**SPECIAL SECTION**

**Gene Regulation**

**INTRODUCTION**
Freedom of Expression

**NEWS**
MicroRNAs Make Big Impression in Disease After Disease

**PERSPECTIVES**
Gene Regulation by Transcription Factors and MicroRNAs
O. Hobert

The Eukaryotic Genome as an RNA Machine

Multilevel Regulation of Gene Expression by MicroRNAs
E. V. Makeyev and T. Maniatis

Transcription Regulation Through Promoter-Proximal Pausing of RNA Polymerase II
L. J. Core and J. T. Lis

Gene Regulation in the Third Dimension
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Complex Riboswitches
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Evolution of Eukaryotic Transcription Circuits
B. B. Tuch, H. Li, A. D. Johnson

**EDITORIAL**

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Shortcuts to Medical Progress?  
by Bruce Alberts  
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**NEWS OF THE WEEK**

Roads, Ports, Rails Aren’t Ready for Changing Climate, Says Report

Study Fingers Soot as a Major Player in Global Warming

Smart Birds Lend a Beak for Food

NIH Reports Breach of Patient Records

Elusive Pathogen Cornered at Last

**SCIENCESCOPE**

China’s Modern Medical Minister

Saudi Start-Up Hopes Grants Will Buy Time

**NEWS FOCUS**

Science by the Masses

Weighing the Climate Risks of an Untapped Fossil Fuel

With New Disease Genes, a Bounty of Questions

Lunar and Planetary Science Conference

Cooking Up the Solar System From the Right Ingredients

New Piece of the Solar System Puzzle Fits In

What Was a ‘Wet and Warm’ Early Mars Really Like?

Snapshots From the Meeting

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MATERIALS SCIENCE
Stretchable and Foldable Silicon Integrated Circuits
D.-H. Kim et al.
High-performance, bendable, and stretchable electronic devices are fabricated on an elastic plastic substrate by placing the critical electronic components in the neutral bending plane.

APPLIED PHYSICS
Silica-on-Silicon Waveguide Quantum Circuits
A. Politi et al.
Quantum circuits—in which individual photons interfere, entangle, and form logic gates—have been realized on silicon chips.

BIOCHEMISTRY
Reconstitution of Pili Assembly Reveals a Bacterial Outer Membrane Catalyst
M. Nishiyama, T. Ishikawa, H. Rechsteiner, R. Glockshuber
The cell-free formation of the protruberant pili of a pathogenic bacteria is accelerated by a protein that catalyzes supramolecular assembly without input of cellular energy.

GENETICS
Rare Structural Variants Disrupt Multiple Genes in Neurodevelopmental Pathways in Schizophrenia
T. Walsh et al.
Patients with schizophrenia carry multiple small deletions and duplications in their DNA that are associated nonrandomly with neuronal signaling and brain development pathways.

LETTERS
The Last Inventor of the Telephone J. Schmidhuber
Thinking Outside the Reef E. L. Peterson, M. Beger, Z. T. Richards
Putting Ant-Acacia Mutualisms to the Fire R. Cochard and D. Agosti Response T. M. Palmer et al.

BOOKS
Proust Was a Neuroscientist J. Lehrer
Artscience Creativity in the Post-Google Generation D. Edwards, reviewed by J. Labinger
Victorian Popularizers of Science Designing Nature for New Audiences B. Lightman, reviewed by P. J. Pauly

POLICY FORUM
The Planet Debate Continues M. V. Sykes

REPORTS
AstroPhysics
Magnetar-Like Emission from the Young Pulsar in Kes 75 F. P. Gavriil et al.
A pulsar exhibits x-ray bursts like that seen only in magnetars, which have ultrahigh magnetic fields, implying that neutron stars exhibit a continuum of magnetic activity.
**PHYSICS**

Sr Lattice Clock at $1 \times 10^{-16}$ Fractional Uncertainty by Remote Optical Evaluation with a Ca Clock

A. D. Ludlow et al.

Two clocks based on optical transitions in single trapped ions, set 4 kilometers apart, are able to keep time within a fractional error of $1 \times 10^{-16}$, better than the standard atomic clock.

