EDITORS' CHOICE

edited by Gilbert Chin

BEHAVIOR

Making Up for Lost Time

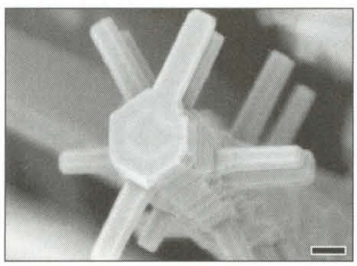
The interplay of genetic makeup and environmental influences is known to be complex, with important and sometimes irreversible consequences for the development of molecular and behavioral phenotypes. Separating mother rat and pup for long periods of time (3 hours per day during the first 2 weeks of life) has been shown to heighten the response of the hypothalamus-pituitary-adrenal axis to stressful stimuli; in addition, expression of corticotropin-releasing factor increases, and the dampening effect of glucocorticoids is reduced. These pups also display a reluctance to explore novel environments. Francis *et al.* have examined the extent to which subsequent rearing of these maternally separated pups in enriched circumstances (a larger cage with playground and toys) can compensate for their early life experiences. They find that the behavioral responses to stress and novelty can be reversed, but that the molecular setpoints remain unchanged. — GJC

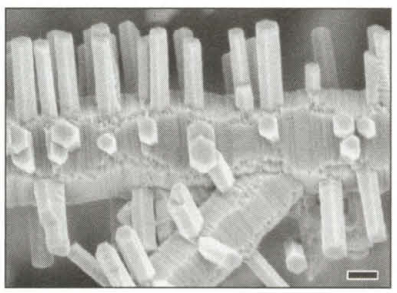
J. Neurosci. **22**, 7840 (2002).

MATERIALS SCIENCE

Core Issues in Oxide Growth

When metal oxides are grown from vapor onto a substrate, the exposed crystal face and the lattice mismatch of the substrate can influence the shape of the objects that form. An extreme case is presented by Lao *et al.*, who observed a hierarchical formation of ZnO nanorods on In_2O_3 cores during a vapor condensation process in which single-crystal nanorods grew with six-, four-, or twofold symmetry. On smaller In_2O_3 cores, rows of single rods were obtained, but on larger cores, multiple rods originated from a single substrate facet. The ZnO rods typically grew perpendicularly to the core, but some variation was observed in the tilt angle.





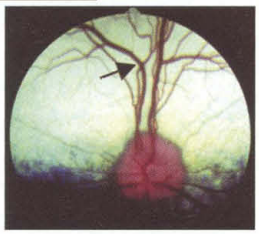
Sixfold symmetry growth of ZnO rods; scale bar, 200 nm.

Detailed examination of the structures showed that the symmetry of the ZnO wires depended on the crystallographic orientation of the In_2O_3. When In_2O_3 was oriented along the [110] or [111] directions, sixfold symmetry was obtained, but when the In_2O_3 was oriented along the [001] direction, fourfold symmetry was seen. The authors believe that the twofold symmetry is controlled by yet another growth mechanism. — MSL

Nano Lett. 10.1021/nl025753t (2002).

BIOMEDICINE

Going to the Dogs



Blood vessels in the retinas of untreated (top) and treated (right) MPS VII dogs.

The notion that gene therapy can be used to achieve long-term correction of disease phenotypes has attracted enormous interest, yet there are few examples of success in large animals or in humans. Ponder *et al.* report exciting progress with a canine model of mucopolysaccharidosis VII (MPS VII), a lysosomal storage disease (Sly syndrome) caused by a deficiency in an enzyme that degrades certain sugar molecules. When dogs with MPS VII were injected as newborns with a retroviral vector encoding the missing enzyme, they showed sustained liver production of the enzyme and remained healthy and mobile for over a year. In contrast, untreated dogs at 6 months of age began to develop the major clinical features of the disease, including an inability to walk, cardiovascular disease, and corneal clouding. In principle, with further optimization, the specific gene delivery method described could be applied more generally to treat other lysosomal storage diseases, blood protein deficiencies such as hemophilia, and deficiencies of liver proteins. — PAK

Proc. Natl. Acad. Sci. U.S.A. **99**, 13102 (2002).

OCEAN SCIENCE

Correcting for Dissolute Behavior

Reconstructions of tropical sea surface temperature (SST) have indicated that tropical SSTs were colder by about 2° to 6°C during the Last Glacial Maximum. How much of this range reflects true oceanographic variability and how much is attributable to inaccuracies associated with different paleotemperature proxies is a topic of considerable controversy. The Mg/Ca of planktonic foraminifera is an increasingly popular proxy for SST, but foraminiferal Mg/Ca is susceptible to postdepositional alteration by dissolution on the seafloor, which can introduce relatively large uncertainties in calculated temperatures and across different temperature calibrations. Rosenthal and Lohmann describe a calibration for Mg/Ca paleothermometry in which size-normalized shell weight is used to correct for postdepositional dissolution of the forams. This approach improves the accuracy of SST estimates and is globally applicable. Using this correction, they calculate that the SST of the eastern equatorial Atlantic was 2.9° ± 0.4°C colder during the Last Glacial Maximum than today. — HJS

Paleoceanography **17**, 1044 (2002).

