

COVER

Single cobalt atoms (cones) on a stepped platinum substrate (blue), with attached stripes of one atomic layer of cobalt, magnetized up (yellow) or down (red), as imaged by spin-polarized scanning tunneling microscopy. Recording such images at successive magnetic fields enables measurement of the magnetic properties of individual atoms. See page 82.

Image: F. Meier et al.
(illustration: F. Marcinowski)

NEWS OF THE WEEK

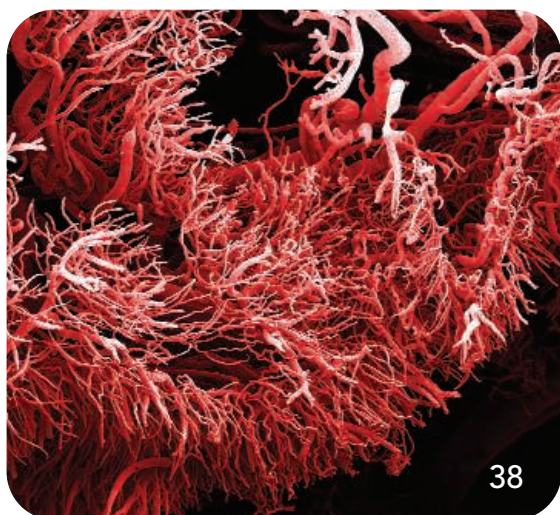
- Review of Vaccine Failure Prompts a Return to Basics 30
- NASA's Stern Quits Over Mars Exploration Plans 31
- Germs Take a Bite Out of Antibiotics 33
- >> *Report p. 100*

SCIENCE SCOPE 33

- China's LAMOST Observatory Prepares for the Ultimate Test 34
- U.S. Asked to Bolster Ties With China 35
- DNA From Fossil Feces Breaks Clovis Barrier 37
- >> *Science Express Report by M. T. P. Gilbert et al.*

NEWS FOCUS

- All in the Stroma: Cancer's Cosa Nostra 38
- American Physical Society Meeting 42
- Magnetic Measurements Hint at Toastier Superconductivity
- Laser Plays Chemical Matchmaker
- Squeeze Play Makes Solid Helium Flow
- Puzzling Over a Steller Whodunit 44



38

DEPARTMENTS

- 13 Science Online
- 15 This Week in Science
- 21 Editors' Choice
- 24 Contact Science
- 27 Random Samples
- 29 Newsmakers
- 120 New Products
- 121 Science Careers

EDITORIAL

- 19 The Promise of Cancer Research
by Bruce Alberts

LETTERS

- Conserving Top Predators in Ecosystems 47
G. Chapron, H. Andr n, O. Liberg
- The Role of Fisheries-Induced Evolution
H. I. Browman, R. Law, C. T. Marshall; A. Kuparinen and J. Meril  Response C. J rgensen et al.
- Tips for NIH *M. Aickin*

CORRECTIONS AND CLARIFICATIONS 50

BOOKS ET AL.

- Violence** A Micro-sociological Theory 51
R. Collins, reviewed by D. D. Laitin

BROWSEINGS 52

POLICY FORUM

- A Case Study of Personalized Medicine 53
S. H. Katsanis, G. Javitt, K. Hudson

PERSPECTIVES

- Toward Understanding Self-Splicing 56
J. A. Piccirilli
>> *Research Article p. 77*
- Blooms Like It Hot 57
H. W. Paerl and J. Huisman
- Deconstructing Pluripotency 58
A. G. Bang and M. K. Carpenter
>> *Report p. 97*
- Tel2 Finally Tells One Story 60
M. Chang and J. Lingner
- Small-Scale Observations Tell a Cosmological Story 61
P. A. Bland
>> *Report p. 91*
- Creating Musical Variation 62
D. S. Dabby



Downloaded from <http://science.sciencemag.org/> on June 18, 2018

5

CONTENTS continued >>

SCIENCE EXPRESS

www.scienceexpress.org

ANTHROPOLOGY

DNA from Pre-Clovis Human Coprolites in Oregon, North America

M. T. P. Gilbert et al.

Fossil human feces from an Oregon cave predate the Clovis culture by about 1000 years, and DNA from the feces marks the presence of Native Americans in North America.

