EDITED BY STELLA HURTLEY AND PHIL SZUROMI

In Southern Time

Ice core records have shown that during the last deglaciation, temperatures in Antarctica began to rise around 18,000 years ago, about 3000 years before similar signals are seen for Greenland. How did temperatures change at the intervening latitudes? **Schaefer *et al.*** (p. 1510) addressed this puzzle by determining the dates at which a variety of mid-latitude glaciers from both hemispheres began to retreat, using ^{10}Be dating of terminal moraines, and comparing their data with an even larger database of existing measurements. These glaciers all began to retreat at about the same time, mostly between 19,000 and 17,000 years ago, which is consistent with rising temperatures in Antarctica and the global increase of atmospheric CO_2 concentrations. These data support the idea that the last glacial termination was forced by greenhouse gases, and suggest that warming in the high northern latitudes was delayed by the occurrence of hypercold winters.

Coming Attractions from the Pliocene?

During the Pliocene, solar insolation and CO_2 levels were similar to present conditions, but the poles were warm enough that there were no ice sheets in the Northern Hemisphere, and sea level was 25 meters higher than at present. **Fedorov *et al.*** (p. 1485; see the news story by **Kerr**) review observations of and theories about climate in the early Pliocene (from 5 to 3 million years ago) and discuss how these might be reconciled.

Superconductor Logic

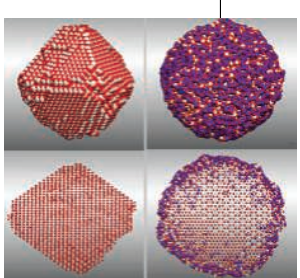
It has been proposed that the *d*-wave symmetry of high-temperature superconductors could provide the possibility of a π-phase element, an important tool for logical operations in which the memory is stored as polarity of the magnetic flux. **Ortlepp *et al.*** (p. 1495, published online 20 April; see the Perspective by **Pegrum**) report the design and test of a flip-flop gate based on fractional flux quanta in a high-temperature superconductor circuit.

Spying on Solid-State Qubits

Quantum computation requires the manipulation of superpositions of quantum mechanical states and making measurements of the final state of the system. Dephasing and decoherence processes influence how the system (or the wave function describing the system) evolves and requires the use of error correction. However, error correction itself requires measurements that usually would collapse the somewhat fragile quantum states. **Katz *et al.*** (p. 1498) make partial quantum measurements on a solid-state qubit in which the wave function neither completely evolves nor completely collapses. Such a partial measurement can then be used to provide feedback on the evolution and control of the qubit.

Abrasives in the Round

A primary use for cerium oxide (ceria) nanoparticles is as an abrasive for the planarization and polishing of semiconductor wafers. However, the particles tend to have faceted shapes that scratch the wafers and lead to the formation of defects on the polished surface. **Feng *et al.*** (p. 1504) find that the addition of titanium to the flame-processing method produces rounded particles with no sharp facets. The particles develop an outer shell of titanium oxide that reduces the surface energy and favors a more spherical shape. These rounded particles increase the silica removal rate and produce fewer defects in the wafers.



Touch and Glow

Artificial tactile sensors with sensitivity comparable to human fingers would be especially useful for robotic surgery applications. In general, however, scaling up such devices beyond millimeter dimensions has been a major hurdle. **Maheshwari and Saraf** (p. 1501; see the Perspective by **Crowder**) fabricated a thin-film sensor that is large enough to image a penny and that, like a finger, achieves a height resolution of less than 5 micrometers at 10 kilopascals of applied pressure. The fabrication process relies on simple self-assembly of alternating gold and semiconducting (CdS) nanoparticle layers, separated by dielectric layers. At biases greater than 8 volts, applied stress enhances electron tunneling between the layers and induces electroluminescence that is linearly proportional to the pressure, which is then detected with a charge-coupled device camera

Scrubbing Sulfur

The potential usefulness of high-temperature solid oxide fuel cells that can run on hydrocarbon fuels is limited by the sensitivity of their nickel-based anodes to sulfur impurities. One way to combat sulfur poisoning is to convert the fuel to reformate (CO and H_2) and then remove hydrogen sulfide (H_2S) with a sorbent, but sorbents have proven difficult to regenerate in high-temperature operation. **Flytzani-Stephanopoulos *et al.*** (p. 1508; see the news story by **Service**) demonstrate reversible adsorption of H_2S on cerium and lanthanum oxide surfaces at temperatures as high as 800°C. The sorbent would be cycled between scrubbing incoming reformate of H_2S and using the spent fuel to desorb the sulfur and regenerate a fresh surface. The flow rates can be high enough to reduce contact times to the millisecond range while still reducing H_2S to levels below 1 part per million.

