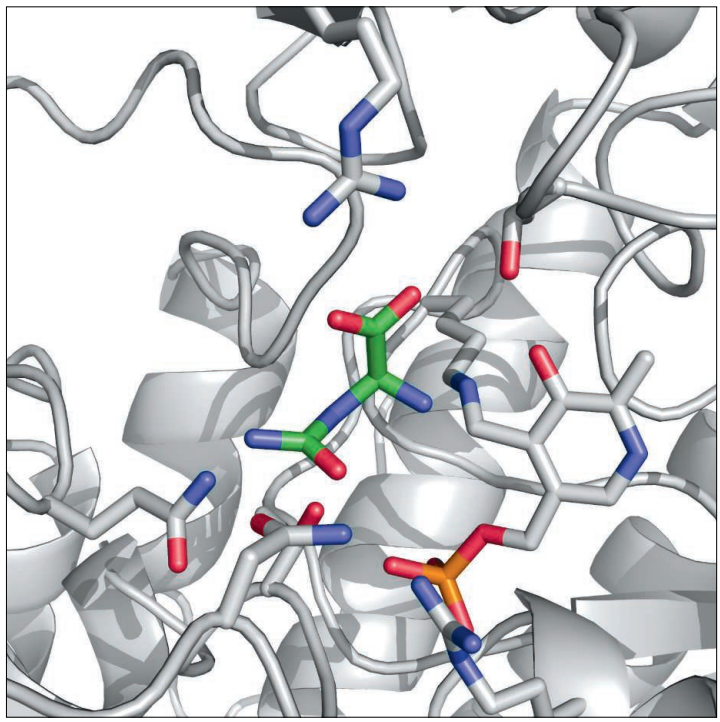
BIOCHEMISTRY

Recovering Carbon and Nitrogen

Purine nucleotide biosynthesis, critical for the assembly of DNA and RNA, uses amino acid precursors and requires energy. In general, however, purine breakdown (catabolism) does not generate energy, nor do most organisms have the capacity to reincorporate very many of the constituent carbon and nitrogen atoms into productive pathways toward other essential biomolecules. In fact, the catabolic intermediate uric acid can cause kidney disease in humans, and the end product glyoxylate can be harmful, too. Metazoa have a glyoxylate detoxification system in which alanine-glyoxylate aminotransferase (AGXT) converts glyoxylate to glycine at the expense of alanine. In contrast, *Bacillus fastidiosus* (a facultative aerobe found in soil and in the animal gut) thrives on purine degradation intermediates. Ramazzina *et al.* show that *B. subtilis* PucG protein is an enzyme with structural similarity to human AGXT1. Instead of consuming alanine, it catalyzes a transamination between *S*-ureidoglycine (carbons in green at right), which is an unstable intermediate in purine metabolism, and glyoxylate to give oxalurate and glycine. Although the original function of UGXT may have been glyoxylate detoxification, its willingness to use keto acids as amino group acceptors enables the recycling of the carbon and nitrogen atoms of purines. — VV

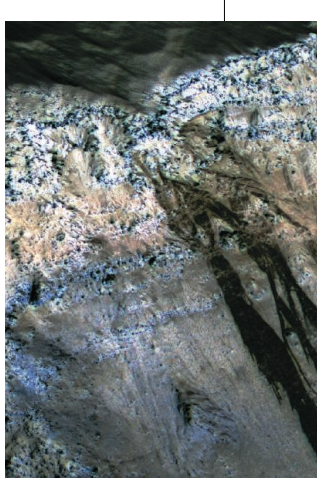
Nat. Chem. Biol. **6**, 10.1038/nchembio.445 (2010).



PLANETARY SCIENCE

Whence the Streaks?

One of the signs of ongoing geologic activity on Mars is the formation of dark streaks on slopes in the equatorial regions. Thousands of such streaks have been seen; they appear over periods as short as a few months in repeated satellite observations. Several possible origins have been proposed. Mushkin *et al.* combined spectral data and high-resolution images of several streaks on Olympus Mons to constrain the options. Identification of specific outcrops and boulder bounces down the slope ruled out selective exposure of substrate as an origin. The spectral data indicate that the streaks are rich in iron oxides but also suggest that water is not currently present (they are not wet now). One possible hypothesis to reconcile these data would entail transient seepage of a brine layer during the warmer Martian summer out along a thin surface layer protected by dust, causing precipitation of iron oxides and silica before the water completely evaporates or sublimes. — BH



Geophys. Res. Lett. 10.1029/2010GL044535 (2010).

PSYCHOLOGY

Plays Well with Others

"If you were in Rome, live in the Roman way" is an aphorism adopted by many a visitor to a strange land. Nonverbal behavioral mimicry of a person by another individual often goes unnoticed by either, yet is generally thought to promote togetherness and affiliation and has been found to enhance positive feelings such as liking and trust. Leander *et al.* describe a series of experiments aimed at assessing how potent this influence might be. They show that Asian-American and African-American students performed better and worse, respectively, on a math test after having been the target of unobtrusive mimicry during a getting-to-know-you conversation, whereas there were no differential gaps for people of the same ethnicities whose gestures and movements had not been mirrored. A similar pattern of stereotype-consistent performance could be induced in men versus women by mimicry; furthermore, the positive and negative increments in math test scores were larger in men and women who thought that these stereotypes reflected societal beliefs, regardless of whether the people personally endorsed those views. An intriguing point raised by these findings is that the affective benefit of fitting in with others might motivate conformist behaviors. — GJC

