EDITORS' CHOICE

edited by Gilbert Chin

PSYCHOLOGY

Reading is a Complex Skill

The act of reading requires rapid processing of information and seamless communication between brain regions. People with dyslexia have difficulty with both of these functions; they cannot accurately decode rapidly changing visual or auditory stimuli, and the parts of their brains required for reading do not communicate well with each other.

Talcott *et al.* assess sensitivity for detecting dynamic visual and auditory stimuli in 32 unselected children and find that these sensitivities correlate with their orthographic and phonological skills. Using a new technique for detecting axons in the brain called diffusion tensor magnetic resonance imaging, Klingberg *et al.* show that there are decreases in the ordered axonal structure within the left temporo-parietal area (which form the connections to the frontal cortex) that correlate with reading ability in adults. Thus, the alterations in brain structures and functions seen in reading-impaired individuals may be representative of variation that contributes to the range of reading ability among normal individuals. — KK

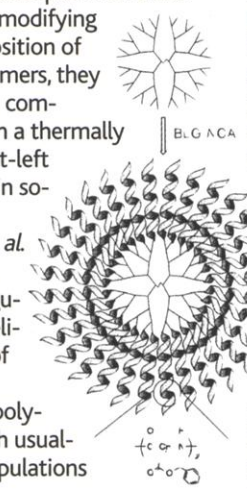
Proc. Natl. Acad. Sci. U.S.A. **97**, 2952 (2000); *Neuron* **25**, 493 (2000).

CHEMISTRY

Switching Hands

Some synthetic polymers can be switched reversibly between right-handed and left-handed helical conformations. Such two-state switchable materials have potential applications in data storage, transmission, and display devices, but the desired helical inversion behavior remains rare.

Koe *et al.* have synthesized poly(diarylsilylene) copolymers —of interest because of their electroluminescence properties —with enantiopure chiral side chains. By modifying the composition of the copolymers, they obtained a compound with a thermally driven right-left transition in solution at 10°C. Li *et al.* have been able to regulate the helical sense of polyisocyanates, polymers which usually form populations containing equal proportions of left-handed and right-handed helical backbones. They attached small amounts of a racemic mix of optically switchable chiral ligands to the polymers. Irradiation with circularly polarized light then generated a small enantiomeric excess in the chiral ligands. This slight excess was amplified by the polymer, and the population developed an overwhelming preponderance of one-handedness. Reversible switching could be achieved by flipping the polarity of the light.



Aggregation promotes helicity.

The degree of helicity in biopolymers that naturally form helices can be modified by changing external conditions, such as the solvent and the temperature, or by aggregation. Higashi *et al.* have grafted oligopeptide units onto the surface of a dendrimer, a hyperbranched macromolecule with a high density of surface functional groups. Alignment of the peptide groups onto the surface of the dendrimer leads to enhanced helicity. — JU

Chem. Commun. **2000**, 389 (2000); *J. Am. Chem. Soc.*, in press; *Chem. Commun.* **2000**, 361 (2000).

NEUROSCIENCE

Move It or Lose It

The sensory apparatus of animals is specialized to detect changes in the environment because these often indicate either danger or opportunities for food. A stationary stimulus, on the other hand, is considered to be rather dull and thus, the energy of processing it should be minimized. In the visual system a phenomenon called "fading" seems to belong to this energy conservation process. If a stimulus is projected continuously onto a single retinal location, perception of it fades over time. In order to see a stationary scene, small eye movements are needed.

Martinez-Conde *et al.* recorded from neurons in the primary visual cortex of macaque monkeys while tracking the animals' eye movements. They observed an increase in bursts of spikes after microsaccades, suggesting that microsaccade-related neuronal activity helps to prevent the loss of visual perception. — PRS

Nature Neurosci. **3**, 251 (2000).

APPLIED PHYSICS

Fast and Efficient Photodetectors

Improved Internet access will depend on the development of technologies for moving signal rapidly. One approach is the "fiber to the home" proposal, which would utilize the speed and information capacity of optic fiber communication networks to replace the existing conventional wires that currently serve to connect homes to long-distance, optical communication trunks. This approach will

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ATMOSPHERES

Not So Fired Up

The focus on the extensive fires at Yellowstone National Park in 1988 may leave the impression that such conflagrations occur fairly often, but a new study suggests that they are relatively rare events, at least in recent times. Millspaugh *et al.* constructed a 17,000-year record of fires by examining charcoal layers in sediments in Cygnet Lake in the central part of Yellowstone Park. Unlike other areas in this region, this area has been dominated by lodgepole pine for the past 13,000 years; this long record reveals the influence of climate on fire occurrence during a period of low and constant plant diversity.

Yellowstone Park in 1988.

