

EDITORS' CHOICE

edited by Gilbert Chin

CLIMATOLOGY

Extreme Weather

Instrumental records show that global average annual surface temperatures increased by about 0.5 °C over the course of the twentieth century. Climate change is a more complex phenomenon than can be illustrated by this one number, however, and it is of importance to quantitate how other aspects of climate have varied.

Easterling *et al.* describe the existing evidence for changes in several of these properties—daily maximum and minimum temperatures, glacial and snow cover, precipitation, cloudiness, and soil moisture—in an attempt to construct a more comprehensive picture of global climate change. They use these data to address three fundamental, yet vexing questions: Is the planet getting warmer? Is the hydrologic cycle changing? Are weather and climate becoming more extreme or variable? The short answer to all of these questions, taking into account an admittedly incomplete data set, is "yes." More detailed analyses of existing data, performed with due caution regarding possible systematic biases and uncertainties, are needed. — HJS

J. Geophys. Res. Atmos. 105, 20101 (2000).

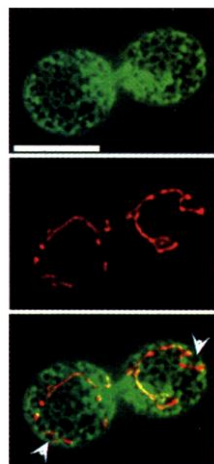
CELL BIOLOGY

A Multitasking Network

The endoplasmic reticulum (ER) is a dynamic arrangement of intracellular membrane representing the entry portal to the protein secretory pathway. Much is known about the architecture of the ER in mammalian cells, but

the structure and dynamics of the yeast ER are less well understood due to the difficulty of visualizing subcellular structures in very small cells.

With the aid of a fluorescently tagged ER membrane protein,



Structural connections between mitochondria (red) and ER (green) in yeast.

Prinz *et al.* observed in vivo a dynamic ER located in the periphery of the yeast cytoplasm. Unlike mammalian ER, maintenance of this network in yeast did not require intact microtubules, although actin did appear to be important for ER dynamics. Mutations in proteins involved in membrane traffic out of the ER (to the Golgi) and muta-

tions in proteins required for targeting ribosomes to the ER (the SRP pathway) did affect network structure. Disturbance of the ER morphology also perturbed in parallel yeast mitochondrial

structure, indicating that mitochondria may utilize the ER network as a scaffold for their own reticular organization. — SMH

J. Cell Biol. 150, 461 (2000).

NEUROSCIENCE

Hot Streaks and Day Traders

The behavior of most animals is driven by instincts that promote the survival of the individual. Gratification of instincts usually is experienced as reward, which has been studied in animal experiments and also has spawned an extensive literature on the human brain areas involved. Humans, however, also can experience more abstract types of reinforcement, and the underlying brain circuitry for these more complex types of reward is much less well mapped.

Elliott *et al.* studied the neural responses of subjects participating in a card gambling task where they received only abstract financial rewards or penalties. They found increased activity in right midbrain regions and the right ventral striatum when individuals were winning, and an

increased activity in the hippocampus and parahippocampus when subjects were losing. In addition, during a winning streak when reward was increasing rapidly, there was a unique response in the anterior medial thalamus, pallidum, and the subgenual cingulate. These experiments reveal a complex pattern of activity in the human brain reward system with specific activation of sites in a context-sensitive way, and they offer a glimpse of the multitude of the processes that occur in the brain of a gambler or perhaps a trader in the equity markets. — PRS

J. Neurosci. 20, 6159 (2000).

MATERIALS SCIENCE

En Route to Cleaner Exhaust

The emission of nitrogen oxides, or NO_x, is the major source of pollution from modern transport vehicles powered by fossil fuels. To reduce emissions, basic oxides are used as adsorbents for NO_x, but these adsorbents suffer from deactivation due to the deposition of sulfur oxides, a process called poisoning. If NO_x

EVOLUTIONARY GENETICS

The Wages of Inbreeding

That inbreeding reduces fitness (measured as reproductive output) is a well-established principle in population genetics. Inbreeding depression arises from increased homozygosity at loci influencing fitness and has practical consequences for the conservation of small populations or rare species. Nevertheless, it has been difficult to document unequivocally the effects of inbreeding in wild populations of animals, because measures of fitness require many years of observation and because pedigrees of individual animals are hard to ascertain.

Slate *et al.* have now provided such a demonstration, using many years of observations of a wild population of red deer (*Cervus elaphus*) on the Isle of Rum, Scotland. The lifetime breeding success (LBS) of females was measured as the number of calves born; LBS of males was assessed from behavioral observations during the breeding season. Inbreeding depression was estimated from heterozygosity of microsatellite markers. Clear correlations between LBS and heterozygosity were found for both males and females, the first time that inbreeding depression (or its converse, heterosis or 'hybrid vigor') has been shown for a wild animal population. — AMS

Proc. R. Soc. Lond. B. 267, 1657 (2000).