J. Exp. Soc. Psychol. **46**, 10.1016/j.jesp.2010.09.002 (2010).

ENGINEERING

Bend, Spin, Swim

Nanostructures that undergo directional propulsion ("nanoswimmers") have recently been powered by catalytic chemical reactions (such as hydrogen peroxide disproportionation) or electric fields. Gao *et al.* now show that flexible nanowires powered by external magnetic fields can swim in a manner analogous to bacterial flagella. After sequential electrodeposition of gold-silver-nickel nanowires (6 μm long and 200 nm in diameter), the silver section was thinned via hydrogen peroxide oxidation to create a flexible linker. In solution, the nanowires respond to a rotating magnetic field,

CREDITS (TOP TO BOTTOM): RAMAZZINA *ET AL.*, *NAT. CHEM. BIOL.* **6**, 10.1038/NCHEMBIO.445 (2010); MUSHKIN *ET AL.*, *GEOPHYS. RES. LETT.* 10.1029/2010GL044535 (2010)

but the nickel head rotates through a greater solid angle than does the gold tail. This broken symmetry, along with tailoring of the segment lengths and magnetic field modulation, allows the structure to swim at speeds of up to 6 μm/s, even in high-salt media. — PDS

J. Am. Chem. Soc. **132**, 10.1021/ja1072349 (2010).

MORPHOLOGY

Jaws

When searching for a friend in a crowd, we look for characteristics such as height, hair color, and facial features. Young *et al.* have introduced facial variation experimentally in a quantitative analysis of the Sonic Hedgehog (SHH) signaling pathway in chickens. They varied SHH activation in the brains of avian embryos before the formation of the face. Microscopy and microcomputed tomography as well as gene expression and cell proliferation measurements revealed that variations in SHH activity from the forebrain resulted in variations in the shape of the upper jaw. Furthermore, mitotic activity in the growth zone of the midface correlated with facial shape. This work may be extended to understanding the phenotypes of SHH-associated diseases and facial malformations, including holoprosencephaly. — BAP

Development **137**, 3405 (2010).

EDUCATION

Burnout Fallout

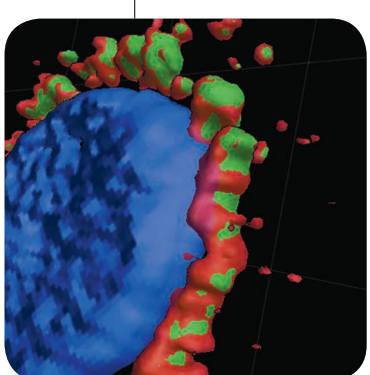
It is no secret that medical school requires many years of hard work, lack of sleep, and late-night study sessions. However, it has been unclear to what extent such stress might affect the students' capacity to act professionally (i.e., with honesty and integrity in adherence to their ethical code of conduct). Dyrbye *et al.* conducted a multi-institutional study of medical school students at all levels in the United States that measured multiple dimensions of professionalism and assessed the relationship to burnout and stress. Their goal was to better understand the influence that attending medical school had on the degree of professionalism reported by respondents. Self-reported cheating and dishonest clinical behaviors showed a direct association with burnout, whereas altruistic professional values showed an inverse relationship, in keeping with the theory that burnout primarily affects the professional domain. Even though respondents reported understanding that cheating and dishonesty are unprofessional, they continued to exhibit these behaviors, suggesting that elements of their learning climate promote dishonesty. As the United States begins to reform its health care system, the effect of burnout in this area merits further study, with a particular focus on whether interventions designed to diminish stress help students develop professional values and behavior. Results from this study also raise a larger question: Is this association also true in practicing physicians? — MM

J. Am. Med. Assoc. **304,** 1173 (2010).

VIROLOGY

Lipids Go Viral

Host cell membranes and their lipid constituents play an essential role in the life cycle of a group of single-stranded RNA viruses called flaviviruses. Lipids help the viruses enter the cell, establish intracellular sites for replication of their RNA genomes, and assemble the nascent RNA into viral particles, which exit the cell as infectious entities. Conceivably, a better understanding of the mechanisms by which the viruses co-opt host cell membranes for their own gain could lead to new antiviral therapies. Progress along these lines was recently reported by independent research groups studying two medically important flaviviruses. Studying the fever-causing dengue virus, Heaton *et al*. found that viral protein NS3 binds to fatty acid synthase (FASN, red at left), a host enzyme that makes fatty acids, and relocalizes it to sites of viral RNA replication (green) in the endoplasmic reticulum, resulting in de novo synthesis of lipids near the replication complexes. In analogous work on hepatitis C virus (HCV), which can cause severe liver damage, Herker *et al.* found that the viral nucleocapsid core binds to diacylglycerol acyltranferase-1 (DGAT1), a host enzyme that participates in lipid droplet synthesis. This interaction results in recruitment of HCV RNA replication complexes to lipid droplets near the ER, which are crucial for assembly of infectious HCV particles. Interestingly, both FASN and DGAT1 have already been studied as possible drug targets for obesity-related diseases. — PAK



CREDIT: HEATON *ET AL., PROC. NATL. ACAD. SCI. U.S.A.* **107**, 17345 (2010)

Proc. Natl. Acad. Sci. U.S.A. **107**, 17345 (2010); *Nat. Med.* **16**, 10.1038/nm.2238 (2010).

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Bend, Spin, Swim

Phil Szuromi

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