

<< Bend Me, Stretch Me

Flexible electronics have been developed using conducting organic materials, but their performance is much poorer than that of inorganic materials. **Kim *et al.*** (p. 507, published online 27 March) have developed a way to combine nanoribbons of silicon with thin plastic or rubbery substrates to create robust, flexible, and bendable electronics without sacrificing electronic performance. A key feature of their design is that the electronics layer lies in the neutral bending plane which experiences almost no strain, even when the overall device is very bent.

Dating Fish Canyon Tuff

A major uncertainty in accurate dating using the common Ar-Ar method is that it requires a standard, and current uncertainties in the standards themselves are about 1% (or 1 million years in a 100-million-year-old age). One way to improve the calibration is calibration against an astronomically dated rock section in which many orbital cycles are preserved in a cyclically layered sediment sequence. **Kuiper *et al.*** (p. 500; see the news story by **Kerr**) do this comparison for the Fish Canyon Tuff in Colorado, one of the main geochronologic standards, reducing its age uncertainty to about 0.1%, which reveals an older primary age for the standard. This finding changes the age estimates of several meteorites and the K-T boundary.

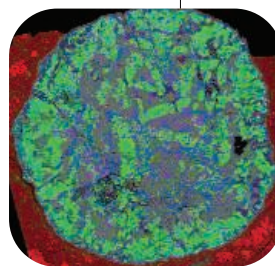
Arctic Rain

Global warming is expected to affect the amount and pattern of precipitation all over the world, but such changes are difficult to detect, and to attribute to human influence. One area in which precipitation is anticipated to change most dramatically is in the Arctic. The Arctic is also of particular interest because of its contribution to the Meridional Overturning Circulation of the North Atlantic Ocean, which itself exerts a fundamental control on climate. **Min *et al.*** (p. 518) compare observations of precipitation with simulations from 22 coupled-climate models and conclude that the amount of rainfall in the northern high latitudes (above 55°N) has increased considerably over the last 50 years. The anthropogenic influence is consistent with earlier reported increases in Arctic river discharge

and sea-surface water freshening, and confirms one more way that human activity has modified the environment.

Exploring Space Dust

Grains rich in calcium and aluminum oxides (CAIs) are thought to be some of the first materials to have condensed in our solar nebula. The oldest meteorites contain about 10% of these grains. **Sunshine *et al.*** (p. 514, published online 20 March; see the Perspective by **Burbine**) compare laboratory spectra of these grains with spectra obtained from several asteroids and show that these asteroids may contain 30% CAIs. The high abundance of CAIs might indicate that these bodies formed extremely early in our solar system and, if so, may be worth examining further for other material reflecting this time period.



Beyond Carbon Paper

As a cork is stretched or compressed, there are only minimal changes in shape in the radial direction, which is due to cork's near-zero Poisson's ratio. Most materials have a positive Poisson's ratio, while a few, like some polymer foams have a negative ratio, so that they actually expand in the lateral direction as they are stretched. **Hall *et al.*** (p. 504) now describe the creation of a paper-like material from mixtures of single and multiwalled carbon nanotubes. By varying the fraction of multiwalled tubes, they

could change the in-plane Poisson's ratio from positive to negative values. This tunability was due to changes in the bending and stretching of the papers with composition, which could be described by a simple model.

Location, Location

Rational drug design often involves the production of small molecule inhibitors of specific steps in a pathological pathway. **Rajendran *et al.*** (p. 520) describe the design of inhibitors of a key event in Alzheimer's disease pathology, an event that occurs at a particular intracellular membrane: the β -secretase-mediated cleavage of the amyloid precursor protein (APP) in endosomes. A transition-state inhibitor that inhibits purified β -secretase failed to inhibit β -secretase in the cellular context. However, anchoring the very same inhibitor to the membrane, which promoted its delivery to the endosomes, enabled it to inhibit β -secretase effectively both in cultured cells and in two animal model systems, mouse and *Drosophila*.

