



PSYCHOLOGY

## State of Reference

Students in elementary physics classes are introduced to the concept of frame of reference—the spatial coordinate system used by an observer to describe events—for instance, in the context of the perceived motion of trees by a passenger in a moving automobile. Adding in the dimension of time leads into non-intuitive territory, as in the example of a traveling astronaut who returns to Earth younger than her stay-at-home twin.

Building on previous work that demonstrated that internal physiological states can influence one's perception of physical quantities (such as thirsty people being more likely to characterize objects as transparent; that is, resembling water), Balcetis and Dunning show that internal psychological states are also capable of altering our perception of the external world. They induced states of high or low cognitive dissonance (a mismatch between thought and action) by asking or telling two groups of students to walk across campus wearing various fruit- and vegetable-themed adornments. In order to render a freely chosen yet somewhat embarrassing task less unpleasant to fulfill, the first set of students mentally shortened the distance they had to cover by estimating it to be fully 40% less than the average estimate made by the second group. Intriguingly, the route to ameliorating the state of dissonance appeared to be purely perceptual, as the free-choice students did not shorten their time of exposure by walking faster; in fact, they took about 10% longer. — GJC

*Psychol. Sci.* **18**, 917 (2007).

MATERIALS SCIENCE

## Thin and Fast

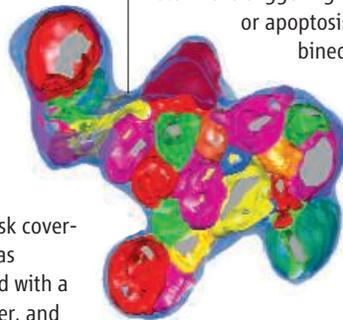
Temperature changes in gas-phase chemical processes such as combustion and explosions can evolve on the submicrosecond time scale, but commercial thermocouples (TCs) are limited to millisecond response times. Thin-film TCs can achieve submicrosecond responses, but extreme film thickness (less than 100 nm) affects sensitivity through decreases in the thermopower. In principle, TCs made from submicrometer-diameter wires (SMTCs) would have a more favorable change in thermal mass and could be thicker (1.0 to 0.5  $\mu\text{m}$ ). Bourg *et al.* fabricated SMTCs by first electrodepositing silver wires 1.0 to 0.5  $\mu\text{m}$  in diameter onto half of a stepped graphite surface. A mask covering the other half of the substrate was removed, the silver wires were coated with a self-assembled alkanethiol monolayer, and nickel wires were deposited. The arrays were then pressed into a cyanoacrylate adhesive, and after hardening, the graphite was removed. Scanning electron microscopy revealed a robust weld at the silver/nickel interface. The success rate for SMTCs ranged up to 80%, and these junctions were functional after months of air

exposure. In laser-heating tests, response times varied from tenths of microseconds to several microseconds, with outputs of 20  $\mu\text{V}/^\circ\text{C}$ . — PDS  
*Nano Lett.* **7**, 10.1021/nl071990q (2007).

CELL BIOLOGY

## Death Throes in Living Color

Mitochondria—the tiny double-membrane-bounded organelles that provide healthy cells with a ready supply of energy—also play a key role in the triggering of programmed cell death or apoptosis. Sun *et al.* have combined light microscopy and



### Vesiculated reconstructed mitochondria.

three-dimensional electron microscopic tomography to record in detail the structural changes in mitochondria in cells that have been stimulated to undergo apoptosis. One of the first events observed after stimulation was a rearrangement of sub-mitochondrial morphology: The inner mitochondrial membrane changed from an organized arrangement of folded membrane cristae into a vesicular patchwork, which was accompanied by

the release of several mitochondrial proteins into the cytosol. However, one key mitochondrial protein involved in the apoptosis pathway, cytochrome c, was released efficiently independently of and before this remodeling. Swelling of the mitochondria occurred after the collapse of the membrane potential and was accompanied by a dissolution of the intramitochondrial structure. This generation of a composite time-course overview of morphological changes within single cells should help to dissect a variety of nonsynchronous cellular events. — SMH

*Nat. Cell Biol.* **9**, 1057 (2007).

ECOLOGY/EVOLUTION

## Something Fishy in Speciation

Adaptation to environmental conditions is believed to drive population divergence and hence demonstrates the predictability of evolutionary change. By investigating the morphology, genetic divergence, and mate choice of Bahamas mosquitofish, which live in isolated pools, Langerhans *et al.* demonstrate parallel speciation events among pools, in which the presence or absence of a fish predator appears to be driving speciation. In pools with strong predation, mosquitofish have evolved a morphology conducive to high-speed escape swim-

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