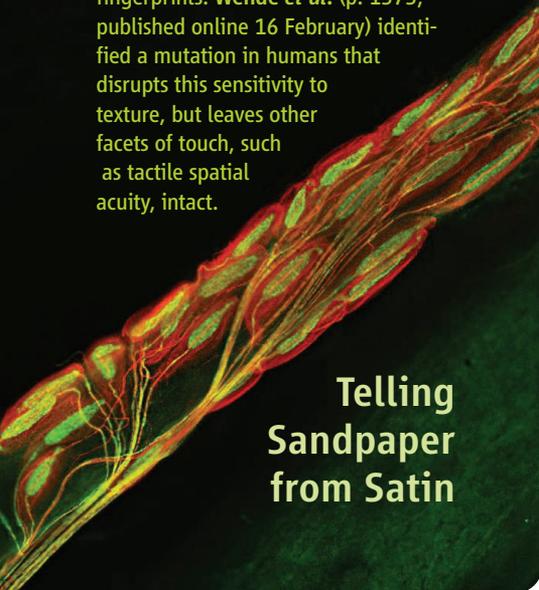


Pacinian corpuscles are mechano-receptors tuned to detect high-frequency, low-amplitude, signals. Found in human palm and fingertips, they are useful for discrimination of rough and smooth textures, a sensitivity seemingly amplified by the ridges of fingerprints. **Wende *et al.*** (p. 1373, published online 16 February) identified a mutation in humans that disrupts this sensitivity to texture, but leaves other facets of touch, such as tactile spatial acuity, intact.



Telling Sandpaper from Satin

Ancient Human Migration

During the past 100,000 years or so, modern humans migrated from Africa into Eurasia, completely replacing existing populations of Neandertals by about 20,000 years ago. This occurred as the climate cooled toward a glacial maximum. **Stewart and Stringer** (p. 1317) review some of the recent evidence for how this demographic transition occurred. Data from ancient genomes of Neandertals and Denisovans coupled with our improved understanding of the role of refugia in driving evolution during the Ice Ages suggest that such refugia were important in the pace and pattern of change.

Quantum Hall Meets Metamaterial

Controlling and tuning light-matter interaction is crucial for fundamental studies of cavity quantum electrodynamics and for applications in classical and quantum devices. **Scalari *et al.*** (p. 1323) describe a system comprising an array of metamaterial split-ring resonators and a series of two-dimensional electronic gases (2DEG) formed in GaAs quantum wells. In a magnetic field, the electrons in the 2DEG performed cyclotron orbits and formed Landau levels. Strong coupling was observed between photon and

magnetic cyclotron modes, producing a tunable semiconductor system for studying the light-matter interaction of two-level systems.

Infrared Route to Graphene Electrodes

Electrochemical capacitors can deliver large amounts of power quickly, but have limited energy storage because only the surface regions of electrodes can store charge. Graphene represents an alternative to activated carbon electrodes because of their high conductivity and surface area, but graphene sheets tend to reassociate and lose surface area. **El-Kady *et al.*** (p. 1326; see the Perspective by **Miller**) show that graphite oxide sheets can be converted by infrared laser irradiation into porous graphene sheets that are flexible, robust, and highly conductive.

Continental Growth Spurts

The appearance and persistence of continents through geologic time has influenced most processes on Earth, from the evolution of new species to the climate. The relative proportion of newly formed crust compared to reworked, or destroyed, older crust reveals which processes controlled continental growth. Based on the combined analyses of Hf-Pb and O isotopes in zircon minerals, **Dhuime *et al.*** (p. 1334) measured continuous but variable rates of new crustal production throughout Earth's history. Increased rates of crustal destruction starting around 3 billion years ago coincide with the onset of subduction-drive plate tectonics, slowing down the overall rate of crustal growth.

Which Electron Went Where?

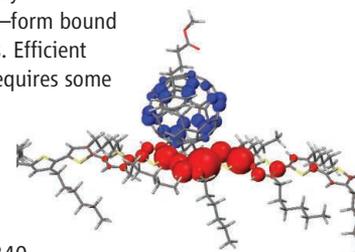
When strong laser fields pull electrons out of atoms or molecules and then send them careening back, the light released on recollision can offer direct insight into local attosecond-scale behavior, or it can be processed into attosecond pulses for probing other samples. When polyatomic molecules are involved, however, it is not always clear which of their electrons are being manipulated by the laser field. **Boguslavskiy *et al.*** (p. 1336; see the Perspective by **Gühr**) present a technique for exploring this question. Simultaneous tracking of electrons and fragment molecular ions during strong-field ionization of hydrocarbons revealed the different pathways involved.

Laying It on Thick

The growth of one layered material onto a second lies at the heart of many electronic devices. However, if there is a lattice mismatch between the two materials, strains develop in the overgrowth material leading to bowing and cracking. **Falub *et al.*** (p. 1330; see the cover) patterned Si substrates into a series of pillars onto which they grew a germanium layer. The germanium initially coated the top of each silicon pillar but then widened as the layer thickened, leading to thick, crack-free germanium films.