Fires were rare in Yellowstone during the waning of the glacial period but increased greatly in the early Holocene to a high of about 15 per 1000 years about 10,000 years ago. At this time, summer insolation in the Northern Hemisphere was at a maximum, and the Yellowstone climate was drier during the summer than it is today. The recent rate for recognizable fire layers is much lower—about 2 to 3 per 1000 years—and does not reveal any regular periodicity in fire occurrence, in contrast to recent suggestions. — BH

Geology **28**, 211 (2000).

SOURCE: JONATHAN BLAIR/CORBIS (LEFT); HIYASHI *ET AL.*, *CHEM. COMMUN.* **2000**, 361 (2000) (RIGHT).

require the refinement of elements of optical transceivers, including modulators and photodetectors, that ideally should be integrated with existing silicon technology.

Germanium-silicon (Ge-Si) heterojunction photodiodes are promising candidates for photodetectors because Ge film growth is compatible with Si processing and Ge has a band gap in the infrared, the wavelength regime used for optical communications. However, the lattice mismatch between Ge and Si results in defects and dislocations in the epitaxially grown Ge film that degrade the photodetector characteristics. Colace *et al*. introduce a simple technique to improve the Ge-Si photodetector response, a post-growth cyclic thermal annealing process that can reduce these defects. The observed photoresponse improves by a factor of 2 and exhibits a subnanosecond response time. — ISO

Appl. Phys. Lett. **76**, 1231 (2000).

MOLECULAR BIOLOGY

In My Activation Is My Doom

Activating gene expression in an inappropriate context can be dangerous and even deadly—cancer being one of many possible consequences. Thus, keeping transcription factors under tight control is of vital importance. One mechanism for limiting their activity is simply to degrade them. For the Myc transcription factor, it is known that the sequence element that targets the protein for destruction overlaps with the gene activation element.

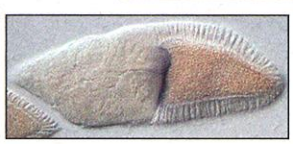
Inspired by this intriguing observation, Salghetti *et al*. uncover a similar correlation for several transcription factors in which the gene activation element can act to target the protein for destruction via ubiquitin-mediated proteolysis. Furthermore, they show that the converse is also true: An element that targets a protein for ubiquitin-mediated degradation also can function to activate gene expression. Why should there be a link between such apparently disparate functions? Perhaps this is a means by which cells can keep potent transcriptional activators in check, or perhaps there are common cellular components involved in transcription activation and ubiquitin-mediated proteolysis. — GR

Proc. Natl. Acad. Sci. U.S.A., in press.

DEVELOPMENT

Motoring RNA

The polarized expression of proteins is essential for the establishment of patterning within the *Drosophila* embryo. Bicoid (Bcd) is a protein whose gradient specifies the anterior pattern of the fly embryo. The gradient of Bcd protein is generated by anterior localization of the *bcd* messenger RNA. This RNA is localized early in embryogenesis and requires the expression of a gene called *swallow* (*swa*).



Swa protein (lower) and *bcd* RNA (upper) at the anterior pole.

Schnorrer *et al*. have found that Swa protein, which contains an RNA-binding domain, interacts directly with the molecular motor dynein. They propose that microtubule-dependent transport of *bcd* RNA by a complex of Swa and dynein serves to localize this RNA at the anterior pole of the oocyte. — SMH

Nature Cell Biol. **2**,185 (2000).

Science's stke

Interleukins and T Helper Cells

Differentiation of naive CD4+ T cells into the T helper type 1 (T_H1) phenotype requires signaling by interleukin (IL)-12 through the IL-12 receptor (IL-12R) β2 chain and activation of the signal transducer and activator of transcription (STAT) 4. On the other hand, induction of the T_H2 phenotype from naive CD4+ T cells requires IL-4 binding to the IL-4 receptor and activation of STAT6. A concomitant reduction of IL-12R β2 also is observed. When naive CD4+ T cells are treated simultaneously with IL-4 and IL-12, the IL-4 effects predominate and T_H2 cells develop. Thus, it has been hypothesized that IL-4-dependent decreases in IL-12R β2 expression abolish IL-12 signaling and allow for differentiation into the T_H2 phenotype. Nishikomori *et al*. find that IL-12R *b2* transgenic CD4+ T cells differentiated into T_H2 cells in the presence of IL-4, or IL-4 and IL-12. In addition, IL-12 treatment of T_H2 cells expressing functional IL-12 receptors did not induce the conversion of these cells into the T_H1 phenotype. Now, Szabo *et al*. report that the transcription factor T-bet can repress IL-4 and redirect T_H2 cells into the T_H1 lineage. — JN

J. Exp. Med. **191**, 847 (2000); *Cell* **100**, 655 (2000).

CREDITS: FRANK SCHNORRER *ET AL., NATURE CELL BIOL.* **2**, 185 (2000).