Cover
A hot spring in Bali, Indonesia. The discovery of thriving microbial communities in such unexpected places has motivated investigation into the diversity and distribution of microbial life. The special issue beginning on page 1027 explores the microbial world.
Image: Sylvain Grandadam/Getty Images

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CELL SIGNALING
The Rag GTPases Bind Raptor and Mediate Amino Acid Signaling to mTORC1
Y. Sancak et al.
Nutrients, specifically amino acids, are sensed by small guanosine triphosphatases, which bind to a signaling complex, moving it close to the nucleus where it initiates cell growth.
10.1126/science.1157535

MICROBIOLOGY
Evolution of Mammals and Their Gut Microbes
R. E. Ley et al.
Genomic sampling of the microbes in the feces of 60 mammals shows that herbivores harbor the most diversity and that individuals of the same species have the same flora.
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10.1126/science.1155725

CELL BIOLOGY
β-Arrestin–Mediated Localization of Smoothened to the Primary Cilium
J. J. Kovacs et al.
β-arrestin, which has several known roles in signaling systems, also links a key receptor to a motor protein so that the receptor can be transported to cilia for sensing environmental cues.
10.1126/science.1157983

CLIMATE CHANGE
Evidence for Upwelling of Corrosive “Acidified” Water onto the Continental Shelf
R. A. Feely et al.
As a result of anthropogenic CO₂ uptake, corrosive seawater undersaturated with calcium carbonate shoaled on the continental shelf of western North America in 2007.
10.1126/science.1155676

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MICROBIOLOGY
Extending the Sub–Sea-Floor Biosphere 1046
E. G. Roussel et al.
Prokaryotic cells and DNA from Archaea are present at depths greater than 1 kilometer in sediments below the ocean floor, where temperatures range up to 100° Celsius.
**RESEARCH ARTICLES**

**MICROBIOLOGY**

**Virus Population Dynamics and Acquired Virus Resistance in Natural Microbial Communities**

A. F. Andersson and J. F. Banfield

Fragments of viral genes found within Archaea and Bacteria genomes are part of an antiviral defense system and can be used to identify and track the viruses themselves.

**BIOCHEMISTRY**

**Regulated Protein Denitrosylation by Cytosolic and Mitochondrial Thioredoxins**

M. Benhar, M. T. Forrester, D. T. Hess, J. S. Stamler

Thioredoxins—known to be antioxidants—also remove nitrosyl groups from a protease to activate it and may also function in this way in other cellular regulatory systems. [>> Perspective p. 1019]

**MATERIALS SCIENCE**

**Inverse Temperature Dependence of Toughness in an Ultrafine Grain-Structure Steel**

Y. Kimura, T. Inoue, F. Yin, K. Tsuzaki

A network of fine, fibrous grains formed at high temperatures substantially improves the strength and ductility of a low-alloy steel at low temperatures, where it is typically brittle. [>> Perspective p. 1022]

**MATERIALS SCIENCE**

**Dislocation-Driven Nanowire Growth and Eshelby Twist**


A screw dislocation drives the growth of a nanowire pine tree, in which branches regularly extend from the trunk in a spiral, confirming Eshelby’s theory of dislocations.

**PLANETARY SCIENCE**

**Detection of Silica-Rich Deposits on Mars**

S. W. Squyres et al.

The rover Spirit has found opaline silica-rich soil and rocks on Mars, providing further evidence for extensive local mineralization by hydrothermal fluids at low pH.

**GEOPHYSICS**

**Anticorrelated Seismic Velocity Anomalies from Post-Perovskite in the Lowermost Mantle**

A. R. Hutko, T. Lay, J. Revenaugh, E. J. Garnero

Analysis of 10,000 seismic waves passing through the deep mantle shows that a velocity jump 300 kilometers above the core is caused by a phase change in a major mantle mineral.

**PHYSIOLOGY**

**Differential Rescue of Light- and Food-Entrainable Circadian Rhythms**

P. M. Fuller, J. Lu, C. B. Saper

When hungry, rodents may optimize their chances of finding food by engaging a food-entrained circadian clock in the brain that takes over from the light-driven clock.

**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. [>> Perspective p. 1023]

**MEDICINE**

**A Polymorphism Within the G6PC2 Gene Is Associated with Fasting Plasma Glucose Levels**

N. Bouatia-Naji et al.

Variation in a gene for a protein in the pancreas may help explain why people have different levels of fasting blood glucose, a factor that affects disease risk.

**CELL BIOLOGY**

**The Serine Protease TMPRSS6 Is Required to Sense Iron Deficiency**

X. Du et al.

A cell-surface enzyme that cleaves proteins is unexpectedly necessary for sensing when iron levels are low and thereby triggering compensatory absorption of iron from food.
Microbial Ecology

PERSPECTIVE: Diversification of the Function of Cell-to-Cell Signaling in Regulation of Virulence Within Plant Pathogenic Xanthomonads
M. Dow
Different plant pathogens use similar signaling molecules in distinct ways.

PERSPECTIVE: Bacterial-Modulated Signaling Pathways in Gut Homeostasis
W.-J. Lee
Stimulation of the production of reactive oxygen species in gut epithelial cells by commensal bacteria dampens the host immune response.

PERSPECTIVE: Etosis—A Novel Cell Death Pathway
F. Wartha and B. Henriques-Normark
Pathogenic microbes are trapped and killed by mast cell– and neutrophil-derived extracellular traps.

An unhappy microbe-host interaction.
Science 320 (5879), 981-1096.

http://science.sciencemag.org/content/320/5879

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