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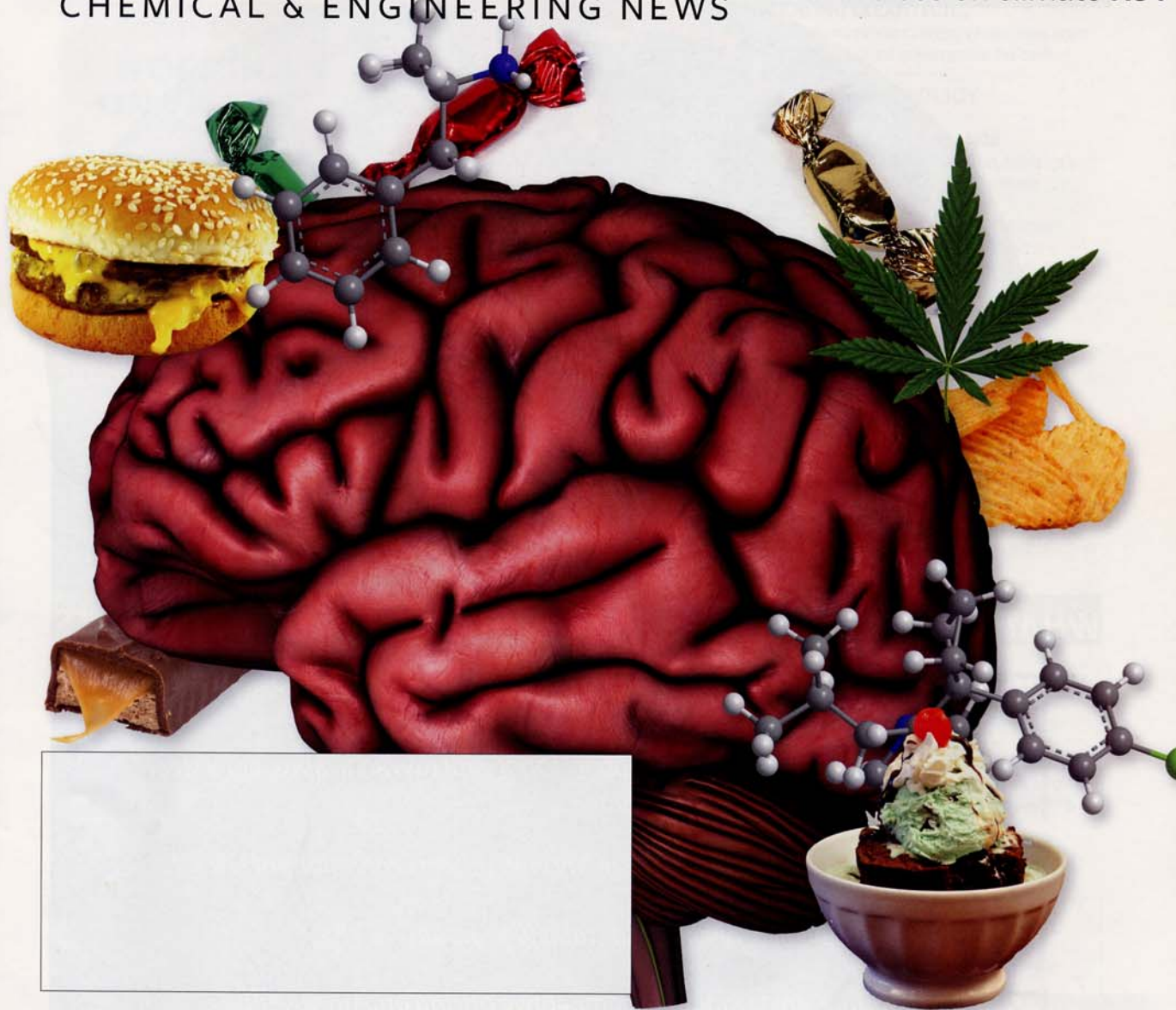
CHEMICAL & ENGINEERING NEWS

BIOBASED CHEMICALS

Producers move toward pilot-scale plants **P.22**

CLARIFYING OPTIONS

National Academies mulls U.S. choices on climate **P.34**



DRUGS FOR OBESITY

Craving more data on the brain's role **P.11**



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mond microcrystals. On the boron-doped crystals they found parallelogram-shaped grains that were 10.5 nm long, 8.3 nm wide, and at least 1.5 nm tall. Because the features are not observed on pure diamond, the scientists postulate that the boron dopant, which gives diamond metallic properties, induces quantum effects that control the growth of the nanostructures. Within the parallelograms are features spaced 3.5 nm apart. The features are due to lateral standing electron waves, the likely driving force of the electronic growth mechanism, the researchers say.—JK

