

SPECIAL SECTION

## The Gut Microbiota

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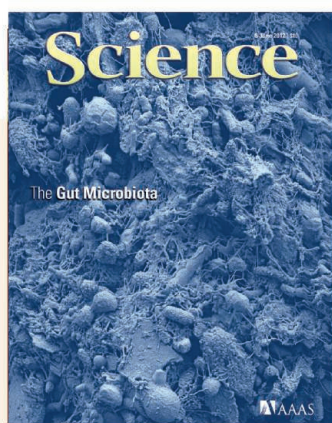
1239 Nuclear-Spin Quantum Memory Poised to Take the Lead  
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1243 Gathering Interstellar Gas  
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Human intestinal bacteria (field-of-view width: ~11.4 μm). The human gut is teeming with symbiotic microbes that interact with their host to maintain health. A joint *Science* and *Science Translational Medicine* special section (see page 1245) explores advances in microbial ecology, microbial and host metabolisms, and interactions between gut microbes and the host immune system. Complementary articles discuss how to apply this knowledge to boost health and nutrition, combat infectious disease, and control noncommunicable diseases such as obesity and diabetes.

Front cover image: Copyright Dennis Kunkel Microscopy, Inc.

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## BREVIA

- 1274 **Crystal Structure of Human Enterovirus 71**  
P. Plevka et al.  
The structure of a virus linked to neurological disease reveals how drugs targeting viruses in this family can be modified.

## RESEARCH ARTICLE

- 1275 **The Stomatopod Dactyl Club: A Formidable Damage-Tolerant Biological Hammer**  
J. C. Weaver et al.  
The structure of mantis clubs is optimized to prevent complete failure caused by repetitive impacts.  
>> *Perspective p. 1237; Science Podcast*

## REPORTS

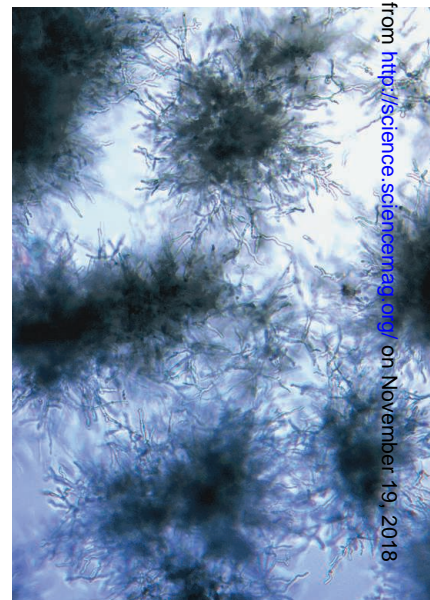
- 1280 **Quantum Information Storage for over 180 s Using Donor Spins in a  $^{28}\text{Si}$  "Semiconductor Vacuum"**  
M. Steger et al.  
An almost isotopically pure sample of  $^{28}\text{Si}$  provides a vacuumlike environment for  $^{31}\text{P}$  qubits.
- 1283 **Room-Temperature Quantum Bit Memory Exceeding One Second**  
P. C. Maurer et al.  
Defects in diamond can be operated as quantum memories at room temperature.  
>> *Perspective p. 1239*
- 1287 **Bright Coherent Ultrahigh Harmonics in the keV X-ray Regime from Mid-Infrared Femtosecond Lasers**  
T. Popmintchev et al.  
An electron excitation process in a high-pressure gas converts infrared light into a well-confined beam of x-rays.
- 1291 **The Heliosphere's Interstellar Interaction: No Bow Shock**  
D. J. McComas et al.  
Observations from the Interstellar Boundary Explorer are not consistent with a bow shock ahead of the heliosphere.  
>> *Perspective p. 1243*
- 1294 **Templating Three-Dimensional Self-Assembled Structures in Bilayer Block Copolymer Films**  
A. Tavakkoli K. G. et al.  
An array of posts guides the bilayer assembly of block copolymers with independent control of morphology and orientation.
- 1298 **Titanium and Zinc Oxide Nanoparticles Are Proton-Coupled Electron Transfer Agents**  
J. N. Schrauben et al.  
Protons can play more of a role than previously appreciated in charge-transfer events at nanoparticle interfaces.

