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

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SCIENCEPODCAST

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http://science.sciencemag.org
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

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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
Collective Reactivity of Molecular Chains Self-Assembled on a Surface
The paired sulfur bonds in dimethyldisulfide 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 Macroyclic 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.
REDOX EXPERIMENTS CONTINUED...

GEOLOGY

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.

DEVELOPMENTAL BIOLOGY

Germ Cell–Intrinsic and –Extrinsic Factors Govern Meiotic Initiation in Mouse Embryos
Y. Lim, 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 retinoic 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.

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.

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.

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.

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.

Published by AAAS
www.sciencemag.org  SCIENCE  VOL 322  12 DECEMBER 2008  Printed on 30% post-consumer recycled paper.
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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Pooches get pouty over unfair treatment.

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