

We like teal M&amp;Ms.

## PSYCHOLOGY

## Cognitive Homeostasis

To hold two opposed ideas in the mind at the same time and still retain the ability to function has been hailed as the mark of first-rate intelligence—and would also be likely to elicit a state of cognitive dissonance, which arises when beliefs and behaviors collide. Alas, ample evidence indicates that most humans are able and willing to alter their attitudes so as to bring them into line with how they have behaved, and thus to reduce the discordance between the two. In fact, three equally valued items (A, B, and C) can be experimentally manipulated—by asking a subject to choose first between A and B, and then by asking the subject to make a second choice between C and the unchosen item from the first round—to yield a greater than 50% preference for C over A or B. The explanation of this outcome is that the unchosen item has lost value by virtue of not having been selected, and thus suffers in comparison to C.

Egan *et al.* have adopted this paradigm, using stickers featuring various animals and a spectrum of colored M&Ms, to investigate the existence and resolution of cognitive dissonance in 4-year-old children and capuchin monkeys. They find that both subject pools behave similarly; that is, item C IS indeed chosen significantly more of the time (60%) when subjects have been enticed into a state of cognitive dissonance via a first-round choice of A versus B, and C is not selected more often when the subjects are simply presented in the first round with A or B as the experimenter's choice. — GJC

*Psychol. Sci.* **18**, 978 (2007).

## BIOMEDICINE

## Putting a Pox on Cancer

Advances in gene therapy and other technologies have helped revive the idea that viruses can be harnessed to destroy tumor cells. Over a dozen distinct families of viruses are being engineered to optimize their "oncolytic" potential—i.e., their ability to replicate in and kill tumor cells without harming normal tissue. Among these is vaccinia virus, whose desirable features as an oncolytic agent include the ability to spread rapidly through the blood to epidermal tissues and a well-established safety profile in humans because of its use as a vaccine for smallpox.

Two recent studies highlight the diverse ways in which vaccinia virus is being redesigned for use as a cancer therapy. Thorne *et al.* generated a strain of vaccinia that (i) specifically targets tumor cells with activation of transcription factor E2F and the epidermal growth factor receptor signaling pathway, and (ii) produces in the tumor vicinity a host-encoded cytokine (GM-CSF) that appears to enhance the body's antitumor immune response. In independent work, Zhang *et al.* inserted into the vaccinia genome transgenes encoding three different light-emitting proteins, a strategy that allowed the antitumor activity of the virus to be monitored in real time by optical imaging. Both virus strains induced regression of tumors in preclinical models and,

importantly, therapeutic activity was seen when the viruses were administered systemically, the delivery method most relevant for clinical therapies targeting solid tumors. — PAK

*J. Clin. Invest.* **117**, 10.1172/JCI32727 (2007);

*Cancer Res.* **67**, 10038 (2007).

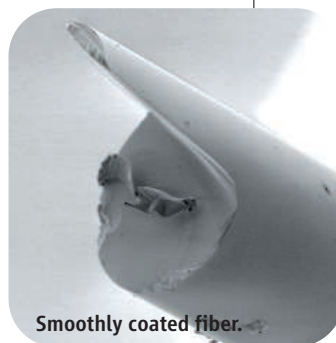
## MATERIALS SCIENCE

## A Coat of Silicon

Silicon materials with nanometer-scale morphologies have a wide range of possible photonic applications, spanning waveguide amplifiers, light-emitting diodes, and laser media. Existing methods for making silicon nanocrystals embedded in a silicon dioxide matrix (nc-Si/SiO<sub>2</sub>) generally involve nucleation from a silicon oxide film and may require subsequent patterning using a resist and etching technique. Hessel *et al.* show that nc-Si/SiO<sub>2</sub> can instead be prepared as a thin-film material through the deposition of solutions of hydrogen silsesquioxane (HSQ) followed by thermal processing at 1100°C. By crosslinking the HSQ using an electron beam,

the authors could generate stable patterns at sub-10 nm resolution, without the need for etching or oxidation steps. The main advantage of this method, though, was the capacity to create smooth conformal coatings on thin glass fibers. When pumped with a blue laser source or ultraviolet lamp, the coated fibers emitted a red/orange glow. Adding erbium chloride to the HSQ stock solution gave rise to a second photoluminescent band at wavelengths relevant for optical communications. — MSL

*Adv. Mater.* **19**, 10.1002/adma.200700731 (2007).



Smoothly coated fiber.

