

EDITORIAL

- 304 A Threat to National Security
John J. Hamre

NEWS OF THE WEEK

- 310 A roundup of the week's top stories

NEWS & ANALYSIS

- 313 Receptor Scientists to Receive Chemistry Nobel
- 314 Economics Nobel Honors Matchmaking Finesse
- 315 New Company Pushes the Envelope on Pre-Conception Testing
- 316 Gene Duplication's Role in Evolution Gets Richer, More Complex
New Way to Look at Life
>> Report p. 384

NEWS FOCUS

- 318 Reinventing the Pill: Male Birth Control
>> Science Podcast
- 321 Looking for a Sugar Rush
- 324 Primordial Matter Comes Into Focus in Many Tiny Big Bangs

LETTERS

- 327 Violence: Finding Peace
G. Benjamin et al.
- Violence: Clarified
S. Pinker
- Readers' Poll Results: Paying for Tissue
- 328 TECHNICAL COMMENT ABSTRACTS

BOOKS ET AL.

- 329 Trees of Life
T. W. Pietsch, reviewed by C. Matuk
- 330 Human Biogeography
A. H. Harcourt, reviewed by J. P. Hart

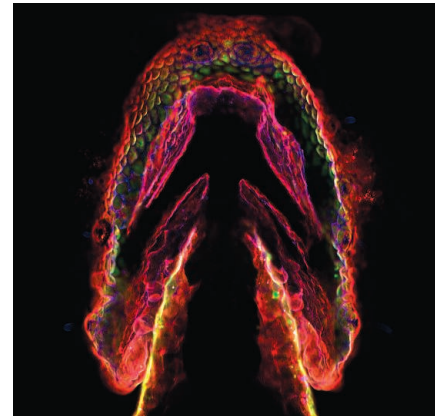
POLICY FORUM

- 331 Toward Variable Funding for International Science
J. Edler

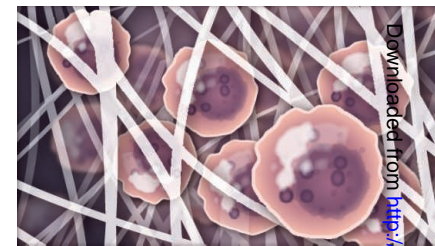
PERSPECTIVES

- 333 Galactic Archaeology
R. Roškar and V. P. Debattista
- 334 How Information Theory Handles Cell Signaling and Uncertainty
M. D. Brennan et al.
- 336 Life in the Early Triassic Ocean
D. J. Bottjer
>> Report p. 366
- 337 Refining the Radiocarbon Time Scale
P. J. Reimer
>> Report p. 370
- 338 Circadian Surprise—It's Not All About Transcription
C. J. Doherty and S. A. Kay
>> Research Article p. 349; Report p. 379
- 340 Unconventional Chemistry for Unconventional Natural Gas
E. McFarland
- 342 Preventable Forms of Autism?
A. L. Beaudet
>> Report p. 394

CONTENTS continued >>

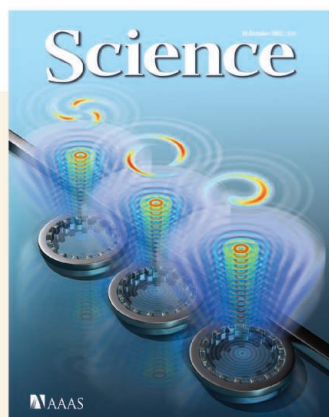


page 321



page 334

Downloaded from <http://science.sciencemag.org/> on October 14, 2019



COVER

Optical vortices emitted by an array of silicon ring resonators. The helical phase fronts, indicated by spirals, denote photons with orbital angular momentum. Emission results from the embedded angular gratings that extract the light waves traveling around the ring. The small emitters (diameter: 8 micrometers) can be integrated on a large scale into photonic integrated circuits, enabling new applications in optical communications and sensing, quantum photonics, and lab-on-a-chip. See page 363.

Image: Yue Zhang (ciel924@126.com), based on data from Xinlun Cai, Jiangbo Zhu, and Siyuan Yu

DEPARTMENTS

- 301 This Week in *Science*
- 305 Editors' Choice
- 308 Science Staff
- 401 New Products
- 402 Science Careers

REVIEW

- 344 Anticipating Critical Transitions
M. Scheffer et al.

