COVER

The universe is filled with filamentary structures of dark and visible matter that make up the "cosmic web," as suggested in this artist's rendering of cosmic bubbles and connected clumps. A special section beginning on page 46 considers the latest research into the origins and evolution of the cosmic web.

Image: Shigemi Numazawa/Atlas Photo Bank/Photo Researchers Inc.

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Three-Dimensional Super-Resolution Imaging by Stochastic Optical Reconstruction Microscopy
B. Huang, W. Wang, M. Bates, X. Zhuang
Three-dimensional fluorescence images of cellular structures in fixed cells are realized at 20- to 30-nm lateral and 50-nm axial resolution, without scanning.
10.1126/science.1153529

BIOCHEMISTRY
Direct Observation of Hierarchical Folding in Single Riboswitch Aptamers
W. J. Greenleaf et al.
Optical trapping reveals that activation by adenine stabilizes the weakest helix in a riboswitch, after which secondary and tertiary structures are formed sequentially.
10.1126/science.1151298

GENETICS
Mutations in the Pericentrin (PCNT) Gene Cause Primordial Dwarfism
A. Rauch et al.
In humans, an inherited condition with small brain size and near-normal intelligence is caused by mutations that disrupt chromosome separation during cell division.
10.1126/science.1151174

CLIMATE CHANGE
The Spatial Pattern and Mechanisms of Heat Content Change in the North Atlantic
M. S. Lozier et al.
Warming and cooling in different parts of the North Atlantic since 1950 reflect variable atmospheric circulation, complicating our understanding of anthropogenic changes.
10.1126/science.1146436

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Revolutionizing China’s Environmental Protection
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M. Buckley et al.
full text at www.sciencemag.org/cgi/content/full/319/5859/33c
Response to Comment on “Protein Sequences from Mastodon and Tyrannosaurus rex Revealed by Mass Spectrometry”
J. M. Asara and M. H. Schweitzer
full text at www.sciencemag.org/cgi/content/full/319/5859/33d

BREVIA
EVOLUTION
Rarity of Males in Pea Aphids Results in Mutational Decay
J. A. Brisson and S. V. Nuzhdin
Genes used preferentially by female pea aphids are under stronger selection than those used by males, probably because females mainly reproduce asexually.

EVOLUTION
Physiological Sex Predicts Hybrid Sterility
Regardless of Genotype
J. H. Malone and P. Michalak
An apparent violation of Haldane’s rule (in hybrid organisms the heterogametic sex tends to be sterile) in frogs can be explained by postulating that males have evolved faster.

RESEARCH ARTICLES
PALEOCLIMATE
Reduced North Atlantic Deep Water Coeval with the Glacial Lake Agassiz Freshwater Outburst
H. F. Kleiven et al.
Data on deep water formation in the North Atlantic indicate that the sudden draining of a huge glacial lake south of Hudson Bay led to dramatic cooling 8200 years ago.

GENETICS
The Physcomitrella Genome Reveals Evolutionary Insights into the Conquest of Land by Plants
S. A. Rensing et al.
Comparison of the moss genome sequence with those of other plants reveals hallmarks of colonization of land, including genes to manage terrestrial stresses such as dehydration.
**REPORTS**

**CHEMISTRY**

Hidden Degrees of Freedom in Aperiodic Materials

B. Toudic et al.

Neutron diffraction shows how a host-guest crystal can undergo a phase transition that affects only higher-dimensional parameters that relate two simple sublattices.  

**CHEMISTRY**

Nonadiabatic Interactions in the Cl + H Reaction Probed by CIH₂⁻ and ClD⁻ Photoelectron Imaging

E. Garand et al.

Comparison of high-resolution spectra with theoretical simulations reveals that electronically excited ions subtly participate in an elementary reaction.

**GEOCHEMISTRY**

Helium and Neon Abundances and Compositions in Cometary Matter

B. Marty et al.

The amount and isotopic composition of helium and neon in Stardust samples imply that comet Wild 2 acquired these gases in a high-energy environment near the young Sun.

**PLANETARY SCIENCE**

Temperature and Composition of Saturn’s Polar Hot Spots and Hexagon

L. N. Fletcher et al.

Cassini observations show that Saturn’s atmosphere has stable, unusually hot vortices around both poles, even though its north pole is shrouded in darkness.

**PALEONTOLOGY**

The Avalon Explosion: Evolution of Ediacara Morphospace

B. Shen, L. Dong, S. Xiao, M. Kowalewski

Earth’s first complex life 575 million years ago rapidly encompassed the full range of ediacara morphologies before declining, a pattern like that in the later Cambrian explosion.

**GEOPHYSICS**

Intermittent Plate Tectonics?

P. G. Silver and M. D. Behn

Subduction may have stopped at times in Earth’s past as supercontinents formed, thus slowing the planet’s heat loss.

**EVOLUTION**

Polymorphic Y Chromosomes Harbor Cryptic Variation with Manifold Functional Consequences

B. Lemos, L. O. Araripe, D. L. Hartl

Unexpectedly, the Y chromosome exerts strong regulatory effects on X-linked and autosomal genes in Drosophila.

**MOLECULAR BIOLOGY**

Heterochromatin and RNAi Are Required to Establish CENP-A Chromatin at Centromeres

H. D. Folco, A. L. Pidoux, T. Urano, R. C. Allshire

Formation of the centromere, the specialized region by which chromosomes are pulled apart during cell division, requires the presence of RNAi-induced heterochromatin.

**CELL BIOLOGY**

Assembly Mechanism of the Contractile Ring for Cytokinesis by Fission Yeast

D. Vavylonis et al.

The contractile ring of cell division is powered by myosin motors on the cell equator, which capture and pull actin filaments growing randomly from the equator.

**NEUROSCIENCE**

Ongoing in Vivo Experience Triggers Synaptic Metaplasticity in the Neocortex

R. L. Clem, T. Celikel, A. L. Barth

During continuous sensory stimulation, NMDA receptors in the mouse cortex switch from enhancing synaptic potentiation to opposing it.

**NEUROSCIENCE**

Small Circuits for Large Tasks: High-Speed Decision-Making in Archerfish

T. Schlegel and S. Schuster

Archerfish shoot their insect prey with a stream of water and then use sensory information and just a few neurons to calculate how to retrieve their food.