>> News story p. 37

10.1126/science.1154116

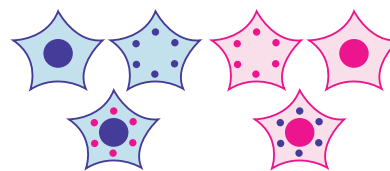
PHYSICS

BREVIA: Fine Structure Constant Defines Visual Transparency of Graphene

R. R. Nair et al.

The transparency of sheets of graphene is quantized in a way that allows a simple determination of the fine structure constant, which relates light and relativistic electrons.

10.1126/science.1156965



MEDICINE

ROS-Generating Mitochondrial DNA Mutations Can Regulate Tumor Cell Metastasis

K. Ishikawa et al.

Mutations in mitochondrial DNA that cause enhanced production of reactive oxygen species can increase the propensity of tumor cells to metastasize.

10.1126/science.1156906



REVIEW

DEVELOPMENTAL BIOLOGY

Stochasticity and Cell Fate

R. Losick and C. Desplan

65

BREVIA

ECOLOGY

Bats Limit Insects in a Neotropical Agroforestry System

K. Williams-Guillén, I. Perfecto, J. Vandermeer

Enclosure experiments show that bats contribute to the reduction of insects on coffee plants more than has been appreciated and to a comparable degree as birds.

70

ECOLOGY

Bats Limit Arthropods and Herbivory in a Tropical Forest

M. B. Kalka, A. R. Smith, E. K. V. Kalko

In a lowland tropical forest, bats consume insect herbivores on understory plants at least as much as birds do, thereby also indirectly limiting damage to the plants.

71

RESEARCH ARTICLES

ARCHAEOLOGY

Aztec Arithmetic Revisited: Land-Area Algorithms and Acolhua Congruence Arithmetic

B. J. Williams and M. del Carmen Jorge y Jorge

Analysis of ancient property records shows that the Aztecs used common algorithms and a distance standard for calculating land area and specific symbols to represent fractions.

72

BIOCHEMISTRY

Crystal Structure of a Self-Spliced Group II Intron

N. Toor, K. S. Keating, S. D. Taylor, A. M. Pyle

The autocatalytic group II intron contains a network of unusual tertiary RNA interactions that form a metalloribozyme active site with parallels to eukaryotic spliceosomes.

>> Perspective p. 56

77

REPORTS

APPLIED PHYSICS

Revealing Magnetic Interactions from Single-Atom Magnetization Curves

F. Meier, L. Zhou, J. Wiebe, R. Wiesendanger

A scanning tunneling microscope with a spin-polarized tip can characterize the magnetic properties of single atoms on a nonmagnetic surface.

82

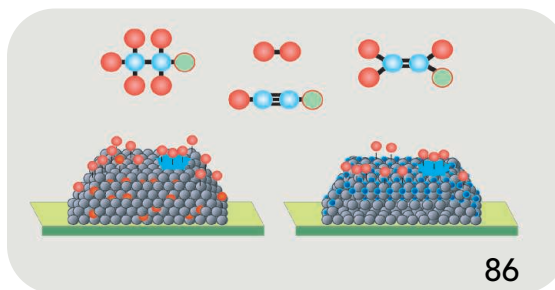
CHEMISTRY

The Roles of Subsurface Carbon and Hydrogen in Palladium-Catalyzed Alkyne Hydrogenation

D. Teschner et al.

The population of hydrogen and carbon within a palladium catalyst governs the hydrogenation of alkynes on its surface.

86



CONTENTS continued >>

REPORTS CONTINUED...

GEOCHEMISTRY

The Electrical Conductivity of Post-Perovskite in Earth's D" Layer 89
K. Ohta et al.

A major silicate mineral deep in Earth's mantle has a high electrical conductivity, causing a sufficiently strong coupling with the core to explain variations in Earth's rotation.

ASTRONOMY

Graphite Whiskers in CV3 Meteorites 91
M. Fries and A. Steele

Graphite whiskers, a naturally occurring allotrope of carbon, have been found in primitive grains in several meteorites and may explain spectral features of supernovae.

>> *Perspective p. 61*

CLIMATE CHANGE

Covariant Glacial-Interglacial Dust Fluxes in the Equatorial Pacific and Antarctica 93
G. Winckler et al.