## CLIMATE SCIENCE

## Wet and Dry Dating

A fundamental challenge in applying <sup>14</sup>C dating to paleoceanography is that the radiocarbon age of sea surface water is different from that of the atmosphere above it, because of varying <sup>14</sup>C production and distribution pathways. Knowing this difference (termed the marine radiocarbon reservoir age) in specific locations is essential for establishing comparative chronologies of changes in ocean circulation and climate between different regions, with the further aim of exploring the causal mechanisms. Sarnthein *et al.* have determined reservoir ages for four Pacific and Atlantic locations

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between 23,000 and 14,000 years before the present, using a radiocarbon plateau-tuning technique. The trends that they see require major changes in deep ocean circulation during different intervals of the record. Two major atmospheric  $^{14}\text{C}$  plateaus, during the end of the Heinrich 1 event and the early Bølling interstadial, occur contemporaneously with the two-step early deglacial rise in atmospheric  $\text{CO}_2$  partial pressure and appear to reflect the transfer of  $\text{CO}_2$  from the deep ocean to the atmosphere. These results imply that  $^{14}\text{C}$  age calibration scales will need to be corrected accordingly. — HJS

*Geophys. Monogr. Ser.* **173**, 175 (2007).

## APPLIED PHYSICS

## Spin Control in Stereo

Encoding and processing information in terms of electron spin is being pursued as a low-power, high-speed alternative to present current-based micro-processing circuitry. Introducing spin with a specified polarization, or magnetic orientation, into a nonmagnetic wire is typically achieved by injection from a ferromagnetic injector. With just a single injection contact, however, the polarization of the accumulated spin is fixed and dependent on the magnetization state of the ferromagnetic injector. Altering the orientation of the spin-injected current then generally requires the application of a magnetic field, presenting an undesirably large drain on power. Kimura *et al.* show that by using two permalloy spin injectors of opposite magnetization positioned at an angle on either side of a nonmagnetic copper wire, they can control the direction of spin accumula-

tion electrically and continuously by varying the amount of injected spin from each injector. This electrical control of spin accumulation presents a great simplification for further development of spintronics circuitry. — ISO

*Phys. Rev. Lett.* **99**, 166601 (2007).

## PLANT SCIENCE

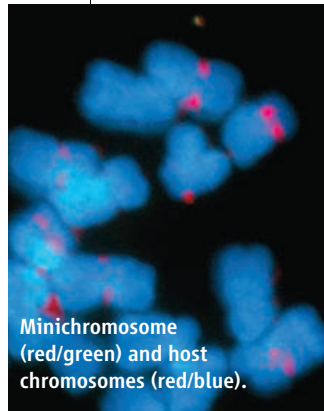
## Adding a Little Bit

Age-old plant breeding methods and more recent gene transformation technologies have introduced and fixed genes in order to confer advantageous traits on crops. When a trait

depends on one gene, the process is relatively simple as compared to when a trait, such as drought resistance, depends on an entire suite of genes that function together in one or several pathways. Carlson *et al.* have constructed a minichromosome that can be introduced into maize. The

autonomous minichromosome, which is built around an array of maize centromeric sequences, remains stable through meiosis and mitosis and carries as much as 35 kb of foreign DNA. Minichromosomes might offer a vehicle with which to introduce groups of functionally related genes rapidly while minimizing disruption of the existing genome. — PJH

*PLoS Genet.* **3**, e179 (2007).



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## &lt;&lt; Targeting ACC to Stay Lean

Acetyl-CoA carboxylase (ACC) regulates the synthesis and degradation of fatty acids, and mice lacking the ACC2 isoform are leaner than wild-type animals. Choi *et al.* have characterized the whole-body energy metabolism and insulin sensitivity of *Acc2*<sup>-/-</sup> mice. By monitoring activity, food consumption, and energy expenditure, they showed that *Acc2*<sup>-/-</sup> animals ate more food than did wild-type animals but remained smaller. The *Acc2*<sup>-/-</sup> animals were also resistant to obesity induced by giving them a high-fat diet. These results could be explained by the increase in energy expenditure observed in the knockout animals, which is consistent with the increase in oxidation of both fats and carbohydrates in *Acc2*<sup>-/-</sup> animals. The resistance to insulin that occurs with fat accumulation is thought to result from the accumulation of diacylglycerol in muscle and liver and the consequent activation of protein kinase C (PKC)  $\theta$  and PKC $\epsilon$  in muscle and liver, respectively. *Acc2*<sup>-/-</sup> mice displayed an enhanced sensitivity to insulin that was associated with decreased activity of the PKC enzymes. Although ACC2 is not a particularly easy target for small-molecule drugs, the development of a specific inhibitor could improve the treatment of diabetes and obesity. — LBR

*Proc. Natl. Acad. Sci. U.S.A.* **104**, 16480 (2007).