PLANT SCIENCE

Suppressing Silencing

Gene expression is regulated not only by the swarm of transcription factors that interact with the promoter region of the gene but also by the nuclear localization of the gene. Matrix attachment regions (MARs) of DNA bind to the proteinaceous network of the nucleus and segregate chromosomal subdomains; the MARs may define loops of chromatin presenting multiple genes for coordinated activation or repression by soluble factors. In plants, the loops seem to be on the order of 10 kilobases in length. Surveying variability in expression from low-copy-number transgenes in

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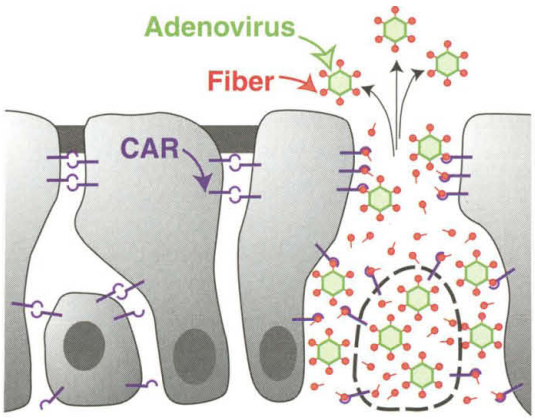
maize, Brouwer *et al.* find that different MARs have diverse effects on gene expression, in some cases reducing transgene silencing, and an individual MAR could have multiple effects according to the developmental status of the cells being tested. The MARs offer a glimpse into a complex process, which can alter both chromatin structure and gene expression. — PJH

Plant Cell **14**, 2251 (2002).

VIROLOGY

Let Me Out of Here

Adenovirus infects epithelial cells by binding to the coxsackievirus and adenovirus receptor (CAR), which is a cell adhesion molecule found on the basolateral cell surface, close to the intercellular tight junctions. In intact epithelia, CARs will be hidden from incoming viruses, but occasional breaches of epithelial integrity will be sufficient to establish a productive infection. After entry into cells, the virus replicates and progeny viruses are released.



A model of how fiber-CAR binding promotes escape of adenovirus.

Walters *et al.* discovered that in human airway epithelia, adenovirus was released on the basal side of the epithelial cell layer. Tight junctions seal the epithelial layer, meaning that the progeny viruses are trapped on the "wrong" side of the epithelium and lack access to the airways. Adenovirus circumvents this conundrum by using the viral fiber protein, which is the viral capsid protein that interacts with CAR. Adenovirus-infected cells produce excess fiber protein, which uncouples the CAR dimers that help to maintain tight junction integrity, resulting in an "unzipping" of the epithelial cells. The use of fiber-CAR interactions for both entry and escape is an efficient method for propagating virus within the epithelium and beyond. — SMH

Cell **110**, 789 (2002).

ASTROPHYSICS

Red, but Not Dead

Rich clusters contain thousands of galaxies. In the process of forming these clusters, the gas from the galaxies is stripped away and concentrated in the cluster center, where it cools quickly and is a major, but short-lived, source of fuel for star formation and for supermassive black holes. Red clusters were thought to be relatively old and quiescent systems in which the gas has been consumed and star formation and supermassive black holes are rare.

Martini *et al.* have found six supermassive black holes in the supposedly quiet red cluster Abell 2104. They identified the characteristic energetic x-ray radiation of actively accreting black holes using the Chandra X-ray Observatory and then confirmed that these black holes were indeed members of the cluster, using the 6.5-m Walter Baade optical telescope. This unexpected overabundance of black holes indicates that the galaxies have somehow held onto their endowment of gas, which is being used to nourish these sprightly black holes. These results have intriguing implications for galaxy evolution and for the care and feeding of black holes in clusters. — LR

Astrophys. J. **576**, L109 (2002).

ENVIRONMENTAL SCIENCE

More Than Just Arsenic

In order to avoid bacterially contaminated drinking water, Bangladesh has developed its groundwater resources. However, studies in the past decade have detected arsenic contamination of groundwater, and tens of thousands of cases of arsenic-related illness have been reported. Frisbie *et al.* present an extensive survey of well water in Bangladesh and show that widespread arsenic contamination is a major health risk, with about half of the population consuming water in which arsenic concentrations are higher than the World Health Organization guideline. In addition, several other metals, including manganese, lead, nickel, and chromium, are also present at unsafe levels in drinking water. Antimony, which can increase arsenic's toxicity, was present in 98% of the samples taken. These results should help guide efforts to provide safer water in this region of the world, including the monitoring of well water and the drilling of deeper wells. — PDS

Environ. Health Perspect. **110**, 1147 (2002).

CREDITS: (SOURCE) WALTERS *ET AL.*, *CELL* **110**, 789 (2002); (ILLUSTRATION) DEBRA J. MORGENEGG/*SCIENCE*