EDITED BY KRISTEN MUELLER AND MARIA CRUZ

MICROBIOLOGY

Simple But Specific

Successful agricultural production is heavily dependent on bee pollinators, but key species have been suffering striking losses. Losses have been attributed to a combination of environmental change, pesticides, and pathogen pressure. Little is known about the normal microbiota of social species such as honey bees and bumble bees, except that they are distinctive. This is of interest because the microbiota plays an important role in shaping a species' nutrition and overall health. Engel *et al.* extended studies beyond the typical 16*S* rRNA analyses to develop a metabolic and functional picture of the honey bee's microbial metagenome. Although only eight bacterial species are typically present in the honey bee gut, pathway reconstruction indicated strain-specific functions, which were particularly enriched for carbohydrate metabolism and transport for dealing with a nectar diet. A suite of pectin-degrading enzymes was also prominent, perhaps for pollen digestion or for pectin detoxification. And interestingly, of the candidate new species, *Snodgrasella* forms an intimate layer against the bee midgut and rectum, overlaid by a thick carpet of *Gilliamella*, which together appear to protect against parasite invasion. Despite the specialized nature of this microflora, it shows extensive strain diversity, and further discoveries about its functional and evolutionary interactions may help us to restore the world's pollinators to good health. — CA

Proc. Natl. Acad. Sci. U.S.A. **109**, 10.1073/pnas.1202970109 (2012).

GEOCHEMISTRY

It's All About the Sulphides

Both hydrated sulphates and carbonates have been observed on the surface of Mars. However, these two types of minerals form under very different conditions, with hydrated sulphates requiring acidic conditions that are incompatible with the formation or preservation of carbonates. Dehouck *et al.* explored the alteration of terrestrial basaltic minerals, similar to those found on Mars, under a simulated Mars-like atmosphere. After a 4-year-long exposure to a CO_2-dominated humid atmosphere, samples without iron sulphide suffered only minor alteration, whereas mixtures of silicates and sulphides led to acidic conditions that favored the precipitation of hydrated sulphates. Infrared reflectance spectra of the samples showed good agreement with data from Mars. Thus, rather than being the result of planet-wide acidic conditions, as has been widely believed, martian hydrated sulphates may have formed from sulphide-rich basalts that produced locally acidic environments. With regional variations in bedrock composition controlling the distribution of alteration minerals on the surface of Mars, rather than a global change of atmospheric chemistry, it is possible for the carbonates to form coevally under the same atmospheric conditions. — MJC

Geochim. Cosmochim. Acta **90**, 47 (2012).

APPLIED PHYSICS

Astronomy Through a Fine-Tooth Comb

The observation of distant astrophysical events with the high precision afforded by large Earth- and space-based instruments continues to expand our knowledge of the universe. Untangling the mechanisms at play typically requires analyzing spectra, with the dynamical processes inferred from shifts in wavelengths of known emission lines. For example, recent work has focused on the identification of planets orbiting distant stars, their presence determined by periodic and minute spectral lines shifts in the emission lines from their host star. These measurements require ever more precise and stable wavelength calibration of the astrophysical spectrographs. Phillips *et al.* demonstrate that laser-generated optical combs—broadband series of equally and precisely spaced wavelengths—can be used as an accurate and stable source to calibrate the spectrographs. The ability to tune and expand the extent of available wavelengths in the comb should provide the sensitivity to search for Earth-like planets orbiting distant stars, as well as to test other exotic astrophysical processes. — ISO

Opt. Express **20**, 13711 (2012).

EDUCATION

A Failure to Forget

Students with science misconceptions often have a hard time giving them up, especially if they have held them for a long time. When students are exposed to scientific evidence that conflicts with their earlier theories, what happens? Are the previous misconceptions overwritten or merely suppressed? Shtulman and Valcarcel devised and implemented a novel speed-reasoning task to investigate this question. Using software designed to record the speed and accuracy of answers, 150 college undergraduates, who had

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completed an average of 3.1 college-level math and science courses, verified 200 statements about natural phenomena (20 statements in 10 areas of science such as evolution, mathematics, etc.). Participants were slower at verifying inconsistent statements than consistent ones, verified true statements faster than false statements, and were more accurate in domains where conceptual change occurs early in life, such as fractions, than they were for domains such as evolution, where conceptual change occurs later. These findings imply that although early, incorrect theories are suppressed by scientific theories, they are not truly replaced by them. This suggests that science instruction may benefit from helping students reanalyze their misconceptions rather than expecting students to simply forget them. — MM

Cognition **124**, 209 (2012).

