COVER
A male lark bunting in the Pawnee National Grassland, Colorado. The plumage quality of the males determines their reproductive success, but different aspects of the black and white markings are preferred by females in different years. This variability alters the long-term sexual selection dynamics and may favor the evolution of multiple sexual ornaments. See page 459.

Photo: Bruce Lyon

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APPLIED PHYSICS
Chemically Derived, Ultrasmooth Graphene Nanoribbon Semiconductors
X. Li, X. Wang, L. Zhang, S. Lee, H. Dai
Unlike nanotubes, 10-nanometer-wide graphene nanoribbons have smooth edges and can act as semiconductors.
10.1126/science.1150878

IMMUNOLOGY
Innate Immune Homeostasis by the Homeobox Gene Caudal and Commensal-Gut Mutualism in Drosophila
J.-H. Ryu et al.
A Drosophila gene important in development also inhibits the production of harmful antimicrobial peptides that could kill off beneficial gut microbes.
10.1126/science.1149357

IMMUNOLOGY
The Right Resident Bugs
N. Silverman and N. Paquette
10.1126/science.1154209

BREVIA

COMPUTER SCIENCE
100% Accuracy in Automatic Face Recognition
R. Jenkins and A. M. Burton
The simple process of image averaging can boost the performance of a commercial face recognition system to 100% accuracy.

REPORTS

PHYSICS
Probing the Carrier Capture Rate of a Single Quantum Level
M. Berthe et al.
Scanning tunneling microscopy reveals how electrons tunnel through a single dangling silicon bond and shows that local subsurface doped holes greatly affect the dynamics.

CHEMISTRY
Spin Conservation Accounts for Aluminum Cluster Anion Reactivity Pattern with O2
R. Burgert et al.
Small metal clusters with an even number of atoms react rapidly with oxygen because electron spin is conserved, whereas odd clusters are more stable because it is not.

CHEMISTRY
NMR Imaging of Catalytic Hydrogenation in Microreactors with the Use of para-Hydrogen
L.-S. Bouchard et al.
The flow of para-hydrogen through industrial catalytic reactors allows magnetic resonance imaging of the gas flow and of the hydrogenation reactions, facilitating optimization.

APPLIED PHYSICS
GaN Photonic-Crystal Surface-Emitting Laser at Blue-Violet Wavelengths
H. Matsubara et al.
Surface-emitting lasers fabricated with photonic crystal structures can now emit at technologically relevant blue-violet wavelengths.

GEOCHEMISTRY
Comparison of Comet 81P/Wild 2 Dust with Interplanetary Dust from Comets
H. A. Ishii et al.
The silicate minerals found in interplanetary dust particles are not seen in Comet 81P/Wild 2, implying that the comet is devoid of material from the outer solar system.
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Transgenic Inhibition of Synaptic Transmission Reveals Role of CA3 Output in Hippocampal Learning
T. Nakashiba, J. Z. Young, T. J. McHugh, D. L. Buhl, S. Tonegawa
Blockade of neural activity in the CA3 region of the hippocampus with a reversible, inducible transgenic method inhibits rapid learning but spares certain spatial tasks.
10.1126/science.1151120

MOLECULAR BIOLOGY
Complete Chemical Synthesis, Assembly, and Cloning of a Mycoplasma genitalium Genome
D. G. Gibson et al.
A complete bacterial genome is synthesized, assembled, and cloned, providing a method that will be useful for generating large DNA molecules de novo.
10.1126/science.1151721

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Cell Biology

Centromeric Aurora-B Activation Requires TD-60, Microtubules, and Substrate Priming Phosphorylation
S. E. Rosasco-Nitcher et al.
A kinase that regulates chromosome segregation to daughter cells during metaphase is confined to the inner centromere through its interactions with other centromeric proteins.

Genetics

Alignment Uncertainty and Genomic Analysis
K. M. Wong, M. A. Suchard, J. P. Huelsenbeck
Comparative evolutionary genomics can be improved by taking into account the uncertainties inherent in aligning genes from organism to organism. >> Perspective p. 416

Immunology

NFAT Binding and Regulation of T Cell Activation by the Cytoplasmic Scaffolding Homer Proteins
G. N. Huang et al.
Signals coming into the T cell are coordinated by two scaffolding proteins, which determine whether the cell will be activated or permanently shut down.

Cell Biology

The Frequency Dependence of Osmo-Adaptation in Saccharomyces cerevisiae
J. T. Mettetal et al.
Modeling the dynamics of the osmotic stress response in yeast reveals an unexpected, rapid nontranscriptional mechanism that may involve glycerol transport. >> Perspective p. 417

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Control of Genic DNA Methylation by a jmjC Domain—Containing Protein in Arabidopsis thaliana
H. Saze, A. Shiraishi, A. Miura, T. Kakutani
A plant demethylase checks the spread of DNA methylation from silenced transposons and repetitive DNA to nearby genes, preventing their inappropriate inhibition.

Molecular Biology

Concurrent Fast and Slow Cycling of a Transcriptional Activator at an Endogenous Promoter
T. S. Karpova et al.
A yeast transcription factor binds onto and off its promoter rapidly, controlling initiation, but also shows a 30-min cycle as the number of accessible promoters varies.

Climate Change

Irreconcilable Differences: Fine-Root Life Spans and Soil Carbon Persistence
A. E. Strand et al.
Two common ways to measure residence times of root carbon in soils measure different things; neither is correct for inferring carbon cycling in ecosystems.

Evolution

Adaptive Plasticity in Female Mate Choice Dampens Sexual Selection on Male Ornaments in the Lark Bunting
A. S. Chain and B. E. Lyon
Female lark bunting prefer different male traits from year to year, suggesting how multiple ornamental features might evolve as a result of female mate choice.

GEOCHEMISTRY

Elasticity of (Mg, Fe)O Through the Spin Transition of Iron in the Lower Mantle
Gradual softening of a prominent mineral in Earth’s lower mantle in response to an electronic phase transition may explain the seismic properties of this region.

GEOCHEMISTRY

Enriched Pt-Re-Os Isotope Systematics in Plume Lavas Explained by Metasomatic Sulfides
A. Luguet et al.
An isotopic signal thought to be a fingerprint of material from Earth’s core in ocean magmas may instead reflect the presence of sulfide mineralization in the melting region.

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Soil Carbon Persistence

Irreconcilable Differences: Fine-Root Life Spans and Soil Carbon Persistence
A. E. Strand et al.
Two common ways to measure residence times of root carbon in soils measure different things; neither is correct for inferring carbon cycling in ecosystems.

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Human ITPK1.

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PERSPECTIVE: Human ITPK1—A Reversible Inositol Phosphate Kinase/Phosphatase that Links Receptor-Dependent Phospholipase C to Ca²⁺-Activated Chloride Channels
A. Saiardi and S. Cockcroft
Studies of ITPK1 reveal subtle interconnections between simple metabolism and regulation of a signaling event.

GLOSSARY
Find out what NOSIP, SIPK, and STAND mean in the world of cell signaling.