- 1301 **Interglacial Hydroclimate in the Tropical West Pacific Through the Late Pleistocene**  
A. N. Meckler et al.  
Precipitation in Borneo, largely invariant during the last four interglacial periods, decreased during glacial terminations.  
>> *Perspective p. 1242*
- 1304 **Global Honey Bee Viral Landscape Altered by a Parasitic Mite**  
S. J. Martin et al.  
The arrival on Hawaii of the mite *Varroa* has decreased diversity and increased prevalence of deformed wing virus.
- 1306 **Vitamin  $\text{K}_2$  Is a Mitochondrial Electron Carrier That Rescues Pink1 Deficiency**  
M. Vos et al.  
Adding vitamin K rescues fruit flies bearing a mutation in a Parkinson's disease gene homolog.  
>> *Perspective p. 1241*
- 1310 **Actin Network Architecture Can Determine Myosin Motor Activity**  
A.-C. Reymann et al.  
Myosin crumples up antiparallel actin fibers and leaves parallel bundles intact.
- 1314 **Interactions Between Commensal Fungi and the C-Type Lectin Receptor Dectin-1 Influence Colitis**  
I. D. Iliev et al.  
Mammals contain resident fungal intestinal populations that influence disease susceptibility.  
>> *The Gut Microbiota section p. 1245*
- 1317 **Chemokine Gene Silencing in Decidual Stromal Cells Limits T Cell Access to the Maternal-Fetal Interface**  
P. Nancy et al.  
Turning off the expression in the placenta of T cell attractants allows the mother to tolerate the fetus.
- 1321 **Innate Lymphoid Cells Promote Anatomical Containment of Lymphoid-Resident Commensal Bacteria**  
G. F. Sonnenberg et al.  
Lymphocytes prevent bacteria from spreading beyond gut-associated lymphoid tissues and causing systemic inflammation.  
>> *News story p. 1228; The Gut Microbiota section p. 1245*
- 1325 **Regulated Virulence Controls the Ability of a Pathogen to Compete with the Gut Microbiota**  
N. Kamada et al.  
Virulence genes and nutritional requirements determine the course of a gastroenteric bacterial infection in mice.  
>> *Perspective p. 1238; The Gut Microbiota section p. 1245*

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## SCIENCEONLINE

## SCIENCEEXPRESS

[www.scienceexpress.org](http://www.scienceexpress.org)

### Massive Phytoplankton Blooms Under Arctic Sea Ice

*K. R. Arrigo et al.*

In midsummer, diatoms have taken advantage of thinning ice cover to feed in nutrient-rich waters.  
10.1126/science.1215065

### dSarm/Sarm1 Is Required for Activation of an Injury-Induced Axon Death Pathway

*J. M. Osterloh et al.*

Mutations in a scaffold protein block the Wallerian degeneration of axons in flies and mice.  
10.1126/science.1223899

### MMS19 Assembles Iron-Sulfur Proteins Required for DNA Metabolism and Genomic Integrity

*O. Stehling et al.*

A protein thought to be involved in DNA repair is, in fact, responsible for inserting iron-sulfur clusters into enzymes.  
10.1126/science.1219723

### MMS19 Links Cytoplasmic Iron-Sulfur Cluster Assembly to DNA Metabolism

*K. Gari et al.*

A protein that associates with DNA metabolism enzymes serves as a platform for the integration of iron-sulfur clusters.  
10.1126/science.1219664

## SCIENCE NOW

[www.sciencenow.org](http://www.sciencenow.org)

Highlights From Our Daily News Coverage

### Raindrops Don't Swat Down Mosquitoes

The annoying insect's tough body lets it survive midair collisions with much bigger raindrops and keep on flying.  
<http://scim.ag/Raindrops-Mosquitoes>

### An Asian Origin for Human Ancestors?

A Myanmar fossil suggests that our earliest predecessors may not have come from Africa.  
<http://scim.ag/Asian-Origin>

### Where Have the Hawk-Sized Insects Gone?

A study suggests that as bird flight improved, the size of their insect prey dropped considerably.  
<http://scim.ag/Large-Insects>

## SCIENCE SIGNALING

[www.sciencesignaling.org](http://www.sciencesignaling.org)

The Signal Transduction Knowledge Environment

**5 June issue:** <http://scim.ag/ss060512>

### RESEARCH ARTICLE: Matrix Rigidity Controls Endothelial Differentiation and Morphogenesis of Cardiac Precursors

*Kshitz et al.*

Culturing cardiac precursors on a surface with the same rigidity as heart tissue increases the yield of endothelial cells.

