# EDITORS' CHOICE

edited by Stella Hurtley

NEUROSCIENCE

## Managing Pain

The current arsenal of drugs to quell acute pain, fever, and inflammation includes nonsteroidal anti-inflammatory drugs (NSAIDs) that inhibit cyclooxygenase (Cox) enzymes. Most traditional NSAIDs do not distinguish between the two known Cox isoforms, Cox-1 and -2, but the newer generation of coxibs are selective and are used clinically for the management of pain symptoms. However, neither isozyme is sensitive to therapeutic concentrations of acetaminophen, one of the most popular analgesic and antipyretic drugs used worldwide. It has been postulated that acetaminophen could act on a brain-specific Cox.

Chandrasekharan *et al.* have now identified Cox-3, a third distinct enzyme that derives from the same gene as Cox-1 but retains a single intron because of an unusual form of alternative splicing. Cox-3 is highly expressed in the human cerebral cortex and in heart tissue. Its activity appears to be different pharmacologically from that of Cox-1 and –2 and shows greater sensitivity to various analgesic and antipyretic drugs and NSAIDs, including acetaminophen, aspirin, and ibuprofen. Thus Cox-3 may represent the long-sought-after target of acetaminophen in the central nervous system. — LC

*Proc. Natl. Acad. Sci. U.S.A* 10.1073/pnas.162468699 (2002).

APPLIED PHYSICS

## Getting More Light into Solar Cells

One problem with silicon (Si) solar cells is that the large difference in refractive index at the Si-air interface reflects much of the incoming light. The problem can be partially resolved by adding an antireflective coating, such as SiN or porous Si, to break the discontinuity in the refractive index into two smaller steps.

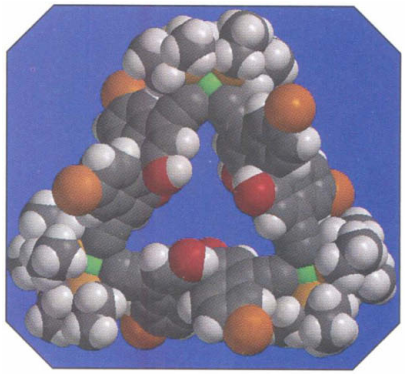
Striemer and Fauchet have now created a continuous gradient in the refractive index by varying the porosity of a Si layer along its thickness. The authors modified the electrochemical etching step that creates porous Si by varying the current parabolically with time. The etched channels contained undulations at both the air and unetched Si interfaces that are likely to enhance the range of the effective porosity. Unlike standard antireflective coatings, which show exceptional antireflective properties only over a narrow range of wavelengths, the gradient porous Si showed good and uniform antireflectivity for the entire range of visible and infrared wavelengths found in the terrestrial solar spectrum. — MSL

*Appl. Phys. Lett.* **81**, 2981 (2002).

CHEMISTRY

## Handedness in Triangular Pockets

Self-assembly of chiral ligands with metal centers into larger structures can provide a facile route to structures that mimic the catalytic environment created by enzymes. Lee *et al.* have self-assembled organometallic "triangles" in which three chiral binaphthyl ligands bridge three Pt atoms bearing phosphine ligands. In



**A chiral arrangement of hydroxyl groups (oxygen atoms in red) lines the triangle's pocket.**

one case, the bulky side groups of the ligands were removed by reduction and replaced by hydrogen to create a large chiral pocket lined with hydroxyl groups. This readily assembled compound gave higher stereospecific yields (typically 90%) for the catalytic reaction of diethyl zinc with aromatic aldehydes to form chiral secondary alcohols than did the free ligand (typically 80%). — PDS

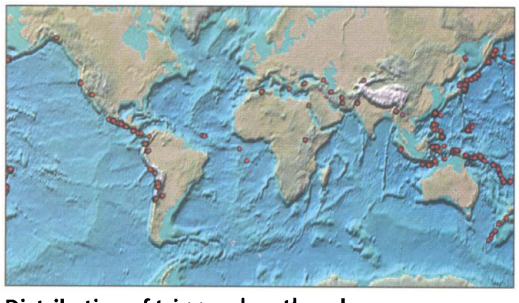
*J. Am. Chem. Soc.* 10.1021/ja028099s (2002).

BIOMEDICINE

## An Ounce of Prevention

The nuclear hormone receptor peroxisome proliferator-activated receptor-γ (PPAR-γ) is the molecular target of the thiazolidinediones, a group of diabetes drugs that activate its function. PPAR-γ is also implicated in tumorigenesis, but whether its activation prevents or promotes cancer has been a matter of controversy.

