

EDITORIAL

- 15 Genomics Is Not Enough
Aravinda Chakravarti

NEWS OF THE WEEK

- 22 A roundup of the week's top stories

NEWS & ANALYSIS

- 26 Human Cells Cloned—Almost
Where Do Human Eggs Come From?
- 28 Sifting Medical Records to Determine
Which Therapies Work Best
- 29 Gene Therapists Celebrate a
Decade of Progress
- 30 Curious Cosmic Speed-Up
Nabs Nobel Prize
- 31 Immunology Prize Overshadowed
by Untimely Death of Awardee

NEWS FOCUS

- 32 An Epoch Debate
A Global Perspective on the Anthropocene
A Sign of Our Times
>> *Science Podcast*

LETTERS

- 38 Strategic Success for Hydropower in Laos
G. Guerrier et al.
Justifiable Changes to *Indicators Survey*
C. Toumey and T. Guterbock
NextGenVOICES: Future of a Generation
Exxon-Mobil Funding Overstated
J. L. Bast et al.
- 39 CORRECTIONS AND CLARIFICATIONS

BOOKS ET AL.

- 41 Out of This World
M. Ashley

POLICY FORUM

- 42 Paleolithic Art in Peril:
Policy and Science Collide
at Altamira Cave
C. Saiz-Jimenez et al.

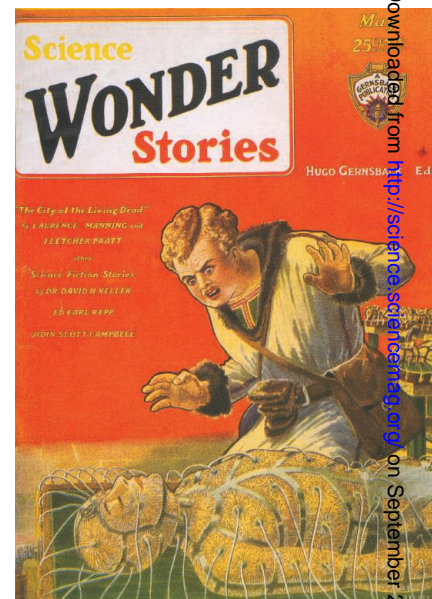
PERSPECTIVES

- 45 The Guts of Dietary Habits
U. Gophna
>> *Report p. 105*
- 46 Resilience to Blooms
J. D. Brookes and C. C. Carey
- 47 Neuroimmune Communication
E. F. Trakhtenberg and J. L. Goldberg
>> *Reports pp. 98 and 101*
- 49 The Genomic Basis of
Local Climatic Adaptation
O. Savolainen
>> *Reports pp. 83 and 86*
- 50 Toward Control of Large-Scale
Quantum Computing
D. P. DiVincenzo
>> *Report p. 57*
- 51 Diamond Window into the Lower Mantle
B. Harte
>> *Research Article p. 54*

CONTENTS continued >>

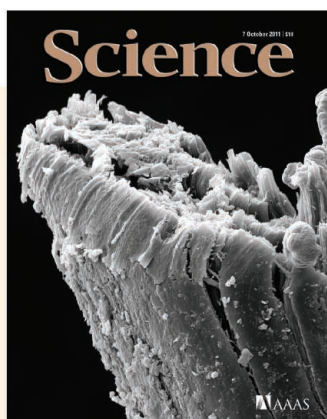


page 32



page 41

Downloaded from <http://science.sciencemag.org/> on September 20, 2020



COVER

Scanning electron microscope image of a strand of hair (about 80 micrometers wide) from the Aboriginal Australian whose genome was sequenced. The genomic sequence provides evidence for multiple dispersals into Asia of modern humans. See page 94.

Courtesy of Timothy P. Topper, Natural History Museum of Denmark

DEPARTMENTS

- 11 This Week in *Science*
- 17 Editors' Choice
- 21 *Science* Staff
- 113 New Products
- 114 *Science* Careers

RESEARCH ARTICLE

54 Deep Mantle Cycling of Oceanic Crust: Evidence from Diamonds and Their Mineral Inclusions

M. J. Walter et al.

Tiny minerals trapped inside Brazilian diamonds show that Earth's carbon cycle extends down to the lower mantle.

>> *Perspective p. 51*

REPORTS

57 Universal Digital Quantum Simulation with Trapped Ions

B. P. Lanyon et al.

A series of trapped calcium ions was used to simulate the complex dynamics of an interacting spin system.

>> *Perspective p. 50*

61 Implementing the Quantum von Neumann Architecture with Superconducting Circuits

M. Mariantoni et al.

A quantum version of a central processing unit was created with superconducting circuits and elements.