RESEARCH ARTICLE

- 349 Transcriptional Architecture and Chromatin Landscape of the Core Circadian Clock in Mammals
N. Koike et al.
A 1-day reconstruction of transcriptional events reveals the influence of the circadian clock across the genome.
>> *Perspective p. 338; Report p. 379*

REPORTS

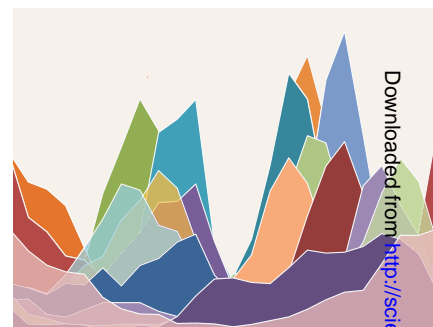
- 355 Jet-Launching Structure Resolved Near the Supermassive Black Hole in M87
S. S. Doeleman et al.
High-resolution observations of the jet in the galaxy M87 probe structures very close to the galaxy's central black hole.
- 358 Self-Assembled Colloidal Superparticles from Nanorods
T. Wang et al.
Colloidal rods self-assemble into semiconducting superparticles with a shape controlled by the number of rods.
- 363 Integrated Compact Optical Vortex Beam Emitters
X. Cai et al.
Microring resonators embedded with angular gratings are used to generate orbital angular momentum states of light.
>> *Science Podcast*
- 366 Lethally Hot Temperatures During the Early Triassic Greenhouse
Y. Sun et al.
Global warming during the Early Triassic was so severe that equatorial latitudes were uninhabitable for many plants and animals.
>> *Perspective p. 336*
- 370 A Complete Terrestrial Radiocarbon Record for 11.2 to 52.8 kyr B.P.
C. Bronk Ramsey et al.
Radiocarbon measurements of samples from Lake Suigetsu, Japan, extend the ^{14}C time scale back to more than 50,000 years ago.
>> *Perspective p. 337*

- 374 Genomic Variation in Seven Khoe-San Groups Reveals Adaptation and Complex African History
C. M. Schlebusch et al.
Cutting-edge genomic approaches test hypotheses about the roots of human history in southern African indigenous populations.
- 379 Cold-Inducible RNA-Binding Protein Modulates Circadian Gene Expression Posttranscriptionally
J. Morf et al.
An RNA-binding protein whose cyclic accumulation is regulated by body temperature confers robustness to circadian oscillators.
>> *Perspective p. 338; Research Article p. 349*
- 384 Real-Time Evolution of New Genes by Innovation, Amplification, and Divergence
J. Näsvalld et al.
Experimental validation of how new genes with divergent functions can evolve within a few thousand generations is described.
>> *News story p. 316*
- 387 Metagenome Mining Reveals Polytheonamides as Posttranslationally Modified Ribosomal Peptides
M. F. Freeman et al.
Large toxins that comprise many modified and D-amino acids are ribosomally synthesized and then derivatized.
- 390 Processing and Subcellular Trafficking of ER-Tethered EIN2 Control Response to Ethylene Gas
H. Qiao et al.
The plant hormone ethylene triggers cleavage and translocation to the nucleus of a signaling component.
- 394 Mutations in *BCKD-kinase* Lead to a Potentially Treatable Form of Autism with Epilepsy
G. Novarino et al.
When the balance of branched-chain amino acids transported into the brain goes awry, neurological deficits can ensue.
>> *Perspective p. 342*
- 397 Direct Observation of Cotranscriptional Folding in an Adenine Riboswitch
K. L. Frieda and S. M. Block
Individual RNA transcripts are observed as they emerge from RNA polymerase and begin to fold into functional forms.

CONTENTS continued >>



pages 337 & 370



pages 338, 349, & 379

ONLINE HIGHLIGHTS

SCIENCEEXPRESS

www.scienceexpress.org

Publication Ahead of Print

**Making the Moon from a Fast-Spinning Earth:
A Giant Impact Followed by Resonant Despinning**
M. Čuk and S. T. Stewart

10.1126/science.1225542

>> [Science Podcast](#)

**Forming a Moon with an Earth-like Composition
via a Giant Impact**

R. M. Canup

10.1126/science.1226073

**Dedifferentiation of Neurons and Astrocytes
by Oncogenes Can Induce Gliomas in Mice**

D. Friedmann-Morvinski et al.

10.1126/science.1226929

Structural Basis of Transcription Initiation

Y. Zhang et al.

10.1126/science.1227786

**Tricking the Guard: Exploiting Plant Defense
for Disease Susceptibility**

J. Lorang et al.

10.1126/science.1226743

**SAICAR Stimulates Pyruvate Kinase Isoform
M2 and Promotes Cancer Cell Survival
in Glucose-Limited Conditions**

K. E. Keller et al.

10.1126/science.1224409

TECHNICAL COMMENTS

**Comment and Response on "Restoring
Voluntary Control of Locomotion
After Paralyzing Spinal Cord Injury"**

Comment: U. Sławińska et al.