Hybrid vigor in the wild.

could be eliminated more efficiently from the exhaust, this would in turn make it possible to control better particulate carbon emissions. Sultana *et al.* have discovered that certain zeolites can trap nitrogen oxides efficiently. The authors flowed representative mixtures of oxidized exhaust gas over a sodium-exchanged Faujasite-type zeolite. The NO_x was trapped in the form of dinitrogen trioxide and could be released through changes in pressure; no sulfur poisoning was observed. This system for the temporary storage of NO_x may become incorporated into improved emission control devices. — JU

Angew. Chem. Int. Ed. **39**, 2934 (2000).

BIOMEDICINE

Too Sensitive to Estrogen?

The growth of normal breast epithelial cells is stimulated dramatically by estrogen. Increased exposure or responsiveness of breast tissue to this hormone is thought to be a risk factor for cancer.

In a search for genetic changes in breast cells that might lead to an altered estrogen response, Fuqua *et al.* found that a large proportion of breast hyperplasias (microscopic masses of proliferating premalignant cells that can progress to cancer) express a variant form of the estrogen receptor ($\text{ER}\alpha$) that is hypersensitive to estrogen. This variant contains an amino acid change in the region between the hinge and hormone-binding domains, and it shows enhanced binding to the TIF2 co-activator when estrogen levels are low. Expression of this aberrant receptor could convey to breast epithelium an augmented mitogenic signal that would accelerate cancer development. If future clinical studies confirm a link between $\text{ER}\alpha$ and breast cancer progression, genetic tests for the variant might help to identify women who would benefit from precautionary measures. — PAK

Cancer Res. **60**, 4026 (2000).

MOLECULAR BIOLOGY

When the Party's Over

Eukaryotic messenger RNAs (mRNAs) carry at their 3' ends a tail of approximately 250 adenylate residues that are added by a template-independent nucleotidyl transferase known as poly(A) polymerase; crystal structures of the mammalian (Martin *et al.*) and yeast (Bard *et al.*, Reports, this issue, p. 1346) enzymes have been solved. These poly(A)⁺ mRNAs are transported from the nucleus to the cytoplasm and protected from degradation while they await translation by the ribosome. One implication is that when the

time for disposal arrives, there must be a safeguard to ensure that partially degraded or poly(A)⁻ mRNAs are not translated.

Searfoss and Wickner report results indicating that in yeast the putative RNA helicase Ski2p contributes to disfavoring translation of nonadenylated RNAs and that the translation apparatus is intrinsically able to operate on poly(A)-deficient mRNAs. Previous work had shown the involvement of Ski2p in a multiprotein complex—the exosome—which incorporates several 3' to 5' exoribonuclease activities. Thus, there appear to be several mechanisms that together serve to shunt the translational apparatus away from messages earmarked for recycling. — GJC

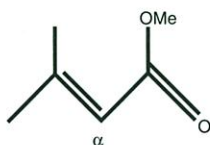
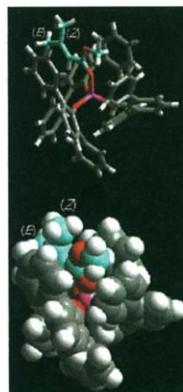
EMBO J. **19**, 4193 (2000);

Proc. Natl. Acad. Sci. U.S.A. **97**, 9133 (2000).

CHEMISTRY

Pocketing the Differences

Many compounds contain a carbonyl group ($\text{C}=\text{O}$) that is connected to a carbon-carbon double bond ($\text{C}=\text{C}$) by an intervening C-C single bond, and derivatizing such α,β -unsaturated compounds selectively is an important synthetic goal. Saito *et al.* report a general route in which molecular recognition of such compounds by aluminum tris(2,6-diphenylphenoxide), or ATPH, supports alkylation exclusively at the γ -carbons. The alkylation reaction was regioselective, too; addition of benzaldehyde occurred primarily to one side of the $\text{C}=\text{C}$ bonds in methyl 3-methyl-2-butenate (**1**) and to the other side in senecialdehyde. Why opposite sides are favored is revealed by x-ray crystallography of complexes formed by ATPH with the target compounds—the pocket formed by ATPH better accommodates one of the isomers obtained by rotation about the in-



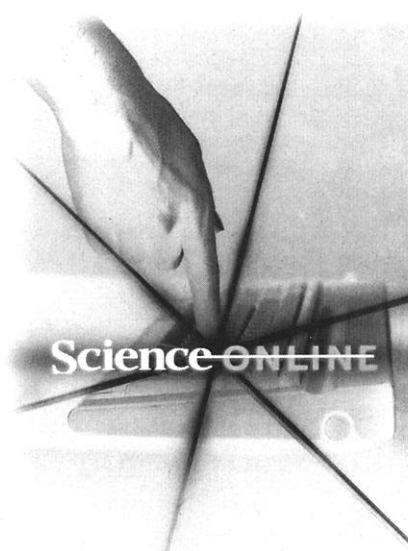
Compound **1**, ATPH, and the complex (above).

tervening C-C single bond. Several other aspects of the reaction also come under the control as a consequence of complexation of the reactants with ATPH. — PDS

J. Am. Chem. Soc., in press.

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