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**PHYSICS**

Frequency Ratio of Al$^+$ and Hg$^+$ Single-Ion Optical Clocks; Metrology at the 17th Decimal Place

T. Rosenband et al.

Precise measurements of the frequency ratio of two optical clocks indicate that the fine-structure constant is fine and constant to an uncertainty of $10^{-17}$. >> Perspective p. 1768

**CHEMISTRY**

Self-Assembly of Large and Small Molecules into Hierarchically Ordered Sacs and Membranes

R. M. Capito et al.

Mixing of a high–molecular weight polymer with a low–molecular weight peptide amphiphile instantly forms repairable membrane sacs large enough to encapsulate cells.

**MATERIALS SCIENCE**

The Transition from Stiff to Compliant Materials in Squid Beaks

A. Miserez, T. Schneberk, C. Sun, F. W. Zok, J. H. Waite

The squid beak, sharp and hard only at the tip, exhibits a chemical gradient that tailors its mechanical properties to prevent damage to the attached soft muscle tissue. >> Perspective p. 1767

**CHEMISTRY**

Determining Transition-State Geometries in Liquids Using 2D-IR

J. F. Cahoon, K. R. Sawyer, J. P. Schlegel, C. B. Harris

Tracking vibrational modes through a transition state by spectroscopy reveals an iron compound’s thermal ligand rearrangement, which was previously too fast to monitor.

**CHEMISTRY**

Surface Trapping of Atoms and Molecules with Dipole Rings

H. Dil et al.

Holes in a boron nitride surface ringed by in-plane dipoles form a nanometer-scale pore network with a trapping potential that can hold weakly adsorbed molecules.

**MOLECULAR BIOLOGY**

Nutritional Control of Reproductive Status in Honeybees via DNA Methylation

R. Kucharski, J. Maleszka, S. Foret, R. Maleszka

Epigenetic modifications that involve methylation cause female honeybee larvae to become queens rather than workers when they are fed royal jelly.

**STRUCTURAL BIOLOGY**

The Flavivirus Precursor Membrane-Envelope Protein Complex: Structure and Maturation

L. Li et al.

Dengue and West Nile viruses mature when the envelope protein precursor is cleaved at low pH, and then the cleavage product dissociates outside the cell, allowing infection.

**NEUROSCIENCE**

Insect Odorant Receptors Are Molecular Targets of the Insect Repellent DEET

M. Ditzen, M. Pellegrino, L. B. Vosshall

The widely used insect repellent DEET acts by inhibiting olfactory neurons that respond to odors such as those that attract insects to their hosts.

**NEUROSCIENCE**

Discrimination of Indistinguishable Odor Cues

W. Li, J. D. Howard, T. B. Parrish, J. A. Gottfried

After association of negative stimuli to one of a pair of initially indistinguishable odors, human participants learn to tell the two odors apart and show altered brain representations.

**NEUROSCIENCE**

Electric Fields Due to Synaptic Currents Sharpen Excitatory Transmission

S. Sylantyev et al.

The electrical field set up by currents within the synaptic cleft can influence diffusion of negatively charged neurotransmitters, such as glutamate, and prolong excitatory events.

**NEUROSCIENCE**

Rule Learning by Rats

R. A. Murphy, E. Mondragón, V. A. Murphy

Rats can learn the rules governing simple sequences of stimuli and then unexpectedly can generalize these rules to new situations.
Focus Issue: Mechanisms of Gene Regulation

New Form of Vision Discovered
Mantis shrimp eyes can see circular polarized light, which may be used in mating or secret signaling.

Therapeutic Cloning Shows Promise for Parkinson’s Disease
Mice treated with their own cells.

What Does a Plant Sound Like?
A computer program reveals how bats find their favorite foliage—and how we can use the same trick.

Mind Matters: Too Perfect?
I. S. Levine
Perfectionism can diminish productivity, undermine job satisfaction, and damage work relationships.

Mastering Your Ph.D.: Goodbye to All That
P. Gosling and B. Noordam
Once you’ve said goodbye to the bench, you can take comfort in the opportunities that await.

Educated Woman, Postdoc Edition, Chapter 14: Interview Excursions
M. P. DeWhyse
It’s official: Micella is out shopping for a new career.

From the Archives: Thanks for the Great Postdoc Bargain
R. Freeman
The Harvard economist thanks postdocs for their skilled and diligent servitude.