

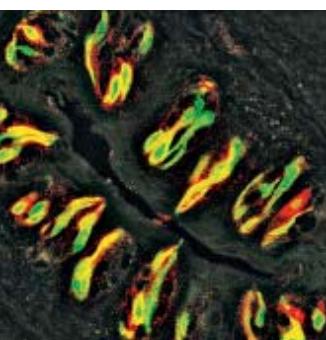
A COATING THAT FIGHTS ICE

Preventing the thick, icy buildup that accompanies freezing rain could become as simple as applying a coating. The first anti-icing superhydrophobic coating has been developed by the University of Pittsburgh's Di Gao and coworkers. The coating is composed of a composite of acrylic polymer and silica nanoparticles (*Langmuir*, DOI: 10.1021/la902882b). The nanoparticles provide the coating with roughness that repels water in the same manner as lotus leaves. While particles that are 1 μm in diameter or smaller will render the coating superhydrophobic, the particles must be 50 nm across or smaller for the coating to be anti-icing. "The energy barrier for the heterogeneous nucleation process increases significantly as the particle size decreases," Gao explains. "Therefore, the surfaces with smaller particles possess a larger energy barrier for the nucleation process, and therefore icing will be less likely to occur." Gao's team demonstrated the coating's ice-repellent properties by applying it to portions of an aluminum plate and satellite dish antenna prior to a freezing rainstorm. Whereas the uncoated portions were covered in a thick, icy glaze after the storm, the areas that were coated remained ice-free.—BH

SOUR CELLS SENSE CARBONATION

An enzyme on the surface of sour-sensing cells is the key to tasting the carbonation in your favorite fizzy drink, reports a group led by Charles S. Zuker of Columbia University (*Science* 2009, 326, 443). Mammals have multiple sensory systems that respond to the CO_2 , but the molecular mechanisms of those systems are poorly understood. Zuker and colleagues blocked the function of selective classes of taste receptor cells to try to pin down the mechanism for tasting CO_2 . They found that sour-sensing cells are also the ones that respond to CO_2 . The group then used gene-expression profiling to narrow in on an extracellular carbonic

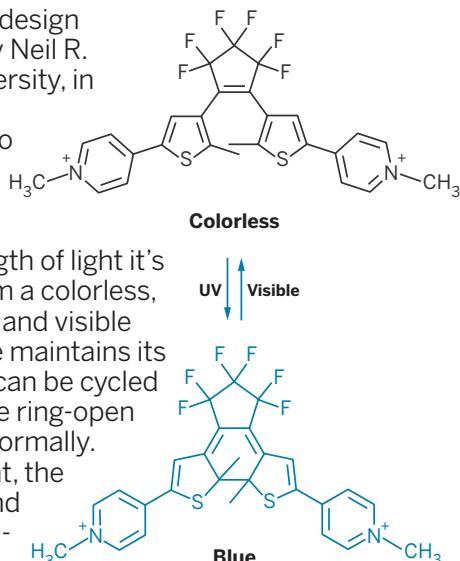
SITES OF CARBONIC ANHYDRASE PRODUCTION (RED) OVERLAP WITH SOUR-SENSING CELLS (GREEN) IN MOUSE TASTE BUDS (AREAS THAT OVERLAP ARE YELLOW).



MOLECULE CONTROLS WORMS WITH THE FLIP OF A SWITCH

Photoswitchable materials could inspire the design of easy-to-deliver drugs, as demonstrated by Neil R. Branda and coworkers of Simon Fraser University, in Burnaby, British Columbia, who have used a bis(pyridinium) dithienylethene compound to induce paralysis in the worm *Caenorhabditis elegans* (*J. Am. Chem. Soc.*, DOI: 10.1021/ja903070u).

The molecule exists in one of two forms, depending on the wavelength of light it's been hit with: Ultraviolet light switches it from a colorless, ring-open form to a blue, ring-closed isomer, and visible light causes the ring to reopen. The molecule maintains its photoswitching ability inside *C. elegans* and can be cycled multiple times. The researcher fed worms the ring-open form and observed that the worms behave normally. When the worms are hit with 365-nm UV light, the molecule converts to the ring-closed form and paralyzes the worms. Shining visible light longer than 490 nm on the worms reverses the paralysis, which is most likely caused by the ring-closed photoisomer disrupting the metabolic electronic pathway involved in energy production, Branda and coworkers note.—CHA



UV light converts the photoswitchable molecule from a colorless, ring-open form to a blue, ring-closed form.

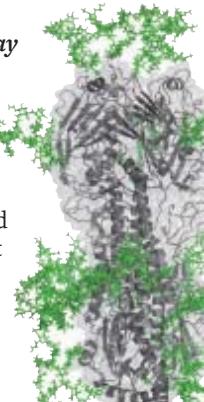
anhydrase as the essential enzyme. Carbonic anhydrase converts CO_2 to HCO_3^- and H^+ . Further investigation revealed that it is likely the H^+ in particular that signals CO_2 reception to taste cells. The authors suggest that the carbonic anhydrase may principally work to maintain the pH balance within taste buds, and its function as a carbonation detector may be merely "an accidental consequence."—JK

TRIMMING SUGARS YIELDS BETTER FLU ANTIBODIES

Truncating the sugar chains attached to an influenza protein leads to antibodies that can better bind to and neutralize the virus, reports a group led by Che Ma and Chi-Huey Wong at Academia Sinica, in Taiwan (*Proc. Nat. Acad. Sci. USA*, DOI: 10.1073/pnas.0909696106). The team investigated the glycosylation of influenza hemagglutinin (HA), a glycoprotein on the viral coat that enables the virus to enter respiratory tract cells by binding to glycan receptors. The team compared normally glycosylated HA with HA that was enzymatically pared

PARING DOWN THE SUGARS (GREEN) ON INFLUENZA HEMAGGLUTININ (GRAY) MAY LEAD TO A NEW VACCINE FOR THE VIRUS.

down in three ways: to remove just the sialic acid groups from the sugar chains, to leave a high proportion of mannose groups, and to truncate the sugar chains so that just a single *N*-acetylglucosamine remained at each glycosylation site. The researchers found that antibodies raised against the *N*-acetylglucosamine-only protein showed better binding affinity and neutralization activity against the influenza virus than antibodies raised against fully glycosylated HA. The results may point toward a new strategy for making vaccines against influenza and other viruses, the authors say.—JK



PROC. NAT. ACAD. SCI. USA

DYNAMIC CHANGES IN IRIDIUM CATALYSTS

Identifying the molecular structure of the active phase of a solid catalyst—and the changes such catalysts undergo during