

ПН  
540/3a

PLANETARY SCIENCE

Wings of a  
Super Saturn

MEDICINE

On/Off Switch  
for Genes

ENVIRONMENT

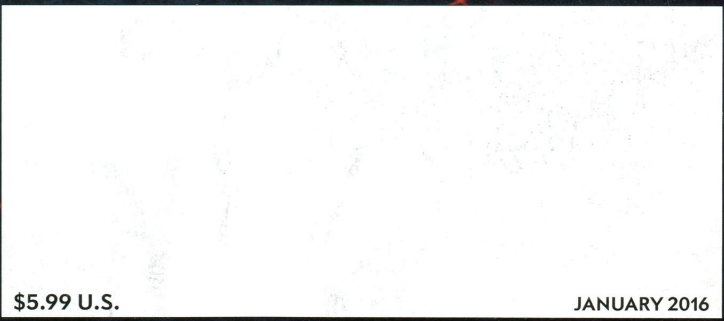
Can We Really  
Capture Carbon?

# SCIENTIFIC AMERICAN

ScientificAmerican.com

# The Brain's GPS

Pathfinding  
networks tell us  
where we are—  
and help to form  
new memories



\$5.99 U.S.

JANUARY 2016



NEUROSCIENCE

**26 Where Am I? Where Am I Going?**

Scientists are figuring out how the brain navigates. *By May-Britt Moser and Edvard I. Moser*

PLANETARY SCIENCE

**34 Rings of a Super Saturn**

A gargantuan set of planetary rings encircles a planet that orbits a star 400 light-years away. *By Matthew Kenworthy*

PUBLIC HEALTH

**42 Death in the Water**

Arsenic contamination in India and other parts of Asia is a growing problem. Experts are divided about how to fight it. *By Katy Daigle*

MEDICINE

**52 An On/Off Switch for Genes**

Molecular switches can turn transplanted genes on and off, paving the way for safer therapies. *By Jim Kozubek*

ENERGY

**58 The Carbon Capture Fallacy**

All credible plans for dealing with climate change, including the ones discussed in Paris this month, hinge on finding a way to remove carbon before it goes up the smokestack. Progress has been slow. *By David Biello*

COGNITION

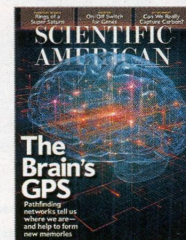
**66 Do Animals Know Where Babies Come From?**

Chimpanzees and other primates sometimes seem to have a grasp of procreation, but they lack key cognitive traits needed to truly understand. *By Holly Dunsworth*

MATHEMATICS

**70 Elegant Equations**

Most people look at symbols and numbers and see cold logic. Mathematicians see the sublime. *By Clara Moskowitz*



ON THE COVER

Nobel Prize-winning research has identified the existence of brain regions that work together to function as a biological GPS. This neural navigation system deep within the brain allows us to move seamlessly from place to place. The disorientation that afflicts Alzheimer's patients may result if these cerebral areas are damaged. *Illustration by Mark Ross.*

Федеральное государственное бюджетное учреждение науки Центральная научная библиотека Уральского отделения Российской академии наук (ЦНБ УрО РАН)

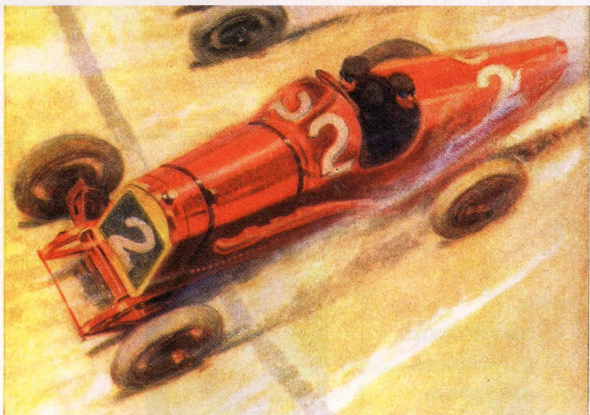
# SCIENTIFIC AMERICAN



11



18



78

## 4 From the Editor

## 6 Letters

## 10 Science Agenda

An important question for presidential candidates is: What is your plan to cut drug prices? *By the Editors*

## 11 Forum

To support women in science, we must reckon with a culture of unconscious bias. *By Claire Pomeroy*

## 12 Advances

NASA's slow-going search for dangerous asteroids. The most accurate GPS. A professional tree climber.

## 23 The Science of Health

Desserts and junk foods can send our appetites into hyperdrive. *By Ferris Jabr*

## 25 TechnoFiles

A surefire way to banish online ads. *By David Pogue*

## 74 Recommended

All the light we can and cannot see. Politics on the brain. How life arose from nonlife. Johannes Kepler's involvement in a witchcraft trial. *By Clara Moskowitz*

## 75 Skeptic

Did *Homo naledi* behave more like *Homo homicidensis*? *By Michael Shermer*

## 76 Anti Gravity

A new book postulates that math can actually be fun. *By Steve Mirsky*

## 78 50, 100 & 150 Years Ago

## 80 Graphic Science

Slumbering research comes to life. *By Amber Williams*

### ON THE WEB

## 2015 Breakthrough Prizes

*Scientific American* spotlights the winners' outstanding achievements in life sciences, physics and mathematics. Go to [www.ScientificAmerican.com/jan2016/breakthrough](http://www.ScientificAmerican.com/jan2016/breakthrough)

Scientific American (ISSN 0036-8733), Volume 314, Number 1, January 2016, published monthly by Scientific American, a division of Nature America, Inc., 1 New York Plaza, Suite 4500, New York, N.Y. 10004-1562. 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 Scientific American, 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 \$72 (USD), Canada \$77 (USD), International \$84 (USD). Businesses and Colleges/Universities: 1 year \$330 (USD), Canada \$335 (USD), International \$342 (USD). Postmaster: Send address changes to Scientific American, Box 3187, Harlan, Iowa 51537. Reprints available: write Reprint Department, Scientific American, 1 New York Plaza, Suite 4500, New York, N.Y. 10004-1562; 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](mailto:scacustserv@cdsfulfillment.com). Printed in U.S.A. Copyright © 2015 by Scientific American, a division of Nature America, Inc. All rights reserved.



Scientific American is part of Springer Nature, which owns or has commercial relations with thousands of scientific publications (many of them can be found at [www.springernature.com/us](http://www.springernature.com/us)). Scientific American maintains a strict policy of editorial independence in reporting developments in science to our readers.