EDITORS' CHOICE

edited by Stella Hurtley

CHEMISTRY

Catalytic Obstacle Race

Small metallic particles are often the active species in many industrial catalysts, but they can be "poisoned" during the catalytic process, either by contaminants in the reaction mixture or by a secondary reaction involving the reactants or products. Microscopic knowledge of the processes that lead to this poisoning is rare.

Schauermann *et al.* now provide detailed insights into how specific sites on metal nanoparticles differ in their catalytic activity and their resistance to poisoning for the decomposition of methanol on palladium particles. This reaction proceeds via two pathways. The dominant (and desired) pathway leads to the formation of carbon monoxide and molecular hydrogen, but the breakage of carbon-oxygen bonds can form unwanted adsorbed carbon species. Molecular beams and time-resolved reflection-absorption infrared spectroscopy were used to show that steps and edges were poisoned preferentially in this system. Once all of the edge and step sites were covered with adsorbed carbon, the rate of adsorbed carbon formation decreased rapidly, leaving the larger flat facets of the particles free for the catalytic pathway. — JU

Angew. Chem. Int. Ed. **41**, 2532 (2002).

ECOLOGY/EVOLUTION

Origins of an Invasion

In the mid-19th century, a marine mollusk, the herbivorous periwinkle *Littorina littorea*, began to spread rapidly southward along the eastern coast of the United States from Nova Scotia, with pronounced effects on the coastal ecosystem as far south as Delaware. The origins of this invasion have been debated almost ever since, some claiming it as an early example of the now-familiar pattern of accidental introduction by humans from European coasts, others pointing to archaeological and allozyme evidence suggesting a much earlier presence and differentiation from European populations.

Wares *et al.* now appear to have laid this controversy to rest with an analysis of mitochondrial and nuclear DNA sequences in *L. littorea*, which shows that the periwinkle has been resident in North American waters for at least 8000 years. The cause of its rapid spread along the New England coast in the 19th century remains enigmatic. However, alteration of the benthic ecosystem by human activity in the form of increased coastal commerce and fishing must remain a prime suspect. —AMS

***Littorina littorea*, the common periwinkle.**

Ecol. Lett. **5**, 577 (2002).

MICROBIOLOGY

Nabbing Nematodes

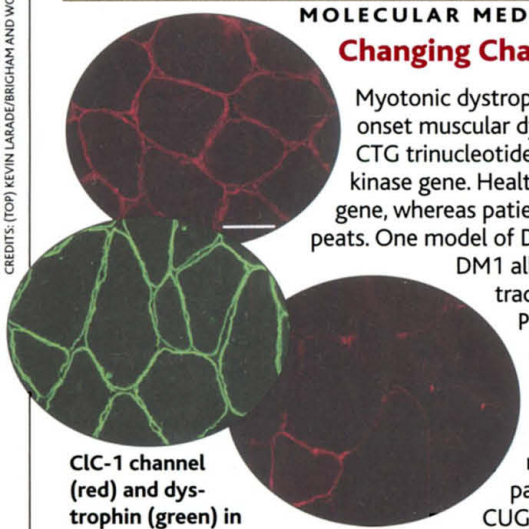
Most species of nematode worms are parasitic and can cause serious animal diseases in addition to acting as important crop pathogens. Nematophagous fungi catch their prey by producing elaborate structures to ensnare the worms. To avoid broadcasting potent nematicides into the environment, these fungi could be used as biological control agents, but their potential needs to be enhanced and for this to be possible the fungi need to be better characterized genetically.

Åhman *et al.* have been investigating the pathogenicity determinants of the fungus *Arthrobotrys oligospora* and have identified a specific extracellular serine protease as being key to nematode killing. This subtilisin-like enzyme is expressed at high levels in response to worm peptides in the environment. When additional copies of the protease gene were engineered into the fungus, worms were killed more effectively and more nematode trap structures were produced, partly because of the increased release of worm peptides. As well as improving the killing ability of the fungus, it may be possible to use the fungal gene to engineer nematode-killing properties directly into crop plants. — CA

Appl. Environ. Microbiol. **68**, 3408 (2002).

MOLECULAR MEDICINE

Changing Channel



ClC-1 channel (red) and dystrophin (green) in muscle fiber cell membranes of normal (top) and dystrophic (middle and bottom) mice.

Myotonic dystrophy type 1 (DM1) is the most common form of adult-onset muscular dystrophy and is caused by expansion of an unstable CTG trinucleotide repeat in the 3′ untranslated region of the DM protein kinase gene. Healthy individuals have fewer than 40 CTG repeats in this gene, whereas patients with DM1 can have as many as thousands of repeats. One model of DM1 pathogenesis postulates that transcription of the DM1 allele produces pathogenic RNAs whose extended CUG tract disrupts critical nuclear events such as RNA splicing. Provocative experimental support for the pathogenic RNA model is provided by Mankodi *et al.* and Charlet-B. *et al.*, who report that aberrant splicing may account for the muscle membrane hyperexcitability (myotonia) that is a hallmark feature of DM. Studying skeletal muscle from a mouse model of DM1, as well as DM1 patients, the authors find that expression of expanded CUG repeats is accompanied by a reduction in transmembrane chloride conductance and by aberrant splicing of the pre-mRNA encoding ClC-1, a muscle-specific chloride channel previously implicated in myotonia. The splicing defect, which leads to reduced levels of the ClC-1 protein in the cell membrane, may be due to increased activity of a splicing regulator called CUG binding protein. — PAK

Mol. Cell **10**, 35, 45 (2002).