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CREDITS (TOP TO BOTTOM): PHOTO/GEORGE H. DENTON; FENG *ET AL.*

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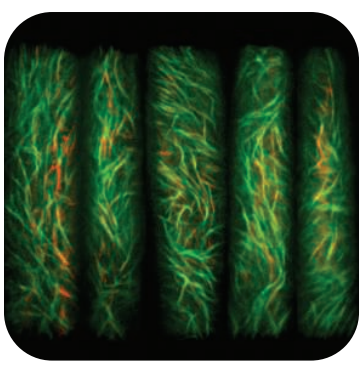
Which Way Is Up?

Plants need to determine which end is "up" long before they emerge as seedlings from the ground. For *Arabidopsis*, the first indications of an apical-basal axis are seen in the initial embryonic cell division that separates a smaller apical cell from a larger basal cell. These cells generally go on to form shoots or roots. **Long *et al.*** (p. 1520) have now cloned the *topless* gene, mutations in which can alter the fate of the apical pole. The TOPLESS protein bears features that resemble transcriptional corepressors. Mutations in a histone deacetylase affect Topless function, and thus chromatin remodeling likely plays a key role. These findings suggest that auxin-mediated axis formation precedes transcription-mediated axis stabilization.

Special Secretion Makes for Virulence

Virulence factors are important in converting harmless bacteria into effective pathogens. **Mougous *et al.*** (p. 1526) provide evidence for an unusual form of bacterial protein secretion in *Pseudomonas aeruginosa* that is important in the control of virulence in the late stages of chronic infection in cystic fibrosis patients. The major protein exported by the secretion apparatus is Hcp1. The authors present the crystal structure of Hcp1, which forms a hexameric ring with a large internal diameter, and suggest that it acts as a conduit for the passage of exported proteins.



CREDIT: PAREDEZ *ET AL.*

Directing Plant Cell Growth

Plant cells are surrounded by a cell wall made up of cellulose fibrils, and these fibrils are synthesized by a large multisubunit complex that is embedded in the plasma membrane. **Paredez *et al.*** (p. 1491, published online 20 April; see the Perspective by **Lloyd**) visualized the activity of this enzyme, cellulose synthase, in living plant cells using fluorescent tags. Movies show the cellulose synthases moving along trajectories defined by microtubules. The organization of the microtubules directs the organization of the growing cellulose fibrils which, in turn, may govern the shape of the growing cell.

Surviving SIV

Any future HIV (human immunodeficiency virus) vaccine will rely on inducing either antibodies that neutralize the virus, or cell-mediated immunity by cytotoxic T lymphocytes (CTLs). The former initiative is being frustrated by the ability of the virus to mutate and escape antibody binding. Although a related problem of viral escape is faced by CTLs, it does appear that a robust cell-mediated immune response can lower the levels of replicating virus after acute infection, and this set-point is known to affect the course of subsequent infection and progression to AIDS. Using infection of monkeys with the pathogenic SIV, the simian cousin of HIV, **Letvin *et al.*** (p. 1530) offer direct experimental evidence that generation of a robust cellular response by vaccination corresponds with increased survival. This finding also correlated with the persistence of high numbers of so-called central memory T cells and suggests that finding ways of preserving these important lymphocytes may help in improving cell-mediated HIV vaccines.

Language Control Tower

New words can arise when they are introduced into one language from another. Until these words become widely familiar, they are likely to cause monolingual individuals to stumble when hearing or reading them. Bilinguals, of course, encounter no such problems. How these individuals switch smoothly between languages has been mysterious; in neuroimaging studies, the two languages activate precisely the same brain areas. **Crinion *et al.*** (p. 1537) have used a semantic priming task as a finer probe of behavioral and neural adaptation in populations of German-English and Japanese-English bilinguals. They identify the left caudate, which is part of the basal ganglia, as an area that monitors which language is being used and switches the processing machinery into the appropriate mode.

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