66 Three-Dimensional Anderson Localization of Ultracold Matter

S. S. Kondov et al.

A localized and a propagating component appear when an ultracold atomic gas expands in a disordered optical potential.

69 Detection of Pulsed Gamma Rays Above 100 GeV from the Crab Pulsar

The VERITAS Collaboration

This detection constrains the mechanism and emission region of gamma-ray radiation in the pulsar's magnetosphere.

>> *Science Podcast*

72 Dispersible Exfoliated Zeolite Nanosheets and Their Application as a Selective Membrane

K. Varoon et al.

Thin zeolite films prepared through a polymer exfoliation method were used as selective membranes.

75 A Major Constituent of Brown Algae for Use in High-Capacity Li-Ion Batteries

I. Kovalenko et al.

Alginate extracts help stabilize silicon nanoparticles used in a high-capacity lithium-silicon battery.

79 A Self-Quenched Defect Glass in a Colloid-Nematic Liquid Crystal Composite

T. A. Wood et al.

A high concentration of colloidal particles stabilizes a defect network in a liquid crystal and creates a gel-like material.

83 Adaptation to Climate Across the *Arabidopsis thaliana* Genome

A. M. Hancock et al.

Alleles that are under selection in *Arabidopsis* serve as genetic markers that can be used to predict local adaptation.

86 A Map of Local Adaptation in *Arabidopsis thaliana*

A. Fournier-Level et al.

Field experiments identify loci associated with fitness and local adaptation in *Arabidopsis*.

>> *Perspective p. 49*

89 The Shaping of Modern Human Immune Systems by Multiregional Admixture with Archaic Humans

L. Abi-Rached et al.

Viral defense and embryo implantation mechanisms have been shaped by contributions from Neandertal and Denisovan genes.

94 An Aboriginal Australian Genome Reveals Separate Human Dispersals into Asia

M. Rasmussen et al.

Whole-genome data indicate that early modern humans expanded into Australia 62,000 to 75,000 years ago.

98 Acetylcholine-Synthesizing T Cells Relay Neural Signals in a Vagus Nerve Circuit

M. Rosas-Ballina et al.

A neural circuit that involves a specialized population of memory T cells regulates the immune response.

101 Functional Innervation of Hepatic iNKT Cells Is Immunosuppressive Following Stroke

C. H. Y. Wong et al.

Neurotransmitters relay immunosuppressive signals to natural killer T cells after stroke.

>> *Perspective p. 47*

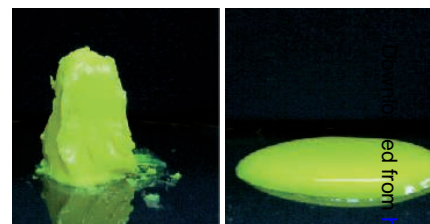
105 Linking Long-Term Dietary Patterns with Gut Microbial Enterotypes

G. D. Wu et al.

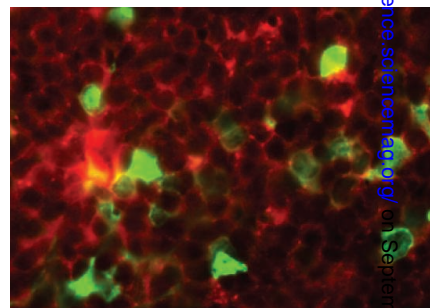
The basic composition of the human gut microbiome is influenced by long-term diet: high fat and protein versus high fiber.

>> *Perspective p. 45*

pages 49, 83, & 86



page 79



pages 47, 98, & 101

CONTENTS continued >>

SCIENCEONLINE

SCIENCEEXPRESS

www.scienceexpress.org

An Activating Mutation of AKT2 and Human Hypoglycemia

K. Hussain et al.

A key kinase in the insulin signaling pathway is constitutively activated in humans with a severe form of hypoglycemia.

10.1126/science.1210878

Stochastic Pulse Regulation in Bacterial Stress Response

J. C. W. Locke et al.

Energy stress activates an alternative sigma factor in stochastic pulses and modulates pulse frequency to control activity.

10.1126/science.1208144

The Influence of Late Quaternary Climate-Change Velocity on Species Endemism

B. Sandel et al.

Regions with low glacial-interglacial climate-change velocity were essential refuges for many small-ranged species.

10.1126/science.1210173

>> *Science Podcast*

Hot Carrier-Assisted Intrinsic Photoresponse in Graphene

N. M. Gabor et al.

Photoexcited electrons in graphene remain thermally excited because they cannot transfer this energy to lattice vibrations.

10.1126/science.1211384

Lithospheric Thinning Beneath Rifted Regions of Southern California

V. Lekic et al.

Seismic imaging reveals the degree to which extensional forces can pull apart the lithosphere.

