



COVER

A lined day gecko (*Phelsuma lineata*) from Andasibe, eastern Madagascar. This gecko is one of the 2315 species analyzed to identify optimal expansion sites for protected areas within Madagascar, as described on page 222.

Photo: Miroslav Honzák

DEPARTMENTS

- 149 Science Online
- 151 This Week in *Science*
- 156 Editors' Choice
- 158 Contact *Science*
- 159 Random Samples
- 161 Newsmakers
- 250 New Products
- 251 Science Careers

EDITORIAL

- 155 Hybrid Vigor in Research
by Bruce Alberts

NEWS OF THE WEEK

- New Rules on Saving Wetlands Push the Limits of the Science 162
- Drug Bestows Radiation Resistance on Mice and Monkeys 163
>> Report p. 226
- HHMI's Cech Signs Off on His Biggest Experiment 164
- An Early Big Hit to Mars May Have Scarred the Planet for Life 165

SCIENCE SCOPE

- At Mixed Odds, Racetrack Memory Charges From Gate 166
>> Report p. 209
- Signs of Disease in Fetal Transplants 167

NEWS FOCUS

- Tackling Alcoholism With Drugs 168
- The Blue Revolution, Drop by Drop, Gene by Gene 171
Getting to the Root of Drought Responses
- Society for American Archaeology Meeting 174
Following an Asphalt Trail to Ancient Olmec Trade Routes
Herring and Nuts for the 'Salmon People'
Signs of the First Whale Hunters



LETTERS

- Retraction *K. K. Shimizu et al.* 176
- Vegetation's Role in Coastal Protection *R. A. Feagin*
Response *E. B. Barbier et al.*
- A Quaternary Question *D. J. Meltzer*
Response *W. A. Berggren*
- Soil Erosion: Data Say C Sink *J. W. Harden et al.*

CORRECTIONS AND CLARIFICATIONS

BOOKS ET AL.

- Return to Warden's Grove Science, Desire, and the Lives of Sparrows *C. Norment*,
reviewed by *R. D. Sagarin* 180
- Nets, Puzzles, and Postmen An Exploration of Mathematical Connections
P. M. Higgins, reviewed by *S. Mertens* 181

POLICY FORUM

- Science and the Candidates 182
S. R. Kirshenbaum et al.

PERSPECTIVES

- Refreshing Connections 183
R. A. Silver and R. T. Kanichay
>> Research Article p. 201
- Toward New Uses for Hematite 184
C. M. Eggleston >> Report p. 218
- Axons Seek Neighborly Advice 185
K. K. Murai and E. B. Pasquale >> Report p. 233
- Anatomy of a Fungal Polyketide Synthase 186
K. J. Weissman >> Report p. 243
- Zooming into Live Cells 187
F. Pinaud and M. Dahan >> Report p. 246
- Retrospective: Arthur C. Clarke (1917–2008) 189
J. N. Pelton and J. Logsdon



180

Downloaded from <http://science.sciencemag.org/> on May 7, 2021



SCIENCE EXPRESS

www.scienceexpress.org

MOLECULAR BIOLOGY

Endogenous siRNAs Derived from Transposons and mRNAs in *Drosophila* Somatic Cells

M. Ghildiyal et al.

Endogenous small interfering RNAs transcribed from both transposons and messenger RNAs are found in somatic cells of flies and may act to silence "selfish" genetic elements.

10.1126/science.1157396

IMMUNOLOGY

Innate Immune Activation Through Nalp3 Inflammasome Sensing of Asbestos and Silica

C. Dostert et al.

A large multiprotein complex detects particulate airborne pollutants that have been taken up by immune cells in the lung and initiates a potent inflammatory response.

10.1126/science.1156995

APPLIED PHYSICS

Subnanometer Motion of Cargoes Driven by Thermal Gradients Along Carbon Nanotubes

A. Barreiro et al.

A segment of the outer shell of a multiwall carbon nanotube can move back and forth in response to a thermal gradient created by electrical current passing through the nanotube.

10.1126/science.1155559

NEUROSCIENCE

Temperature Sensing by an Olfactory Neuron in a Circuit Controlling Behavior of *C. elegans*

A. Kuhara et al.

An olfactory neuron in *Caenorhabditis elegans* also senses the ambient temperature and is necessary for worms' propensity to seek out the temperature at which they were raised.

