Finite element method simulation of an Arabidopsis shoot apical meristem where two cells have been laser-ablated. The color map indicates the von Mises stress (a measure of distortional stress); the white lines mark the directions of maximal principal stress, which are circumferential around the ablated cells, in agreement with experimentally determined microtubule orientations. See page 1650.

Image: Pawel Krupinski/Lund University
PHYSICS
Quantum Criticality in the Electrical Resistivity of La$_{2-x}$Sr$_x$CuO$_4$
R. A. Cooper et al.
High magnetic fields can strip away the superconducting regime of a cuprate superconductor, revealing the presence of an enigmatic quantum critical point.
10.1126/science.1165015

CHEMISTRY
Femtosecond XANES Study of the Light-Induced Spin Crossover Dynamics in an Iron(II) Complex
Ch. Bressler et al.
X-ray absorption spectroscopy resolves the dynamics of spin-state interconversions, which take place in less than a picosecond, in a well-studied class of iron compounds.
10.1126/science.1165733

MOLECULAR BIOLOGY
Chromatin-Associated Periodicity in Genetic Variation Downstream of Transcriptional Start Sites
S. Sasaki et al.
The periodic wrapping of DNA around nucleosomes in chromatin determines a periodic variation in mutation type and frequency around transcription start sites in a fish.
10.1126/science.1163183

TECHNICAL COMMENT ABSTRACTS
GENETICS
Comment on “An Association Between the Kinship and Fertility of Human Couples”
R. Labouriau and A. Amorim
full text at www.sciencemag.org/cgi/content/full/322/5908/1634b
Response to Comment on “An Association Between the Kinship and Fertility of Human Couples”
A. Helgason et al.
full text at www.sciencemag.org/cgi/content/full/322/5908/1634c

BREVIA
ECOLOGY
Compromised Survivorship in Zoo Elephants
R. Clubb, M. Rowcliffe, P. Lee, K. U. Mar, C. Moss, G. J. Mason
Data from over 4500 elephants show that wild elephants live for approximately twice as long as those kept in European zoos.
>> Science Podcast

RESEARCH ARTICLES
PLANT SCIENCE
Developing Patterning by Mechanical Signals in Arabidopsis
O. Hamant et al.
The growth pattern of plant meristem, the group of stem cells at the tip of a growing shoot, is controlled by a microtubule-based mechanical feedback loop.
>> Perspective p. 1643

DEVELOPMENTAL BIOLOGY
The Sphingolipid Transporter Spns2 Functions in Migration of Zebrafish Myocardial Precursors
A. Kawahara et al.
Normal heart development in zebrafish requires the function of a lipid transporter in a membrane surrounding the yolk, a tissue outside of the embryo proper.
10.1126/science.1167449

GENETICS
A Single Gene Causes Both Male Sterility and Segregation Distortion in Drosophila Hybrids
N. Phadnis and H. A. Orr
A Drosophila gene that causes sterility in the offspring of two species and may be important for speciation causes increased transmission of itself to progeny.
10.1126/science.1163934

GENETICS
A Mouse Speciation Gene Encodes a Meiotic Histone H3 Methyltransferase
O. Mihola et al.
a gene responsible for sterility in the offspring of two mouse species, and therefore important in speciation, regulates gene expression via methylation in chromatin.
10.1126/science.1163601

BIOCHEMISTRY
A Competitive Inhibitor Traps LeuT in an Open-to-Out Conformation
S. K. Singh, C. L. Piscitelli, A. Yamashita, E. Gouaux
A bacterial protein similar to mammalian neurotransmitter transporters is blocked when a competitive inhibitor prevents the formation of the normal intermediate state.
>> Perspective p. 1644

CHEMISTRY
Gold-Catalyzed Synthesis of Aromatic Azo Compounds from Anilines and Nitroaromatics
A. Grirrane, A. Corma, H. García
Gold nanoparticles can catalyze a direct, environmentally friendly route to industrially important azobenzene dye compounds from either aniline or nitrobenzene precursors.

CHEMISTRY
Collective Reactivity of Molecular Chains Self-Assembled on a Surface
The paired sulfur bonds in dimethyl disulfide molecules, which assemble in long chains on gold surfaces, can be rearranged by injecting an electron into the end of the chain.

CHEMISTRY
Mechanism of Threading a Polymer Through a Macrocyclic Ring
A. B. C. Deutman et al.
a polymer threads through a large ring-shaped molecule faster when it is long enough to bind to the outside of the ring first, but not too long that it cannot easily loop into the hole.

CLIMATE CHANGE
A Dynamic Marine Calcium Cycle During the Past 28 Million Years
The isotopic composition of calcium in marine carbonates indicates that the calcium cycle has been dynamic over the past 28 million years and closely linked to climate.
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Earthquake Supercycles Inferred from Sea-Level Changes Recorded in the Corals of West Sumatra
K. Sieh et al.
Uplift records from corals imply that the Sumatra plate boundary ruptured in the 1300s, 1500s, and in 1797 and 1833; a 2007 temblor may mark the initiation of a next series of quakes.

