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.
>> Microbial Ecology section p. 1027
10.1126/science.1155725

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MICROBIOLOGY
Extending the Sub—Sea-Floor Biosphere
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.
10.1126/science.1155676
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

REPORTS

MATERIALS SCIENCE
Structural Diversity of Sodium
E. Gregoryanz et al.
Single-crystal diffraction data reveal that many crystalline phases of sodium, some quite complex, occur near its unusual minimum melting temperature at very high pressure.

MATERIALS SCIENCE
Inverse Temperature Dependence of Toughness in an Ultrasfine 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.

GEOLOGY
Formation of Box Canyon, Idaho, by Megaflood:
Implications for Seepage Erosion on Earth and Mars
M. P. Lamb et al.
A classic amphitheater-shaped canyon in Idaho, similar to features seen on Mars, formed in a glacial megaflood, not through groundwater seepage at its head as was thought.

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

EVOLUTION
Resource Partitioning and Sympatric Differentiation Among Closely Related Bacterioplankton
D. E. Hunt et al.
A model of a marine plankton population reveals that ecologically distinct subgroups undergo sympatric speciation fast enough to overcome horizontal gene flow.

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.

PSYCHOLOGY
The Right and the Good: Distributive Justice and Neural Encoding of Equity and Efficiency
M. Hsu, C. Anen, S. R. Quartz
A brain region linked to emotion-processing systems is activated as humans weigh fairness to an individual against benefit for a group.
An unhappy microbe-host interaction.

SPECIAL SECTION

Microbial Ecology

SCIENCE SIGNALING

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THE SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

EDITORIAL GUIDE: Focus Issue—A Niche of One’s Own

E. M. Adler and J. F. Foley

The nature of microbe-host relationships often depends on signaling pathways in the host.

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.