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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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

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

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

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

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

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

A bacterial protein similar to mammalian neurotransmitter transporters is blocked when a competitive inhibitor prevents the formation of the normal intermediate state.

Gold nanoparticles can catalyze a direct, environmentally friendly route to industrially important azobenzene dye compounds from either aniline or nitrobenzene precursors.

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.

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.

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.
Noncoding RNA Epigenetically Silences

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.

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.

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.

Germ Cell–Intrinscic 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 retinoic acid and express a particular RNA-binding protein.

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

Structure and Functional Role of Dynnein’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 along the microtubule. >> Perspective p. 1647

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.

Modafinil Shifts Human Locus Coerulescens 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.

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.

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

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.

The Cajal body, a nuclear structure for small ribonucleoprotein particles, is also unexpectedly required in some Archaea for cell division.

MOLECULAR BIOLOGY

The Air Noncoding RNA Epi-genetically 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.
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E. Pain
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EDITORIAL GUIDE: Focus Issue—Organ Development from Beginning to End
A. M. VanHook
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.

Download the 12 December Science Podcast to hear about the compromised welfare of zoo elephants, reconciling financial models with human behavior, and more.