The results of two new studies support the hypothesis that PPAR-γ activation suppresses tumor formation. Girnun *et al.* show that mice lacking one copy of the PPAR-γ gene are more prone to develop colonic tumors in response to a chemical carcinogen than are wild-type mice. This effect was not seen when the mice carried mutations in the *APC* (adenomatous polyposis coli) tumor suppressor gene, suggesting that PPAR-γ prevents tu-



**Distribution of triggered earthquakes.**

EARTH SCIENCE

## Triggering Earthquakes

All earthquakes are associated with aftershocks, which are usually smaller shocks produced within 100 kilometers or so of the original epicenter that decay with time. But how often does a large earthquake trigger another large earthquake possibly as much as several years later? This question is critical for hazard assessment because it is these large earthquakes (greater than 7.0 on the Richter scale) that produce the most damage. Parsons analyzed subsequent earthquakes that occurred within 2° of 117 large earthquakes that have occurred since 1977 and could have acted as triggers. These earthquakes may have triggered more than 100 later earthquakes with magnitudes >6.5, including 13 earthquakes with magnitudes larger than that of the triggering earthquake (three with magnitudes >8.0). What's more, the occurrence of triggered earthquakes globally followed a function known as Oromi's law, in which the distribution of triggered earthquakes decreased by the reciprocal of time after the triggering earthquake, and the decay time was 7 to 11 years. This function can now be used to assess earthquake hazards on faults that have experienced what might potentially represent a triggering earthquake. — BH

*J. Geophys. Res.* **107**, 10.1029/2001JB000646 (2002).

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CREDITS: (TOP) LEE *ET AL.*, *J. AM. CHEM. SOC.* 10.1021/JA028099S (2002); (BOTTOM) TOM PARSONS/USGS

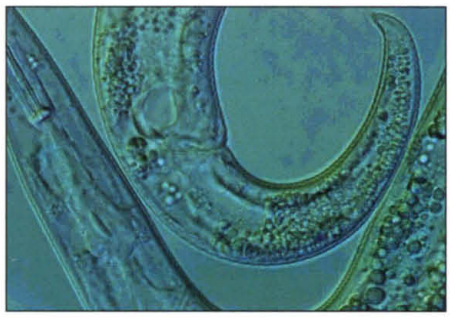
mor initiation. In independent work, Heaney *et al.* studied PPAR-γ in a class of benign pituitary tumors that can be life-threatening because they secrete high levels of adrenocorticotrophic hormone. Activators of PPAR-γ were found to inhibit growth of human corticotroph tumor cells in culture and prevent development of these tumors in mice. Thus, the clinical utility of the thiazolidinediones could conceivably extend beyond the treatment of diabetes to cancer prevention. — PAK

*Proc. Natl. Acad. Sci. U.S.A* **99**, 13771 (2002); *Nature Med.* 10.1038/nm784 (2002).

ECOLOGY

## Battles Below Ground

A major factor influencing the success of particular plant species within ecological communities is the extent of herbivory. Herbivores rarely actually kill target plants, and so it is likely that their activities change the balance of competition between grazed species. Interest in the effects of herbivores on natural plant communities has largely focused on the consumption of leaves and stems. Now there is increasing interest in the ecological role of root herbivory by soil-dwelling invertebrates. Verschoor *et al.* studied the effects of root-feeding nematodes on the competitive ability of two grass species, *Anthoxanthum odoratum* and *Holcus lanatus*, grown on soil from a Netherlands nature reserve. Under natural conditions, *A. odoratum*, the stronger competitor for light, tends to replace *H. lanatus*, the stronger competitor for nutrients, in the course of vegetation succession. In a greenhouse experiment, nematode herbivores were found to hasten the replacement of *H. lanatus* by *A. odoratum* in the successional sequence. This effect was not the result of nematode preference for one plant species over another; rather, the stronger nutrient competitor was less vulnerable to the herbivores. These results suggest a mechanism by which the composition of managed grassland plant communities may be mediated by below-ground herbivores. — AMS



***H. lanatus* (left) and a herbivorous nematode (top).**

CREDITS: (TOP) HHB VAN MEGEN; (BOTTOM) BC VERSCHOOR

*J. Ecology* **90**, 753 (2002).

HIGHLIGHTED IN *SCIENCE*'S SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

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## Keeping Count of Calcium

Transient increases in intracellular calcium concentration $[Ca^{2+}]_i$ communicate with specific signaling pathways to trigger diverse cellular processes. In some cases, the specificity of the response depends on localization of the $[Ca^{2+}]_i$ transient; in others, however, the $[Ca^{2+}]_i$ transient is not spatially restricted. In cells that undergo $[Ca^{2+}]_i$ oscillations, $[Ca^{2+}]_i$ transient frequency, amplitude, duration, and number can regulate given cellular responses. However, the relationship between the coding of the $[Ca^{2+}]_i$ signal and selective recruitment of different $Ca^{2+}$-dependent processes is unclear. Using electric field pulses in low $[Ca^{2+}]_o$ medium to elicit trains of $[Ca^{2+}]_i$ transients of constant amplitude and frequency in freshly ovulated mouse eggs, Ducibella *et al.* investigated the dependence of $Ca^{2+}$-mediated developmental processes on transient number. Cortical granule (CG) exocytosis occurred after a single $[Ca^{2+}]_i$ transient, whereas four stimuli caused reinitiation of the cell cycle, and 24 stimulated formation of a pronucleus. Egg activation was also differentially regulated. CG exocytosis, for example, occurred as a graded response to increasing transient number. Eight pulses, which caused extensive CG exocytosis and cell cycle progression, stimulated protein synthesis. Twenty-four pulses further stimulated the expression of some proteins but reduced the expression of others. Thus calcium signaling does not act as a simple on/off switch to initiate egg development, and transient number can be used to differentially regulate and temporally coordinate different $Ca^{2+}$-dependent processes. — EA

*Dev. Biol.* **250**, 280 (2002).