



ECOLOGY

Don't Touch My Cache

For plants, seed dispersal is critical for survival. It can provide an escape from competition, disease, and predators. One way seeds are dispersed is by seed-caching predators—their few forgotten seeds may eventually germinate and grow into new plants. One concern, however, is that although these animals move seeds away from competition with their parent plant, they may place them in competition with other conspecifics nearby. Hirsch *et al.* addressed this by following hundreds of radio-tagged black palm seeds for over a year on Barro Colorado Island. They found, instead, that the tree's main disperser, the Central American agouti, distributes its seeds to areas with low conspecific density. The distance from the parental tree and other conspecifics increased the more the seed was moved by agoutis, up to 18 times in some cases. The agoutis may be selecting areas of low black palm density for their caches, and the subsequent moving of their seeds, in order to avoid pilfering by other agoutis. Thus, the efforts of the agoutis to protect their caches result in better germination conditions for the trees and are probably worth the cost of the seeds that aren't forgotten. — SNV

Ecol. Lett. **15**, 10.1111/ele.12000 (2012).

GENETICS

How to Part Ways

Proteins perform critical functions in the cell, serving as structural units, enzymes, and transcription factors, among other roles. Protein activity can be static, as for some structural proteins, or dynamic, as in the case of transcription factor binding to gene promoters. In many cases, once transcription begins, transcription factor binding is no longer needed and in fact needs to be terminated so that other regulatory factors can act at that site. How this occurs, however, is not well understood. Zelin *et al.* now provide one such example. They show that the molecular chaperone p23 functions to disassemble protein-DNA complexes that include heat shock factor 1 or the DNA replication factor CDC6. Subsequently, covalent modification via acetylation of lysine residues by GCN1 can extend this dissociated state. Such dynamic interplay among a multitude of factors provides insight into how complex DNA regulation is mediated. — BAP

Mol. Cell **47**, 10.1016/j.molcel.2012.08.026 (2012).

EDUCATION

How to Train a Leader

If we are to increase the number of women in science, technology, engineering, math, and medicine (STEMM), it is imperative to increase the number of women in STEMM leadership roles. Isacc *et al.* describe the impact of a 16-week course that focused on increasing women's lead-

ership self-efficacy with the aim of making the students "bias literate." In the course, students discussed how gender stereotypes influence behavior and were presented with evidence-based strategies designed to counteract their impact. Pre- and post-course surveys were evaluated from the first three cohorts along with follow-up queries of the first two cohorts, with quantitative analyses of differences between scores for all measures being significant. Increases in scores for leadership self-efficacy and personal mastery, coupled with a decrease in perceived constraints, suggested that the course prepared participants to engage in leadership. Analysis of journal entries showed that participants recognized their own implicit gender bias while citing research discussed in class. Also prevalent in journal entries were narratives indicating a new view on leadership—specifically, the realization that the participants themselves were capable of being successful leaders. — MM

CBE Life Sci. Educ. **11**, 307 (2012).



GEOPHYSICS

Hitching a Ride into the Mantle

The movement of Earth's crust relies on the underlying mantle to behave viscously and flow as a response to convective forces. As a consequence, the upper mantle just below the oceanic crust may get pulled along with the crust as it is driven to depth at subduction zones. Alternatively, the mantle may decouple from the subducting crust as a result of mantle flow in another direction. One way to track the flow of the mantle is through monitoring how seismic waves respond to the orientation of certain mineral grains, which preferentially align according to flow directions and induce anisotropic splitting of seismic waves. Song and Kawakatsu examined this seismic anisotropy below the global oceanic asthenosphere—the viscous and ductile upper layer of the mantle—below subduction zones as a function of subducting slab dip and incident angles. They found that the times and direction of seismic shear waves split into fast and slow components in a way that is consistent with about 100 km of the asthenosphere flowing as though it is coupled to the subducting slab even with buoyancy forces resisting its downward motion. Appreciable subduction of oceanic asthenosphere over long time scales would require the revision of mantle mixing models. — NW

Geophys. Res. Lett. **39**, L17301 (2012).