10.1126/science.1148922

REVIEW

APPLIED PHYSICS

Magnetic Domain-Wall Racetrack Memory 190
S. S. P. Parkin, M. Hayashi, L. Thomas

BREVIA

PALEOCLIMATE

Amplification of Cretaceous Warmth by Biological Cloud Feedbacks 195

L. R. Kump and D. Pollard

The extreme warmth of the Cretaceous may have been a consequence of fewer clouds, caused by a low abundance of organic cloud nuclei from reduced ocean productivity.



184 & 218

RESEARCH ARTICLES

PHYSICS

Electronic Origin of the Inhomogeneous Pairing Interaction in the High- T_c Superconductor 196

$\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$

A. N. Pasupathy et al.

Scanning tunneling microscope measurements around the superconducting transition temperature imply that electron correlations, not a proposed boson glue, pair up electrons.

NEUROSCIENCE

Surface Mobility of Postsynaptic AMPARs Tunes Synaptic Transmission 201

M. Heine et al.

Desensitized glutamate receptors are exchanged for functional ones through lateral movement within membranes to help maintain fast excitatory neurotransmission. >> *Perspective p. 183*

REPORTS

CHEMISTRY

Gate-Variable Optical Transitions in Graphene 206

F. Wang et al.

Application of electrical biases to single or double layers of graphene changes its infrared reflectivity, mimicking aspects of transistors and opening up optoelectronic applications.

APPLIED PHYSICS

Current-Controlled Magnetic Domain-Wall Nanowire Shift Register 209

M. Hayashi, L. Thomas, R. Moriya, C. Rettner, S. S. P. Parkin

Brief, polarized current pulses can create and shift magnetic domain walls along a magnetic nanowire, demonstrating the basis for a racetrack memory. >> *News story p. 166*

CLIMATE CHANGE

Impact of Artificial Reservoir Water Impoundment on Global Sea Level 212

B. F. Chao, Y. H. Wu, Y. S. Li

Accounting for water impounded globally in artificial lakes that were filled during the past 80 years raises estimates of natural contributions to recent sea level.

CONTENTS continued >>

REPORTS CONTINUED...

GEOCHEMISTRY

- Determining Chondritic Impactor Size from the Marine Osmium Isotope Record** 214

F. S. Paquay, G. E. Ravizza, T. K. Dalai, B. Peucker-Ehrenbrink

The difference in osmium concentrations and isotopes between seawater and asteroids allows reconstruction of impact occurrence and size, including for the Cretaceous.

CHEMISTRY

- Linked Reactivity at Mineral-Water Interfaces Through Bulk Crystal Conduction** 218

S. V. Yanina and K. M. Rosso

A current flow through a hematite crystal couples dissolution and growth reactions at different surfaces, a finding likely relevant to a broad range of semiconducting minerals.

>> *Perspective p. 184*

ECOLOGY

- Aligning Conservation Priorities Across Taxa in Madagascar with High-Resolution Planning Tools** 222

C. Kremen et al.

A broad analysis of many taxa throughout Madagascar identifies regions where conservation is likely to protect the most species.

MEDICINE

- An Agonist of Toll-Like Receptor 5 Has Radioprotective Activity in Mouse and Primate Models** 226

L. G. Burdelya et al.

A drug that triggers the pathway that cancer cells use to avoid death can protect healthy cells from the harmful effects of radiation treatment. >> *News story p. 163*

IMMUNOLOGY

- Evidence for Editing of Human Papillomavirus DNA by APOBEC3 in Benign and Precancerous Lesions** 230

J.-P. Vartanian, D. Guétard, M. Henry, S. Wain-Hobson

A cellular enzyme that defends against infection by causing mutations in retroviruses can also mutate the genome of a DNA virus associated with benign and precancerous cells.

NEUROSCIENCE

- Segregation of Axial Motor and Sensory Pathways via Heterotypic Trans-Axonal Signaling** 233

B. W. Gallarda et al.

In mice, axons carrying signals from spinal cord to muscle are kept separate from those going in the opposite direction by ephrin signaling between them.