OCEANOGRAPHY

Water on the Move

Variations in the rate of thermohaline circulation are intimately connected with climate change. The ventilation age—the time that it takes for a given mass of water to be replaced by a new one—provides a measure of the rate of ocean circulation. The ventilation age of the North At-

CONTINUED ON PAGE 741

CREDITS: (TOP) KEVIN LARADE/BRIGHAM AND WOMEN'S HOSPITAL/HARVARD MEDICAL SCHOOL; (BOTTOM) MANKODI *ET AL.*, *MOL. CELL* **10**, 35, 45 (2002)

lantic Ocean has varied between approximately 500 and 700 years during the Holocene, the 10,000 years of relatively warm climate since the end of the last glacial period. Was it different during geologically recent periods of cold climate?

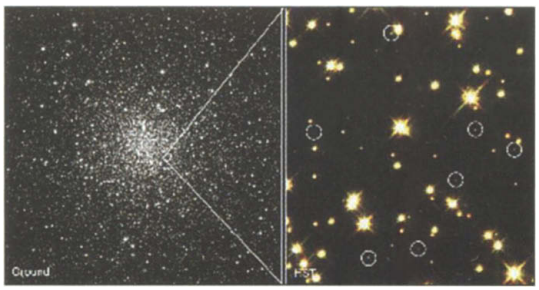
Keigwin and Schlegel have combined measurements of stable oxygen isotope ratios, radiocarbon ages, and mineralogical and foraminiferal compositions of sediments from the western subtropical North Atlantic in order to estimate ventilation ages during two important cold periods. Ventilation ages for the Younger Dryas, a cold interval that occurred in the Northern Hemisphere (at least) between 12,900 and 11,600 years ago, and the Last Glacial Maximum, 21,000 years ago, were 1000 years and 2000 years, respectively. These ages, much greater than some previous estimates, help to provide a more quantitative estimate of the weakening of circulation in the North Atlantic during recent cold periods. — HJS

Geochem. Geophys. Geosys. **3**, 10.1029/2001GC000283 (2002).

ASTROPHYSICS

Flavors of White Dwarfs

Globular clusters—clumps of stars that formed in a single starburst—are among the oldest objects in the universe. Most of the low-mass stars in clusters have gravitationally collapsed into white dwarfs, compact objects that cool and fade with time. The halos of spiral galaxies may contain the bulk of the missing or "dark" matter predicted by stellar velocity anomalies. Halo white dwarfs have been thought to account for some of this dark matter.



White dwarfs (within circles) in Messier 4.

Richer *et al.* and Hansen *et al.* used 123 orbits of the Hubble Space Telescope to stare at the globular cluster Messier 4, located in the halo of the Milky Way. The reams of long-exposure images identified many white dwarfs and allowed the color-magnitude relations and mass and luminosity functions for the entire population to be derived more precisely. Messier 4 is 12.7 billion years old compared to the Milky Way, which is 7.3 billion years old. The time gap is consistent with the idea that a thick-disk phase of growth of a proto–Milky Way preceded the main normal-disk growth of the Galaxy. Astronomers looking for halo white dwarfs to which to attribute dark matter in our Galaxy thus need to exclude normal-disk and thick-disk white dwarfs ... The "white dwarfs are dark matter" plot thickens. — LR

Astrophys. J. **574**, L151, L155 (2002).

CREDIT: HARVEY RICHER (UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER, CANADA) AND NASA

HIGHLIGHTED IN *SCIENCE*'S SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

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Turning on the Egg

When a sperm joins with an egg, development is begun by a signal encoded in oscillations in the concentration of intracellular free calcium ($[Ca^{2+}]_i$) in the cytoplasm of the egg. Precisely how the interaction triggers these oscillations has been a matter of debate, but soluble extracts of sperm cells can reproduce the effect. The Ca^{2+} is released from intracellular stores in response to increased concentrations of inositol 1,4,5-trisphosphate (IP_3), suggesting that a phosphatidylinositol-specific phospholipase C (PLC), which generates IP_3 from phosphoinositides, could be the culprit. But known PLCs can't substitute for sperm in egg activation.

Saunders *et al.* now report that mouse sperm produce an isoform of PLC, PLCζ. Eggs microinjected with complementary RNA encoding PLCζ showed oscillations in $[Ca^{2+}]_i$ with similar temporal characteristics to those in normally fertilized eggs. Furthermore, the amount of PLCζ from just one sperm cell (about 50 fg) mimicked activation by a sperm, and depletion of PLCζ from sperm extracts by immunoprecipitation removed egg-activating activity. Thus, PLCζ from the sperm cytoplasm appears to be the key molecular determinant of egg activation. These findings may be important in future treatments of male infertility or in the activation of eggs for the production of stem cells. — LBR

Development **129**, 3533 (2002).

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