10.1126/science.1208898

Editorial Expression of Concern on Puneet et al. Report

B. Alberts

10.1126/science.1214735

SCIENCE NOW

www.sciencenow.org

Highlights From Our Daily News Coverage

Ig Nobels Honor Bladder Control, Beer Bottle Mating

Annual awards recognize the humorous side of science.

http://scim.ag/_IgNobels

Got War? Blame the Weather

Study argues that climate shifts are behind most of humankind's maladies.

<http://scim.ag/war-weather>

Beam Me Up, Ratty

'Teleportation' study shows that spatial memories are stored in 125-millisecond packages.

<http://scim.ag/rat-beams>

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

4 October issue: <http://scim.ag/ss100411>

RESEARCH ARTICLE: Genome-Wide Analysis of a Wnt1-Regulated Transcriptional Network Implicates Neurodegenerative Pathways

E. M. Wexler et al.

A systems biology approach identifies connections between Wnt1 signaling and neurodegenerative diseases.

RESEARCH ARTICLE: Itk Controls the Spatiotemporal Organization of T Cell Activation

K. L. Singleton et al.

Loss of the kinase Itk in activated T cells disrupts actin accumulation at the immunological synapse, compromising T cell activation.

PERSPECTIVE: A WNTer Revisit: New Faces of β -Catenin and TCFs in Pluripotency

K. Watanabe and X. Dai

Wnt-stabilized β -catenin may enable embryonic stem cells to resist differentiation by balancing transcriptional repression and activation.

PODCAST: *Science Signaling* Podcast: 4 October 2011

A. Levchenko and A. M. VanHook

By working together, cells can overcome the loss of information as it flows through a signaling network.

ST NETWATCH: E-RNAi

Get online help designing and evaluating RNAi reagents.

ST NETWATCH: Proteomics Identifications Database (PRIDE)

Access published proteomics data sets and contribute your own mass spectrometry data to an online public repository.

SCIENCE TRANSLATIONAL MEDICINE

www.sciencetranslationalmedicine.org

Integrating Medicine and Science

5 October issue: <http://scim.ag/stm100511>

COMMENTARY: The Changing Burden of Infectious Disease in Europe

R. Fears et al.

Opportunities and challenges are described for improving disease surveillance and healthcare innovation to tackle the growing threats of infection.

PERSPECTIVE: Striking a Balance Between Feasible and Realistic Biological Models

A. Calijano

A simple yet elegant quantitative modeling of oncogene addiction advances our predictive understanding of this physiological phenomenon.

RESEARCH ARTICLE: Increased Gene Dosage of *Ube3a* Results in Autism Traits and Decreased Glutamate Synaptic Transmission in Mice

S. E. P. Smith et al.

Tripling the dosage of an autism- and Angelman syndrome-related gene in mice results in reduced glutamatergic synaptic transmission and autism behavioral traits.

RESEARCH ARTICLE: Neutrophil-Derived Cathelicidin Protects from Neointimal Hyperplasia

O. Soehnlein et al.

Cathelicidin-coated stents limit neointima formation.

RESEARCH ARTICLE: Survival and Death Signals Can Predict Tumor Response to Therapy After Oncogene Inactivation

P. T. Tran et al.

Modeling survival and death signaling in tumors by combining quantitative imaging and in situ biomarker analysis can be used to predict responses to therapy after oncogene inactivation.

SCIENCE CAREERS

www.sciencecareers.org/career_magazine

Free Career Resources for Scientists

Scientists as Competitive-Intelligence Analysts

S. Louët

Scientific training gives applicants most of the skills companies need to keep track of the competition.

http://scim.ag/Competitive_Intelligence

Taken for Granted: A Way to Improve Lab-Safety Culture?

B. L. Benderly

A former lab manager argues that modern information systems hold the key to safer academic labs.

<http://scim.ag/rbuDBL>

Content Collection: Science Writing and Editing

J. Austin

A collection of the best *Science* Careers articles on this popular career path for scientists.

http://scim.ag/CC_Writing

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast

Free Weekly Show

On the 7 October *Science* Podcast: climate change and species distributions, pulsar gamma ray emissions, the case for 'the Anthropocene,' and more.

SCIENCE INSIDER

news.sciencemag.org/scienceinsider

Science Policy News and Analysis

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 © 2011 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): \$149 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$990; 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 \$25.00 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.



ADVANCING SCIENCE. SERVING SOCIETY

Science

334 (6052)

Science **334** (6052), 11-113.

ARTICLE TOOLS

<http://science.sciencemag.org/content/334/6052>

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 © 2011 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.