Bands That Separate

In organic photovoltaic devices, the charge carriers that form at the interface between donor and acceptor layers—the electrons and holes—form bound states called excitons. Efficient current generation requires some mechanism for their separation and for the movement of free carriers to the electrodes.



Bakulin *et al.* (p. 1340, published online 23 February) studied a process in which the excitons created with an optical pulse were also subjected to infrared pulses. In polymer-blend devices, a three-step process was observed: The bound-state excitons diffused toward the donor-acceptor interface, formed a charge-transfer state, and then dissociated into free carriers.

Invading a Place Like Home

Biological invasions can cause enormous economic problems but they also represent a biological experiment and provide insight into species distributions and range expansion or restriction. Most predictions about when and where species will invade rest on the assumption that invasive species will retain the same climatic niche in the invaded area. But is this assumption valid? **Petitpierre *et al.*** (p. 1344) studied a large data set on plant invasions between Eurasia, North America, and Australia and indeed found that fewer than 15% of the studied species occupied more than 10% of invaded distribution outside their native climatic niche, and only one species exhibited >50% climatic niche expansion in its invaded range. Thus, niche shifts are rather rare events in plant invasions.

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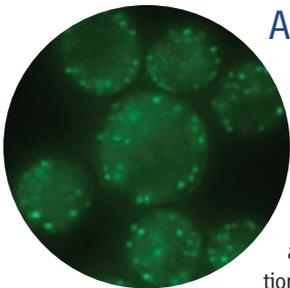
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Making Carlactone

Germination of parasitic witchweeds depends on strigolactones, which also regulate plant branching and signal in the context of mycorrhizal symbioses. The biosynthetic pathways that lead to strigolactones are founded in carotenoid biosynthesis, but further steps have been obscure. **Alder *et al.*** (p. 1348) have now identified a biochemical pathway that generates a strigolactone-like compound, carlactone, which shows biological actions similar to those of strigolactone.

Toward Addiction

Addiction can result when substances, such as drugs or alcohol, co-opt the brain's natural reward system. **Shohat-Ophir *et al.*** (p. 1351; see the Perspective by **Zars**) explored this potential in *Drosophila* by examining the relationship between the natural reward stimulated by mating and the unnatural reward offered by ethanol consumption. Males deprived of mating increased consumption of ethanol, and, when permitted to mate following deprivation, their ethanol consumption decreased. At a mechanistic level, mating increased the neurotransmitter neuropeptide F (NPF), while mate deprivation decreased NPF levels.



A Fair COP

During eukaryotic intracellular membrane traffic, how is membrane curvature imparted by the cytoplasmic proteins that form the COPII coat, which mediates vesicle budding from the endoplasmic reticulum? **Čopič *et al.*** (p. 1359, published online 2 February; see the Perspective by **Silvius**) dissected this process by exploiting yeast bypass-of-sec-thirteen (*bst*) mutants, which can survive without the otherwise essential COPII coat protein. These *bst* mutants appear to create a locally altered membrane that is more amenable to deformation by a Sec13-free coat.

A Synaptic Vesicle in Time

Synaptic vesicles move extensively within presynaptic nerve terminals, and their positional features are thought to have an impact on the likelihood and mode of vesicle fusion and transmitter release. **Park *et al.*** (p. 1362, published online 16 February) now provide real-time, three-dimensional tracking of individual synaptic vesicles in living nerve terminals. Single synaptic vesicles were identified within hippocampal neurons right up to the moment of exocytosis.

Ribosome Rescue

Ribosomes stall when they reach the end of defective messenger RNAs (mRNAs). In bacteria, the most-studied ribosomal rescue pathway involves a ribonucleoprotein complex comprising tmRNA (which acts as both transfer RNA and mRNA) and the protein SmpB. In an alternative pathway, some Gram-negative bacteria contain proteins that achieve tmRNA-independent rescue. Now, **Neubauer *et al.*** (p. 1366) present the structure of the *Thermus thermophilus* ribosome bound to a fragment of tmRNA, SmpB, and elongation factor Tu, and **Gagnon *et al.*** (p. 1370) report the structure of the *T. thermophilus* ribosome in complex with an initiator tRNA, a short mRNA fragment, and the rescue factor YaeJ. Though the two rescue systems are very different, both involve a protein tail that binds in the mRNA channel. This orients the rescue apparatus to facilitate switching translation to a different message in the tmRNA system or hydrolysis of peptidyl tRNA by YaeJ.

Diversity in Immune Adversity

Streptococcus pneumoniae commonly colonizes the nasopharynx and has the potential to cause life-threatening infections. Many variants of this pathogen are recognized that have subtly different capsule (an external polysaccharide coat) structures, which prompt distinct immune responses from the host and allow classification of this pathogen into serotypes. A consistent pattern of multiple coexisting serotypes occurs in human populations. **Cobey and Lipsitch** (p. 1376, published online 1 March) probed the mechanisms behind serotype coexistence by developing an ecological model and feeding it data from nasopharyngeal carriage studies.

CREDIT: ČOPIČ ET AL.