>> *Perspective p. 185*

EVOLUTION

- Convergence of *Campylobacter* Species: Implications for Bacterial Evolution** 237

S. K. Sheppard, N. D. McCarthy, D. Falush, M. C. J. Maiden

A survey of two related human pathogens shows that they are merging, probably as a result of their proximity in a new ecological niche—the intestines of farmed animals.



CELL BIOLOGY

- Leiomodin Is an Actin Filament Nucleator in Muscle Cells** 239

D. Chereau et al.

The de novo assembly of the thin filaments in muscle cells is initiated by a newly described protein that efficiently nucleates actin polymer formation.

BIOCHEMISTRY

- Deconstruction of Iterative Multidomain Polyketide Synthase Function** 243

J. M. Crawford et al.

A eukaryotic polyketide natural product is synthesized by assembling seven malonyl building blocks on a specialized protein template where a cyclization cascade is initiated.

>> *Perspective p. 186*

CELL BIOLOGY

- Video-Rate Far-Field Optical Nanoscopy Dissects Synaptic Vesicle Movement** 246

V. Westphal et al.

Sequential subdiffraction resolution images of fluorescently labeled synaptic vesicles in live cells reveal that they exhibit several distinct movement patterns. >> *Perspective p. 187*



ADVANCING SCIENCE, SERVING SOCIETY

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 © 2008 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): \$144 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$770; 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 #1254 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 \$20.00 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.

CONTENTS continued >>>



Birdseed. Friend or foe?

SCIENCE NOW

www.sciencenow.org DAILY NEWS COVERAGE

Birds on the Dole

Does the backyard bird feeder help or hurt your feathered friends?

The Long and Short of It

Dozens of genes and DNA regions linked to height.

Converted Cells Show Promise for Parkinson's

Induced pluripotent stem cells mitigate movement disorder in rats.



Today's undergrads, tomorrow's scientists.

SCIENCE CAREERS

www.sciencereers.org/career_development

CAREER RESOURCES FOR SCIENTISTS

Special Feature: Undergraduates

J. Austin

Today's college kids are the scientists of the future—and in some cases, the present.

The Truth About Gen Y

E. Pain

Experts consider "millennials" one of the greatest generations ever to hit the workplace.

Does Grad School Make Financial Sense?

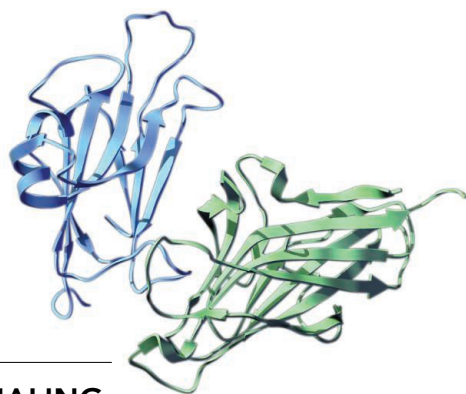
S. Webb

Although a Ph.D. in science may work out financially over an entire career, money woes can be considerable in the short term.

Community Colleges Fuel the Science Workforce

S. Carpenter

With minority scientists in short supply, officials turn to 2-year colleges as a source of talent.



Eph-ephrin interactions.

SCIENCE SIGNALING

www.sciencesignaling.org

THE SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

REVIEW: Eph, a Protein Family Coming of Age—More Confusion, Insight, or Complexity?

M. Lackmann and A. W. Boyd

Eph receptors and their ephrin ligands coordinate cell-positioning programs during development and oncogenesis.

JOURNAL CLUB: GABA Effects on Neurogenesis—An Arsenal of Regulation

T.-F. Yuan

γ -aminobutyric acid (GABA) regulates neurogenesis in various circumstances.

SCIENCE PODCAST

Download the 11 April *Science* Podcast to hear about possible radioprotective drugs, modeling the Cretaceous supergreenhouse, new treatments for alcoholism, 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 (5873)

Science **320** (5873), 151-250.

ARTICLE TOOLS

<http://science.sciencemag.org/content/320/5873>

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. The title *Science* is a registered trademark of AAAS.

Copyright © 2008 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.