A 500,000-year record shows that more dust, which provides iron and other nutrients, was blown into the equatorial Pacific during glacial periods than during warm periods.

MOLECULAR BIOLOGY

Selective Blockade of MicroRNA Processing by Lin-28 97
S. R. Viswanathan, G. Q. Daley, R. I. Gregory

A protein necessary for reprogramming skin fibroblasts to pluripotent stem cells is an RNA-binding protein that normally inhibits microRNA processing in embryonic cells.

>> *Perspective p. 58*

MICROBIOLOGY

Bacteria Subsisting on Antibiotics 100
G. Dantas et al.

A wide range of bacteria in the environment, many related to human pathogens, are both resistant to antibiotics and consume them as their only source of carbon for growth.

>> *News story p. 33*

CELL BIOLOGY

Reversible Compartmentalization of de Novo Purine Biosynthetic Complexes in Living Cells 103
S. An, R. Kumar, E. D. Sheets, S. J. Benkovic

The enzymes needed for purine biosynthesis cluster in the cytoplasm when cells are depleted of purine but dissociate when the demand for purine is low.

BIOCHEMISTRY

Single-Molecule DNA Sequencing of a Viral Genome 106
T. D. Harris et al.

The M13 viral genome has been resequenced by a single-molecule method that allows simultaneous sequencing of 280,000 DNA strands of 25 bases with 100 percent coverage.

NEUROSCIENCE

Entrainment of Neuronal Oscillations as a Mechanism of Attentional Selection 110
P. Lakatos et al.

In monkeys that are paying attention to a rhythmic stimulus, brain oscillations become tuned to the stimulus so that the response in the visual cortex is enhanced.

NEUROSCIENCE

Episodic-Like Memory in Rats: Is It Based on When or How Long Ago? 113
W. A. Roberts et al.

Unlike humans, who can place past events within a temporal framework, rats can only remember when an event happened by tracking the time elapsed since its occurrence.





Gorgeous trains get no love from peahens.

SCIENCE NOW

www.sciencenow.org DAILY NEWS COVERAGE

Peacock Feathers: That's So Last Year

Some female birds have lost interest in flashy males.

Traffic Jams Happen, Get Used to It

Physics helps explain bunch-ups on the highway.

Organics in the Mist

Astronomers find an amino acid precursor lurking in an interstellar cloud.



Networking among polar scientists.

SCIENCE CAREERS

www.sciencereers.org/career_development

CAREER RESOURCES FOR SCIENTISTS

Taken for Granted: Help Is on the Way (for Some)

B. Benderly

A flurry of activity on workforce issues in early March did little to ease the problems of young scientists.

A Competitive Fellowship

J. Mervis

Next year, NSF officials hope to launch a novel training program connected to the president's American Competitiveness Initiative.

Networking Group Seeks to Bridge the Poles

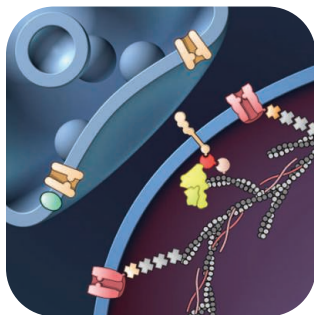
C. Reed

A fledgling organization connects polar scientists.

April 2008 Funding News

J. Fernández

Learn about the latest in research funding opportunities, scholarships, fellowships, and internships.



Calpain cleaves postsynaptic proteins.

SCIENCE SIGNALING

www.stke.org THE SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

REVIEW: Calpain in the CNS—From Synaptic Function to Neurotoxicity

J. Liu, M. Cheng Liu, K. K. W. Wang

Physiological activation of calpains may play a role in memory, whereas pathological activation leads to cell death.

PODCAST

E. M. Adler and J. F. Foley

Mutations in the IGF-1 receptor are associated with longer life span in humans.

SCIENCE PODCAST

Download the 4 April *Science* Podcast to hear about DNA evidence of pre-Clovis people in the Americas, bacteria subsisting on antibiotics, Aztec arithmetic, and more.

www.sciencemag.org/about/podcast.dtl



Separate individual or institutional subscriptions to these products may be required for full-text access.

Science

320 (5872)

Science **320** (5872), 15-120.

ARTICLE TOOLS

<http://science.sciencemag.org/content/320/5872>

PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.