODUCTION

**490** Big data and the Internet are empowering researchers and the public—but endangering privacy

### NEWS

**492** Unmasked *By J. Bohannon*

**494** When your voice betrays you *By D. Shultz*

**495** Breach of trust *By J. Bohannon*

**497** Game of drones *By D. Shultz*

**498** Risk of exposure *By M. Enserink*

**499** Could your pacemaker be hackable? *By D. Clery*

**500** Hiding in plain sight *By J. You*

**501** Trust me, I'm a medical researcher *By J. Couzin-Frankel*

**502** Camouflaging searches in a sea of fake queries *By J. You*

### PERSPECTIVES

**504** Control use of data to protect privacy *S. Landau*

**507** What the “right to be forgotten” means for privacy in a digital age *A. L. Newman*

### REVIEW

**509** Privacy and human behavior in the age of information *A. Acquisti et al.*

► NEWS STORY P. 468 ► PERSPECTIVE P. 479

► BOOKS ET AL. P. 481 ► REPORT P. 536

► SCIENCE CAREERS STORIES BY R. BERNSTEIN AND E. PAIN ► PODCAST

► [sciencemag.org/site/special/privacy](http://sciencemag.org/site/special/privacy)

### ON THE COVER



Data pour out of us and our devices every second of every day, and people no longer control their personal privacy. Understanding how these data streams can be used will help us to cope with the consequences. For a

key to the data in the art on the cover and on page 490, search for an encrypted URL and decode it. *Image: William Duke*

## NEWS

### IN BRIEF

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

### IN DEPTH

#### **463** A MOMENT OF TRUTH ARRIVES FOR U.S. OCEAN SCIENCE

Report urges painful cuts in infrastructure to free up funds for research *By E. Kintisch*

#### **464** INDIA'S COSTLY NEUTRINO GAMBLE

The country splurges on a deep underground laboratory, hoping to regain leadership in neutrino physics *By R. Stone and P. Bagla*

#### **465** DARPA SETS OUT TO AUTOMATE RESEARCH

Crash program aims to teach computers to read journals and hatch new ideas *By J. You*

SCIENCE [sciencemag.org](http://sciencemag.org)

#### **466** MEET TWO NEW SCIENCE SPENDING CARDINALS IN CONGRESS

Representatives Cole, Culberson share enthusiasm for research, but differ in approach *By J. Mervis*

#### **468** CREDIT CARD STUDY BLOWS HOLES IN ANONYMITY

Attack suggests need for new data safeguards *By J. Bohannon*

► THE END OF PRIVACY SECTION P. 490; REPORT P. 536

### FEATURE

#### **469** A NEW DRUG WAR

As new designer drugs hit the streets, researchers try to forecast which will prove most dangerous *By E. Underwood*

... **473** Alarm over synthetic cannabinoids *By E. Underwood*



## INSIGHTS

### PERSPECTIVES

#### **474** THE SUPERRESOLVED BRAIN

Physically enlarged neurons can be observed at high resolution with light microscopy

*By H.-U. Dodt*

► REPORT P. 543

#### **475** THE GLOBAL ENGINE THAT COULD

How do hydrological processes affect Earth's heat engine?

*By O. M. Pauluis*

► REPORT P. 540

#### **476** WHEN THE CIRCADIAN CLOCK BECOMES BLIND

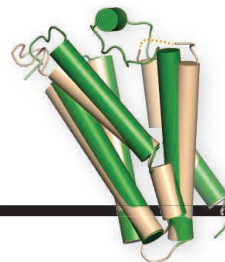
The conceptual model of circadian oscillator function may need revision

