

RM
S410/302

SUSTAINABILITY

ancing Energy,
er and Food

NEUROSCIENCE

Electrical Stimulation
Eases Depression

INFOTECH

Neuronlike
Computing

SCIENTIFIC AMERICAN

ScientificAmerican.com

HUMAN EVOLUTION

Inside the Neanderthal Mind

Intriguing clues about our
surprisingly clever cousins



0 74470 38529 5

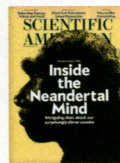
\$5.99 U.S.

FEBRUARY 2015

SCIENTIFIC AMERICAN

February 2015 Volume 312, Number 2

ON THE COVER



Neandertals have a reputation for having been slow-witted. But were our extinct cousins truly that different from us? Studies of their anatomy and DNA have yielded limited information about Neandertal cognition. New insights from the cultural remains they left behind hint that they were far cleverer than they have been given credit for. Image by Jean-François Pödevin.



74

FEATURES

HUMAN EVOLUTION

36 Neandertal Minds

Our Neandertal cousins were much more intelligent than you probably think. *By Kate Wong*

ASTROPHYSICS

44 Can We Mine a Black Hole?

If a future civilization ever considered trying to extract energy from a black hole, it would have some formidable obstacles to surmount. *By Adam Brown*

CHRONOBIOLOGY

50 The Clocks within Us

The human body does not have just one biological clock. It has many. *By Keith C. Summa and Fred W. Turek*

COMPUTER SCIENCE

56 Just Add Memory

Electronic components that act like neurons may fuel computing's next great leap. *By Massimiliano Di Ventra and Yuriy V. Pershin*

ENVIRONMENT

62 A Puzzle for the Planet

Our future depends on whether we can craft an integrated and sustainable new system for providing food, water and energy. *By Michael E. Webber*

NEUROSCIENCE

68 Treating Depression at the Source

Electrical stimulation deep within the brain may deliver a much needed treatment for severe mood disorders. *By Andres M. Lozano and Helen S. Mayberg*

NUCLEAR FALLOUT

74 The Swallows of Fukushima

We know surprisingly little about what low-dose radiation does to organisms and ecosystems. Four years after the disaster in Fukushima, scientists are beginning to get some answers. *By Steven Featherstone*

SCIENTIFIC AMERICAN

DEPARTMENTS

6 From the Editor

8 Letters

12 Science Agenda

The new Congress has a chance to reverse years of stinting on fundamental research. *By the Editors*

14 Forum

A pause on risky pathogen research should be made permanent. *By Marc Lipsitch*

15 Advances

Cable-stayed bridges on the rise. A race with *T. rex*. Hemoglobin from beets. New chemical bond.

32 The Science of Health

How medical marijuana works in the body. *By David Noonan*

35 TechnoFiles

Why mobile payments are stalled and the credit card is here to stay. *By David Pogue*

82 Recommended

Our endangered polar regions. Voyager approaches 40. Future batteries. A forgotten volcano that changed the world. *By Clara Moskowitz*

84 Skeptic

How science can inform ethics. *By Michael Shermer*

85 Anti Gravity

Insects take New York. *By Steve Mirsky*

86 50, 100 & 150 Years Ago

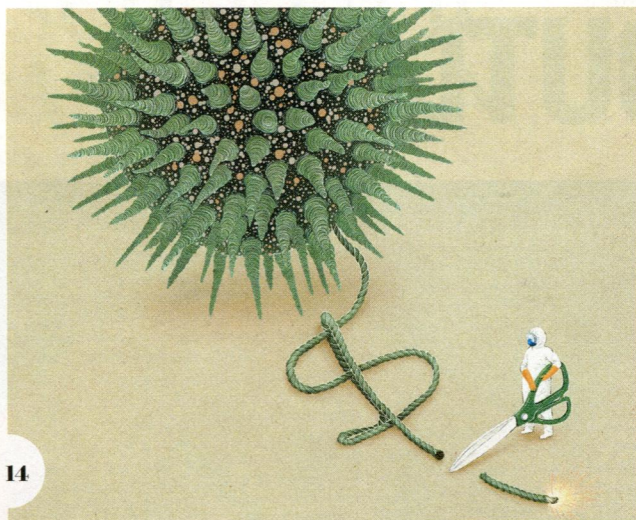
88 Graphic Science

Ebola's steady rise. *By Mark Fischetti*

ON THE WEB

Top 10 Stories of 2014

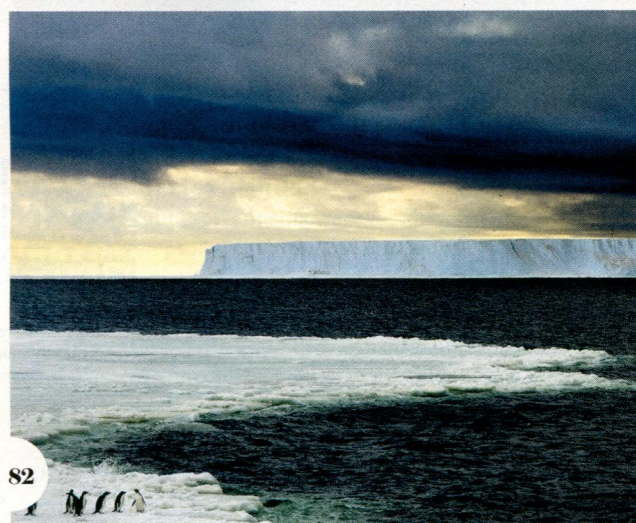
Scientific American reviews the most important events in science and technology from the past year, including the Ebola outbreak and the Rosetta spacecraft's comet landing. Go to www.ScientificAmerican.com/feb2015/top-10



14



15



82

Scientific American (ISSN 0036-8733), Volume 312, Number 2, February 2015, published monthly by Scientific American, a division of Nature America, Inc., 75 Varick Street, 9th Floor, New York, N.Y. 10013-1917. Periodicals postage paid at New York, N.Y., and at additional mailing offices. Canada Post International Publications Mail (Canadian Distribution) Sales Agreement No. 40012504. Canadian BN No. 127387652RT; TVQ1218059275 TQ0001. Publication Mail Agreement #40012504. Return undeliverable mail to, P.O. Box 819, Stn Main, Markham, ON L3P 8A2. **Individual Subscription rates:** 1 year \$39.97 (USD), Canada \$49.97 (USD), International \$61 (USD). **Institutional Subscription rates:** Schools and Public Libraries: 1 year \$79 (USD), Canada \$84 (USD), International \$91 (USD). Businesses and Colleges/Universities: 1 year \$379 (USD), Canada \$384 (USD), International \$391 (USD). Postmaster: Send address changes to Scientific American, Box 3187, Harlan, Iowa 51537. **Reprints available:** write Reprint Department, Scientific American, 75 Varick Street, 9th Floor, New York, N.Y. 10013-1917; fax: 646-563-7138; reprints@SciAm.com. **Subscription inquiries:** U.S. and Canada (800) 333-1199; other (515) 248-7684. Send e-mail to scacustserv@cdsfulfillment.com. Printed in U.S.A. Copyright © 2015 by, a division of Nature America, Inc. All rights reserved.

