

Gauging the allure of
designer drugs p. 469

Blown-up brains for a better
inside view pp. 474 & 543

Single-crystal perovskite
solar cells pp. 519 & 522

Science

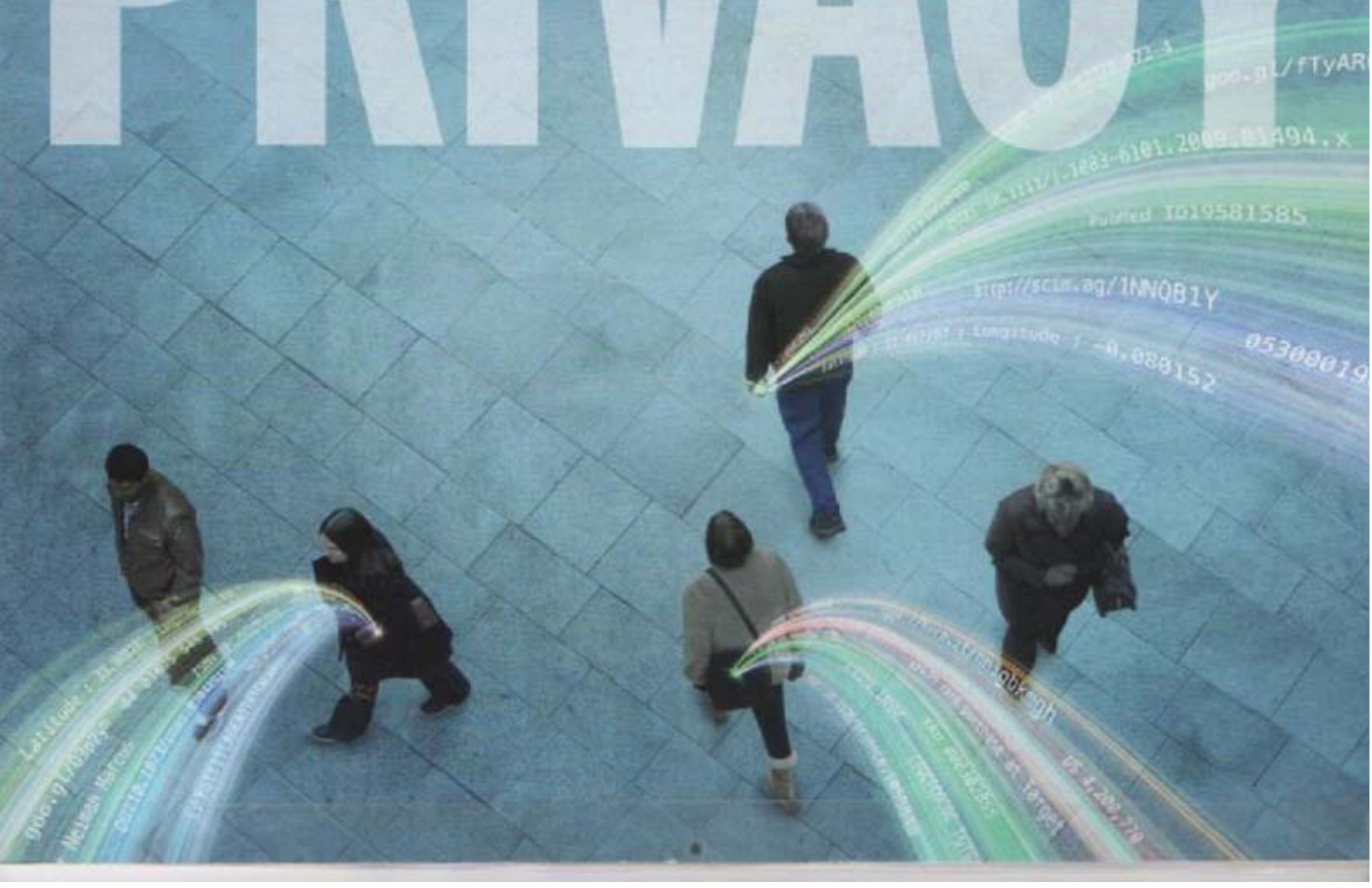
\$10
30 JANUARY 2015
sciencemag.org

AAAS

SPECIAL ISSUE

The End of

PRIVACY



CONTENTS

30 JANUARY 2015 • VOLUME 347 • ISSUE 6221

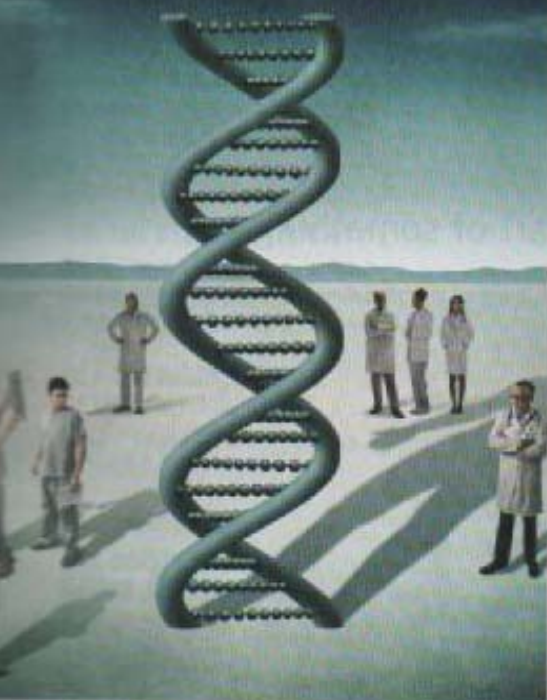


477 & 534

Chicks, like people, count from left to right

SPECIAL SECTION

THE END OF PRIVACY



INTRODUCTION

490 Big data and the Internet are empowering researchers and the public—but endangering privacy
A. L. Newman

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. Lundau

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. Acquati 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

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*

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

CONTENTS

30 JANUARY 2015 • VOLUME 347 • ISSUE 6221



551 & 555

How a disease mutation affects protein function

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 by 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

► 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

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 reidentifiability of credit card metadata *Y.-A. de Montjoye et al.*

► NEWS STORY P. 463; 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 postage (publication No. 484480) 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 (\$24 allocated to subscription). Domestic institutional subscription (51 issues): \$1292; foreign postage extra; Mexico, Caribbean (surface mail) \$55; other countries (air mail delivery) \$48. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request: GST #R125496122. Publications Mail Agreement Number 1059524. Printed in the U.S.A. Change of address: Allow 4 weeks, giving old and new addresses and e-mail 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 (includes surface postage, bulk rates on request). Authorization to photocopy: made up for internal or personal use, or the internal or personal use of specific clients, is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that \$10.00 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.