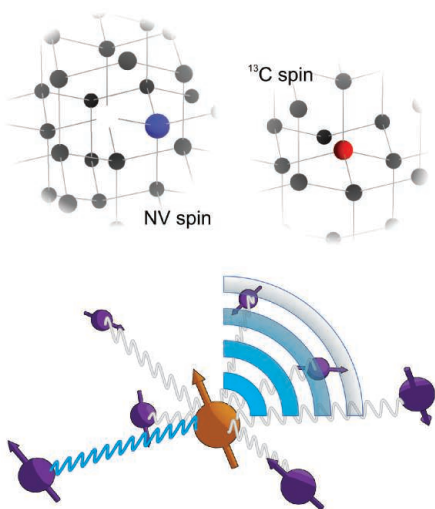
CREDITS (TOP TO BOTTOM): BRIAN GRATWICK; RICH LEGG/ISTOCKPHOTO

Downloaded from www.sciencemag.org on October 12, 2012

PHYSICS

Exercising Spin Control

Electron spin resonance is a powerful tool that can provide detailed information on the chemical and electronic makeup of a material. Compared to the typical measurements of bulk samples that are ensemble averages of many electron spins, the nitrogen vacancy defect, or NV center, in diamond presents the spin of a single electron. Such pinpoint spin centers can be used as a local probe of the tiny magnetic fields produced by nearby nuclear spins of the diamond lattice surrounding it and are also



being explored for applications in quantum optics and quantum information science. Because the local environment of each nuclear spin is slightly different, each has its own electronic signature. Kolkowitz *et al.* and Taminiou *et al.* exploit that to demonstrate that they can address and coherently control each of the surrounding nuclear spins through their specific coupling with the NV center. The ability to sense and control the electronic properties of these NV centers and surrounding nuclear spins will have wide application, from ultrasensitive magnetometers to quantum information processing in which information can be encoded in the spin of the surrounding nuclear spins. — ISO

Phys. Rev. Lett. **109**, 137601; 137602 (2012).

MICROBIOLOGY

Hit 'Em Quick, Hit 'Em Strong

Clinicians are very aware of the increasing failure rate of currently available antibiotics to treat persistent infections. In fact, we know little about how populations of bacteria respond to antibiotics, but we do know that the efficacy of

antibiotics in several classes depends on the initial density of the bacteria at infected sites, regardless of whether resistant mutants arise or whether protective mechanisms are triggered in the pathogens. It makes sense that the presence of a greater number of bacteria capable of breaking down a fixed dose of antibiotic will allow a greater proportion to escape the effects of the drug. But what happens if the bacteria can't disable the antibiotic? Tan *et al.* took kanamycin, an antibiotic that targets the bacterial ribosome, and discovered that this drug indirectly induces a heat shock response to the mistranslated proteins, which degrades the ribosome. The denser the bacterial population, the more the antibiotic is titrated and the greater the chances that more bacteria will escape after a period of recovery, or lag, to regrow. It's not so simple though, because clinicians often administer pulses of antibiotic to avoid toxicity effects on patients and the emergence of resistance. But it is also important that they get the dose and treatment times optimized around the lag times, otherwise bacteria may escape again. — CA

Mol. Syst. Biol. **8**, 10.1038/msb.2012.49 (2012).

ECONOMICS

Hard Data Help, a Little Bit

Performance appraisals are generally not high on anyone's list of likes and are often points of friction between employers and employees. One educational program in the United States, Race to the Top, has encouraged the use of student outcomes—in the form of scores on standardized tests—in the evaluations of teachers. Rockoff *et al.* have analyzed the results of a randomized trial carried out in the New York City public schools, where the difference between treatment and control groups of school principals was the provision of value-added measures of individual teacher performance to the former. They found that the hard data did correlate with the principals' prior subjective evaluations of their teachers; moreover, the agreement was greater when the hard data were more precise or when the principals had been observing the teachers for more years—as one would hope and expect. Also, the principals weighted the hard data more strongly in cases where their subjective evaluations were less reliable, and teachers who received lower-value-added reports were more likely to be let go. On the critical issue of student performance, however, the outcomes were modest: Math achievement went up a little bit, and English achievement stayed the same. — GJC

Am. Econ. Rev., in press (2012);
www.nber.org/papers/w16240.