Plastin Protection in SMA

Spinal muscular atrophy (SMA) is a neuromuscular disorder that leads to death early in childhood in more than half of the patients. It is caused by the homozygous deletion of the survival motor neuron gene 1 (*SMN1*), but the severity of the disease is influenced by the copy

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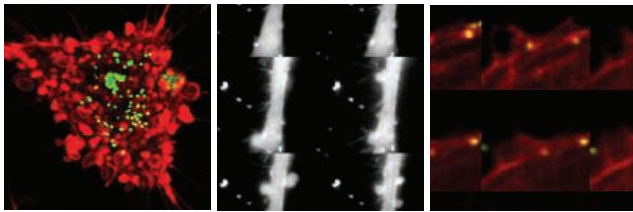
number of the highly homologous *SMN2* gene. However, in rare instances, siblings with identical *SMN1* mutations, identical *SMN2* copy numbers, and identical haplotypes have completely different phenotypes: Some are affected while others are fully asymptomatic. This discrepancy suggests the influence of independent modifying factors capable of protecting against SMA. By differential expression analysis using RNA from six SMA discordant families, **Oprea et al.** (p. 524) identified plastin 3 as a candidate protective modifier against SMA. The influence of plastin 3 upon the SMA phenotype was mainly due to expression variability, which is often triggered by transacting factors.

Distinctive Individual Smells

Pheromones are critical for social communication in many animals. A lot of information about an animal's status is represented in the complex pheromone components in urine. In mice, detection of such complex chemical signals by the vomeronasal organ (VNO) plays an important role in triggering endocrine changes and eliciting stereotyped innate behaviors. **He et al.** (p. 535) developed a system to probe neuronal receptor dynamics using genetically encoded fluorescent sensors. They observed distinct populations of VNO neurons that responded specifically to male and to female urine signals. Mouse strain and individual recognition were determined by combinatorial activation across a population of neurons. Such combinatorial activation was unique, allowing each individual animal to be discriminated and recognized.

Exploiting Surface Phosphatidylserine

Many animals use the presence of the phospholipid, phosphatidylserine (PS), on the outer leaflet of the plasma membrane as a way to recognize and destroy apoptotic cells by phagocytic engulfment. In this issue, two papers illustrate the differential roles played by PS in normal cells and during virus infection (see the Perspective by **Fairn and Grinstein**). **Darland-Ransom et al.** (p. 528) identified an enzyme in *Caenorhabditis elegans*, aminophospholipid translocase 1 (TAT-1), which appears normally to restrict PS to the inner side of the plasma membrane. Animals lacking TAT-1 had increased PS on the cell surface and random cells were lost from the animals in a process that depended on PSR-1, a PS receptor involved in



the clearance of apoptotic cells. **Mercer and Helenius** (p. 531) used live cell imaging to follow vaccinia virus entry into tissue culture cells. Viruses first bound to actin-rich cell-surface protrusions, filopodia, along which the viruses surfed to the cell body. At the cell body the incoming virus stimulated its own uptake, due to the presence of PS on the viral membrane, mimicking the uptake of apoptotic cell corpses.

Genetics of Schizophrenia

Although complex disorders such as schizophrenia have a heritable component, identifying the genetic components associated has been very difficult. **Walsh et al.** (p. 539, published online 27 March) found that multiple, individually rare, structural mutations (genomic microdeletions and microduplications) occurred more frequently in 150 individuals with schizophrenia than in controls. The enrichment was more than threefold among schizophrenia cases generally and more than fourfold among schizophrenia cases with onset by age 18. The genes disrupted by the genomic breakpoints of mutations in the schizophrenia patients were not random, but were disproportionately members of pathways controlling neuronal signaling and brain development.

Animal Self-Sterility Genes

Self-sterility is widely observed among hermaphroditic plants and animals. Although insights have been made for self-incompatibility systems of plants, relatively little is known about animal mechanisms. **Harada et al.** (p. 548, published online 20 March) now show that self-sterility in the hermaphroditic chordate *Ciona intestinalis* is controlled by two genetic loci. The self/nonself-discriminating gamete interaction takes place on the basis of allele-specific molecular interactions between fibrogen-like ligands on the egg coat and sperm-borne polycystin 1-like receptors, which are homologs of the causative gene of a hereditary human disease. Genes for the receptors and ligands are linked and are polymorphic, similar to self-sterility genes in plants.

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