### RESEARCH ARTICLE: Coupled Activation and Degradation of eEF2K Regulates Protein Synthesis in Response to Genotoxic Stress

*F. Kruiswijk et al.*

### PERSPECTIVE: F-Box Proteins Elongate Translation During Stress Recovery

*S. Meloche and P. P. Roux*

DNA damage triggers the phosphorylation of factors involved in protein synthesis to regulate polypeptide elongation.

### PROTOCOL: Labeling and Identification of Direct Kinase Substrates

*S. M. Carlson and F. M. White*

A strategy that uses analog-sensitive kinases enables the identification of low-abundance kinase substrates.

## SCIENCE TRANSLATIONAL MEDICINE

[www.sciencetranslationalmedicine.org](http://www.sciencetranslationalmedicine.org)

Integrating Medicine and Science

**6 June issue:** <http://scim.ag/stm060612>

### The Gut Microbiota: Joint Special Section PERSPECTIVE: The Human Gut Microbiota and Undernutrition

*J. I. Gordon et al.*

Interactions between breast milk and the developing gut microbiota and immune system modulate malnutrition.

### REVIEW: Microbiota-Targeted Therapies—An Ecological Perspective

*K. P. Lemon et al.*

Insights from ecology will help to drive the development of microbiota-targeted therapeutics.

### REVIEW: Therapeutic Modulation of Microbiota-Host Metabolic Interactions

*E. Holmes et al.*

Abnormal microbial-host metabolic interactions underlying disease provide new targets for therapeutic intervention.

### REVIEW: Microbiota, Disease, and Back to Health—A Metastable Journey

*R. Blumberg and F. Powrie*

The gut microbiota affects many immune-related diseases; the next step is to harness this knowledge for therapeutics.

>> For related Science content, see

[http://scim.ag/gut\\_microbiota](http://scim.ag/gut_microbiota)

### RESEARCH ARTICLE: Preexisting BCG-Specific T Cells Improve Intravesical Immunotherapy for Bladder Cancer

*C. Biot et al.*

Preexisting immunity to bacillus Calmette-Guérin (BCG) improves treatment response to intravesical BCG therapy for bladder cancer in mouse models and humans.

### RESEARCH ARTICLE: Identification of Naturally Occurring Fatty Acids of the Myelin Sheath That Resolve Neuroinflammation

*P. P. Ho et al.*

Myelin fatty acids resolve neuroinflammation.

### RESEARCH ARTICLE: Phase 1 Study of Stereotactic Body Radiotherapy and Interleukin-2—Tumor and Immunological Responses

*S. K. Seung et al.*

Stereotactic body radiation therapy enhances tumor response rate to high-dose interleukin-2 in a phase 1 study.

### RESEARCH ARTICLE: A Validated Tumorgraft Model Reveals Activity of Dovitinib Against Renal Cell Carcinoma

*S. Sivanand et al.*

An extensively validated tumorgraft model shows activity of investigational agent dovitinib against renal cell carcinoma.

### RESEARCH ARTICLE: Noninvasive Whole-Genome Sequencing of a Human Fetus

*J. O. Kitzman et al.*

Sequencing of cell-free fetal-derived DNA from maternal plasma provides a noninvasive way to predict the fetal genome sequence.

## SCIENCE CAREERS

[www.sciencereers.org/career\\_magazine](http://www.sciencereers.org/career_magazine)

Free Career Resources for Scientists

### Emerging Professions: Knowledge Broker

*S. A. Holgate*

Opportunities are opening up for scientists interested in facilitating knowledge exchange between researchers and a wide range of stakeholders.  
<http://scim.ag/KnowledgeBrokers>

### A Hidden Academic Workforce

*S. Carpenter*

For university staff scientists, the rewards are far off the tenure track.  
<http://scim.ag/HiddenWorkforce>

## SCIENCE PODCAST

[www.sciencemag.org/multimedia/podcast](http://www.sciencemag.org/multimedia/podcast)

Free Weekly Show

On the 8 June Science Podcast: harnessing biological hammers, respecting our microbial residents, the health implications of mass gatherings, and more.

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