OXIDATION ALTERS ION CHANNELS DURING AGING

Oxidative metabolism produces highly reactive oxygen species (ROS). More and more of these toxic compounds accumulate as an organism ages and its antioxidant defenses weaken. In turn, ROS are thought to contribute to aging through damage to proteins, DNA, and cell membranes. Now, Federico Sesti and Shi-Qing Cai of the University of Medicine & Dentistry of New Jersey have demonstrated that ROS also target ion channels that are essential to the proper function of neurons (*Nat. Neurosci.*, DOI: 10.1038/nn.2291). Working with the worm *Caenorhabditis elegans*, they showed that oxidative modification of KVS-1 potassium ion channels leads to progressive neurodegeneration and loss of chemotaxis ability—a sensory function controlled by KVS-1—during aging. The researchers examined the impact of ROS on transgenic worms that possess oxidation-resistant potassium ion channels and on other worms that produce more than the normal amount of antioxidants. In both cases, Sesti and Cai found that the diminished oxidation of the worms' potassium ion channels preserved neuronal function and chemotaxis ability as the worms aged.—SLR

NICKEL FAMINE MAY HAVE LED TO LIFE ON EARTH

The evolution of complex life-forms on Earth, from parakeets to panthers, could occur only after oxygen gas appeared in our atmosphere more than 2 billion years ago. But scientists have long debated how oxygen-producing bacteria could have gained dominance over methane-produc-



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ing bacteria, and in so doing, taken control of the composition of primordial Earth's air. Now, a team of researchers led by Kurt O. Konhauser, a biogeochemist at the University of Alberta,

in Edmonton, report evidence that this turning point in the history of life on Earth may be rooted in an ancient nickel famine (*Nature* 2009, 458, 750). In particular, the team found that the nickel-to-iron ratio in ancient rocks dropped around 2.7 billion years ago. Because methane-producing bacteria rely heavily on nickel for many of their essential enzymes, a deficiency of the metal could have decreased the metabolism and populations of methane makers, giving oxygen-evolving microbes the necessary edge. "If a single geological change can starve a major microbial community, and thereby change the trajectory of life on Earth, it suggests that there is a fragility to Earth's elemental cycles that we are only beginning to uncover," notes Mak A. Saito of Woods Hole Oceanographic Institution, in a commentary that accompanies the report.—SE

CATALYST THICKNESS CAN TUNE ADSORPTION

Controlling the state of a molecule adsorbing onto a catalyst surface is an important part of improving catalyst performance. Now, a research group led by David E. Starr of Brookhaven National Laboratory and Hendrik Blumh of Lawrence Berkeley National Laboratory has found that NO_2^- when adsorbed onto MgO films only two monolayers thick (*J. Phys.*

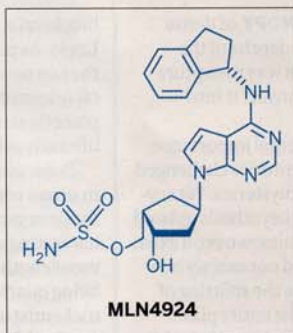
Banded iron formations, such as these found in Ontario, show chemical features of having formed in iron-rich oceans billions of years ago.

Chem. C., DOI: 10.1021/jp900410v). For MgO films thicker than five monolayers, however, NO_2^- converts to NO_3^- , as is the case for bulk MgO. The MgO films were supported on a silver substrate, and the researchers also observed changes at the MgO/Ag interface when NO_2^- adsorbed onto thinner films. That result, along with prior computational work, led the researchers to conclude that the presence of the metal substrate modifies the adsorption properties of NO_2^- , leading to the charge transfer to NO_2^- and the overall stabilization of the system. The results demonstrate that it is possible to tune the adsorption properties of molecules, as well as deposited metals, by controlling the thickness of thin oxide films, the authors say.—JK

NEW PROSPECT FOR TACKLING CANCER

A nucleotide analog that interferes with protein degradation halts tumor growth in a new way and may become a new cancer

treatment, according to a report in *Nature* (2009, 458, 732). Damaged or unnecessary proteins throughout the body get marked for destruction with small protein tags and are degraded by an enzyme called the proteasome. A drug that blocks the proteasome has proven effective at treating



some types of blood cancer, so researchers are interested in targeting other parts of the pathway with an eye toward developing complementary cancer drugs. Now, a team at Millennium Pharmaceuticals has developed MLN4924, a small molecule that resembles the nucleotide adenosine 5'-monophosphate and blocks activation of a small protein tag called NEDD8, which switches on an enzyme upstream of the proteasome. MLN4924 stops tumor growth in mice and is in early-stage clinical trials for several types of cancer. It might not become a drug, but it will nonetheless be a great tool for learning more about protein degradation, says Caltech biochemist Raymond J. Deshaies in a commentary accompanying the report.—CD