<http://dx.doi.org/10.1126/science.1226082>

Response: G. Courtine et al.

<http://dx.doi.org/10.1126/science.1226274>

SCIENCE NOW

www.sciencenow.org

Highlights From Our Daily News Coverage

Baby Back, Waaaay Back, Ribs

The remains of an ancient meal suggest that early humans may have hunted meat.

http://scim.ag/Ancient_Meal

Vesta: The Mini-Planet That Could Magnetize

A 4-billion-year-old meteorite reveals evidence that an asteroid had a dynamo-driven magnetic field.

<http://scim.ag/Mini-Planet>

Dance Your Ph.D.: And the Winner Is...

An Australian materials scientist takes the top honor for translating his thesis into a burlesque performance.

http://scim.ag/Dance_PhD

SCIENCE SIGNALING

www.sciencesignaling.org

The Signal Transduction Knowledge Environment

16 October issue: <http://scim.ag/ss101612>

**RESEARCH ARTICLE: TWEAK and cIAP1 Regulate
Myoblast Fusion Through the Noncanonical
NF- κ B Signaling Pathway**

E. Enwere et al.

Muscle fiber formation from progenitor cells is dependent on noncanonical NF- κ B signaling.

**RESEARCH ARTICLE: The Temporal Pattern of
Stimulation Determines the Extent and Duration
of MAPK Activation in a *Caenorhabditis elegans*
Sensory Neuron**

T. Tomida et al.

Imaging kinase activity in neurons of living worms reveals the complexity in the response.

**PERSPECTIVE: The Response of Cancers to BRAF
Inhibition Underscores the Importance of Cancer
Systems Biology**

E. C. Stites

Targeting the receptor and a mutant component may be an effective colon cancer treatment.

**REVIEW: The Hedgehog Signal Transduction
Network**

D. J. Robbins et al.

Canonical and noncanonical Hedgehog signaling modules are important in health and disease.

**PRESENTATION: Neurosteroids and
Microneurotrophins Signal Through NGF
Receptors to Induce Prosurvival Signaling
in Neuronal Cells**

A. Gravanis et al.

Synthetic DHEA analogs promote neuronal survival without estrogenic or androgenic side effects.

SCIENCE TRANSLATIONAL MEDICINE

www.sciencetranslationalmedicine.org

Integrating Medicine and Science

17 October issue: <http://scim.ag/stm101712>

**RESEARCH ARTICLE: A Preclinical Evaluation
of Minnelide as a Therapeutic Agent Against
Pancreatic Cancer**

R. Chugh et al.

**PERSPECTIVE: Pancreas Cancer Meets
the Thunder God**

S. R. Hingorani and J. D. Potter

Minnelide is a new potential treatment for pancreatic cancer.

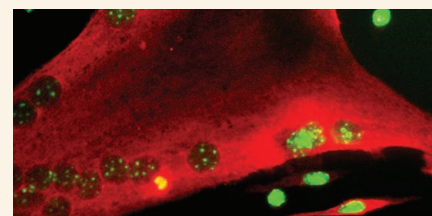
**RESEARCH ARTICLE: A Translational Paradigm
for the Preclinical Evaluation of the Stroke
Neuroprotectant Tat-NR2B9c in Gyrencephalic
Nonhuman Primates**

D. J. Cook et al.

**PERSPECTIVE: Sisyphus and Translational
Stroke Research**

P. Lyden and P. Lapchak

Primates treated with a neuroprotectant after stroke showed outcomes that mimicked those of a human trial.



SCIENCE SIGNALING

Stimulating myoblast fusion.

**RESEARCH ARTICLE: Methylation Subtypes and
Large-Scale Epigenetic Alterations in Gastric
Cancer**

H. Zouridis et al.

A survey of epigenetic alterations in gastric cancer identifies clinically relevant subgroups.

SCIENCE CAREERS

www.sciencereers.org/career_magazine

Free Career Resources for Scientists

<http://scim.ag/SciCareers19October2012>

No Starry-Eyed Astronomer

V. Venkatraman

Jane Luu just won the Shaw Prize for astronomy—so why is she working as an engineer?

Tooling Up: Resume Wisdom

D. Jensen

To go beyond "good enough," think hard about the needs of the hiring manager and the position.

SCIENCE PODCAST

www.sciencemag.org/multimedia/podcast

Free Weekly Show for 19 October 2012

Listen to stories on twisted light, ejecting the Moon, male contraception, and more.

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 © 2012 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 \$30.00 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

338 (6105)

Science **338** (6105), 301-401.

ARTICLE TOOLS

<http://science.sciencemag.org/content/338/6105>

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 © 2012 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works.