GEOCHEMISTRY
Shock Metamorphism of Bosumtwi Impact Crater Rocks, Shock Attenuation, and Uplift Formation
L. Ferrière, C. Koebel, B. A. Ivanov, W. U. Reimold
Microscale deformation features in a drill core through an impact crater and a model of the impact history show that the central uplift in the crater was produced by brittle faults.

SOCIOLOGY
The Spreading of Disorder
K. Keizer, S. Lindenberg, L. Steg
Upon observing signs of social disorder (such as littering or graffiti), individuals are more likely to disobey a variety of social rules, including prohibitions against theft.

DEVELOPMENTAL BIOLOGY
Germ Cell—Intrinsic and—Extrinsic Factors Govern Meiotic Initiation in Mouse Embryos
Y. Lin, M. E. Gill, J. Koubova, D. C. Page
Mouse germ cells begin meiosis for sperm or egg production only when they both are stimulated by the hormone retinoid acid and express a particular RNA-binding protein.

BIOPHYSICS
Traction Dynamics of Filopodia on Compliant Substrates
C. E. Chan and D. J. Odde
A model that predicts that substrate/surface stiffness acts through a cellular motor-clutch mechanism to alter retrograde flow rates and traction is confirmed in chick neurons. >> Perspective p. 1646

BIOCHEMISTRY
Structure and Functional Role of Dynein’s Microtubule-Binding Domain
A. P. Carter et al.
ATP hydrolysis by the molecular motor dynein transmits a structural change to its microtubule-binding domain, determining movement direction along the microtubule. >> Perspective p. 1647

MEDICINE
Genomic Loss of microRNA-101 Leads to Overexpression of Histone Methyltransferase EZH2 in Cancer
S. Varambally et al.
In some human prostate cancers, a genomic deletion eliminates a key regulatory microRNA, which results in disruption of gene-silencing mechanisms.

NEUROSCIENCE
Modafinil Shifts Human Locus Coeruleus to Low-Tonic, High-Phasic Activity During Functional MRI
M. J. Minzenberg et al.
Brain images of humans treated with a cognitive enhancing drug show increased task-oriented activity in a brainstem nucleus and confirm that this region controls cognition.

GENETICS
A Null Mutation in Human APOC3 Confers a Favorable Plasma Lipid Profile and Apparent Cardioprotection
T. I. Pollin et al.
A mutation resulting in a lifelong decrease in the expression of a protein that inhibits triglyceride hydrolysis may protect against cardiovascular disease.

IMMUNOLOGY
Regulation of Dendritic Cell Migration by CD74, the MHC Class II–Associated Invariant Chain
G. Faure-André et al.
By binding to a myosin, an immune-specific protein known to control antigen processing also regulates the migration of dendritic cells, possibly coordinating the two functions. >> Perspective p. 1640

CELL BIOLOGY
A Role for the ESCRT System in Cell Division in Archaea
R. Y. Samson, T. Obita, S. M. Freund, R. L. Williams, S. D. Bell
A class of proteins required for membrane trafficking and cytokinesis in eukaryotes is also unexpectedly required in some Archaea for cell division.

CELL BIOLOGY
De Novo Formation of a Subnuclear Body
T. E. Kaiser, R. V. Intine, M. Dundr
The Cajal body, a nuclear structure for small ribonucleoprotein metabolism, can self-assemble from any one of its components immobilized on a substrate.

MOLECULAR BIOLOGY
The Air Noncoding RNA Epigenetically Silences Transcription by Targeting G9a to Chromatin
T. Nagano et al.
Air, a large noncoding RNA, interacts with chromatin at a particular promoter, recruiting a histone methyltransferase to silence gene expression in an allele-specific manner.
Cell signaling events play a key role in the induction, regulation, and maintenance of organ development.

RESEARCH ARTICLE: Analysis of Metagene Portraits Reveals Distinct Transitions During Kidney Organogenesis
Grouping microarray expression data into metagenes, followed by organization of these gene clusters into self-organizing maps, reveals distinct stages of kidney organogenesis.

REVIEW: De Novo Organ Formation from Differentiated Cells—Root Nodule Organogenesis
M. Crespi and F. Frugier
Root nodule organogenesis in legumes is initiated by bacterial signals and directed by plant signaling pathways.

PERSPECTIVE: Intercellular Peptide Signals Regulate Plant Meristematic Cell Fate Decisions
J. E. Gray, S. Casson, L. Hunt
By controlling stem cell fate, secreted peptides control the formation of many plant cell types.

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R. N. Austin
A summer internship is a good way to get started in scientific research.

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E. Pain
Knowing what to expect and how to contribute will make your summer research experience more valuable.

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L. Laursen
Research internships offer undergrads experience, exposure to new fields, and networking opportunities.

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Science Careers Staff
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