PHYSIOLOGY

Restless Flies Show Their Legs

Your leg may not seem to have much in common with that of a fly; however, it may be more than you think. Freeman *et al*. show that a relatively common human neurological disorder called restless legs syndrome, characterized by a strong urge to move one's legs and "fragmented" sleep, can be modeled in the fruit fly *Drosophila melanogaster*. A polymorphism in the gene *BTBD9* confers approximately 50% of the population-attributable risk in the human disorder. Deletion of the homolog in *Drosophila*, *dBTBD9*, recapitulated features of this condition, such as altered rest activity cycles, disrupted sleep, and hyperlocomotion. Knockdown of dBTBD9 in a specific set of dopaminergic neurons also resulted in fragmented sleep. Also similar to the human disorder, aberrant dopamine levels were observed in the *dBTBD9* mutant fly brain. Treatment of mutant flies with a dopamine agonist improved sleep patterns. In human cells, iron homeostasis was controlled by BTBD9. These findings support prior studies suggesting a role for dopamine regulation and iron metabolism in restless legs syndrome. Furthermore, the fly may serve as a useful model for understanding this disorder. — BAP

Curr. Biol. **22**, 1142 (2012).

BIOMEDICINE

miRNAs: Optional for Cancer?

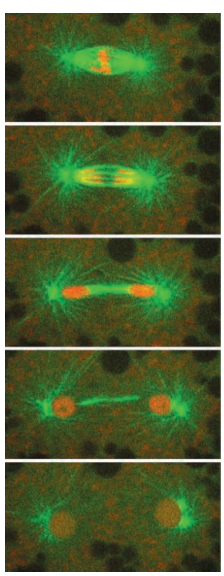
MicroRNAs (miRNAs) are small noncoding RNAs that control the expression of about half of the protein-coding genes in mammals. These regulatory RNAs have been implicated in a wide range of diseases, including cancer, where a large body of evidence suggests that they are essential for tumor survival and growth. The surprising results of a new study invite reexamination of this hypothesis. By genetic methods, Ravi *et al*. generated mouse sarcoma cells that were completely deficient in DICER1, an enzyme essential for miRNA production, and then experimentally verified the nearly total loss of miRNAs in these cells. In contrast to expectations, when these cells were injected into mice, they retained the ability to form tumors, although the tumors developed at a slower rate than those derived from control cells. Thus, global miRNA loss does not intrinsically preclude tumorigenesis. Whether these results highlight a quirk of tumors derived from mesenchymal cells or also apply to tumors of epithelial origin (which represent the majority of human solid tumors) remains to be determined, but is an important question given the current interest in miRNAs as potential targets for cancer therapy. — PAK

Cancer Cell **21**, 848 (2012).

CELL BIOLOGY

Knowing Your Place

Often life starts in very large cells. In the fruit fly, thousands of micrometer-sized nuclei distribute in a half-millimeter–sized egg, but it is a mystery how dividing nuclei distribute in the embryo. The positioning of nuclei in the embryo cortex is important for the subsequent cellularization required for successful development. Telley *et al.* studied a cell extract from individual early *Drosophila* embryos that was able to faithfully recapitulate repeated mitotic nuclear division cycles. When dividing nuclei were encapsulated in microchambers, the nuclear separation machinery was unable to adapt to reduced space. Thus, a distinct length scale of nuclear separation appears to be programmed into the early insect embryo, which is adapted to the requirements of the early developmental program of the syncytium. This scaling behavior involved actin-dependent microtubule aster migration and anaphase spindle elongation. — SMH



CREDIT: TELLEY *ET AL.*, *J. CELL BIOL.* **197**, 887 (2012)

J. Cell Biol. **197**, 887 (2012).