*By A. Kramer*

► RESEARCH ARTICLE P. 518

30 JANUARY 2015 • VOL 347 ISSUE 6221 **455**

# CONTENTS



## 551 & 555

How a disease mutation affects protein function

30 JANUARY 2015 • VOLUME 347 • ISSUE 6221

### 477 CHICKS WITH A NUMBER SENSE

Chicks and humans map numbers to space in a similar way *By P. Brugger*

► REPORT P. 534

### 479 BALANCING PRIVACY VERSUS ACCURACY IN RESEARCH PROTOCOLS

Restricting data at collection, processing, or release *By D. L. Goroff*

► THE END OF PRIVACY SECTION P. 490

### BOOKS ET AL.

#### 481 THE BLACK BOX SOCIETY

*By F. Pasquale, reviewed by V. Mayer-Schönberger*

► THE END OF PRIVACY SECTION P. 490

#### 482 THE HIDDEN AGENDA OF THE POLITICAL MIND

*By J. Weeden and R. Kurzban, reviewed J. R. Hibbing*

### LETTERS

#### 484 ROUGH WATERS FOR NATIVE CHINESE FISH

*By P. E. Hulme*

#### 484 THE VALUE OF AUDIOVISUAL ARCHIVES

*By L. F. Toledo et al.*

#### 484 TYRANNY OF TREES IN GRASSY BIOMES

*By J. W. Veldman et al.*



## RESEARCH

### IN BRIEF

515 From *Science* and other journals

### RESEARCH ARTICLE

#### 518 CIRCADIAN RHYTHMS

Decoupling circadian clock protein turnover from circadian period determination *L. F. Larrondo et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT: [dx.doi.org/10.1126/science.1257277](https://doi.org/10.1126/science.1257277)

► PERSPECTIVE P. 476

### REPORTS

#### SOLAR CELLS

519 Low trap-state density and long carrier diffusion in organolead trihalide perovskite single crystals *D. Shi et al.*

522 High-efficiency solution-processed perovskite solar cells with millimeter-scale grains *W. Nie et al.*

► DONG ET AL. [10.1126/science.aaa5760](https://doi.org/10.1126/science.aaa5760)

#### 526 SUPERNOVAE

The bubble-like interior of the core-collapse supernova remnant Cassiopeia A *D. Milisavljevic and R. A. Fesen*

#### 530 REACTION DYNAMICS

Vibrational relaxation and microsolvation of DF after F-atom reactions in polar solvents *G. T. Dunning et al.*

#### 534 ANIMAL COGNITION

Number-space mapping in the newborn chick resembles humans' mental number line *R. Rugani et al.*

► PERSPECTIVE P. 477

#### 536 IDENTITY AND PRIVACY

Unique in the shopping mall: On the identifiability of credit card metadata *Y.-A. de Montjoye et al.*

► NEWS STORY P. 468; THE END OF PRIVACY SECTION P. 490

### 540 ATMOSPHERIC DYNAMICS

Constrained work output of the moist atmospheric heat engine in a warming climate *F. Laliberté et al.*

► PERSPECTIVE P. 475

### 543 OPTICAL IMAGING

Expansion microscopy *F. Chen et al.*

► PERSPECTIVE P. 474

### 548 MITOCHONDRIAL BIOLOGY

Replication-transcription switch in human mitochondria *K. Agaronyan et al.*

### PROTEIN STRUCTURE

551 Structure and activity of tryptophan-rich TSPO proteins *Y. Guo et al.*

555 Crystal structures of translocator protein (TSPO) and mutant mimic of a human polymorphism *F. Li et al.*



### DEPARTMENTS

#### 459 EDITORIAL

Bridging the opinion gap *By Alan I. Leshner*

#### 578 WORKING LIFE

An education that closed doors *By Jeffrey Mervis*

Science Staff .....	458
AAAS News & Notes .....	486
New Products .....	559
Science Careers .....	560

SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005. Periodicals mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 2015 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$153 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$1282. Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$85. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request. GST #R1254 88122. Publications Mail Agreement Number 1069624. Printed in the U.S.A. Change of address: Allow 4 weeks, giving old and new addresses and 8-digit account number. Postmaster: Send change of address to AAAS, P.O. Box 96178, Washington, DC 20090-6178. Single-copy sales: \$10.00 current issue, \$15.00 back issue prepaid includes surface postage; bulk rates on request. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that \$30.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for Science is 0036-8075. Science is indexed in the Reader's Guide to Periodical Literature and in several specialized indexes.