PALEONTOLOGY

Tracks in the Sand

Animals evolved the ability to breathe air and then colonized the land in the Silurian period about 430 million years ago; however, curious tracks preserved by Cambrian microbial mats sitting atop mudflats and dunes seem to imply that arthropods or other animals ventured ashore before then. Hagadorn and Seilacher provide considered thoughts about who made these tracks and how. The tracks show a distinctive tail trace and other marks suggesting that the animals scurried along via the synchronous action of pairs of legs. The tracks, and in particular the tail trace, imply that the animal carried only a small shell, in contrast to, for example, the capacious shell used by a modern-day hermit crab. The authors suggest that an early chelicerate—possibly a eurypterid (sea scorpion)—used a mollusk shell to protect its gills and to keep them hydrated; a larger shell would not have been necessary as there were no other land predators yet. — BH

Geology **37**, 295 (2009).

CELL BIOLOGY

One for You, Two for Me

Asymmetric cell division, wherein the daughter cell receives an unequal set of contents from the dividing mother cell, drives the formation of the many and diverse cell lineages that populate multicellular organisms. The single-celled yeast *Saccharomyces cerevisiae* also undergoes asymmetric cell divisions to produce so-called mother and daughter cells, but as this occurs at every cell division, there are no obviously distinct cell lineages formed, as is true for many unicellular organisms. However, a closer look at the way yeast proteins are segregated during meiosis reveals a rather different outcome.

Thorpe *et al.* have fluorescently tagged a number of proteins from the kinetochore (the molecular machine that links the chromosomes to the spindle in dividing cells and thus ensures their proper segregation) and find that they segregate asymmetrically at the first meiotic division, forming the haploid spore, and also in subsequent divisions, so that they are preferentially retained in the mother cell lineage derived from the spore. These same proteins are symmetrically distributed between other dividing "cell types," and other proteins that are not part of the kinetochore do not show a similar asymmetry. The unequal segregation of the kinetochores may allow for the non-random segregation of sister chromatids, which would thereby maintain an "immortal" DNA strand, or of the centromeric DNA to which the kinetochores bind, which could drive the evolution of the centromeres. — GR

Proc. Natl. Acad. Sci. U.S.A. **106**, 10.1073/pnas.0811248106 (2009).

PHYSICS

Colliding Light Beams

Under normal conditions, photons don't interact with each other very much. For instance, the light beams from two laser pointers pass through each other without trouble. Ramping up the power of the beams, however, changes that somewhat standoffish behavior. High-powered-laser beams can form self-focusing filaments in air that propagate without dispersion. These light bullets or light sabers are finding use in a diverse range of applications from triggering lightning to remote spectroscopic sampling. Finding ways of controlling propagation on the wing rather than tinkering with the laser on the ground would offer much more flexibility.

Bernstein *et al.* take two high-powered laser beams and collide them. Rather than passing through each other unscathed, the beams couple and exchange energy, up to 7%, with one beam amplifying the other at its own expense. Being able to tune the output of the collision in terms of the energy and frequency distribution of the modified light pulses should provide a powerful and flexible method for remote sensing applications. — ISO

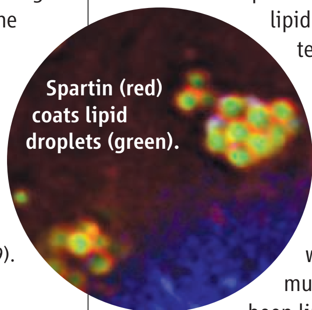
Phys. Rev. Lett. **102**, 123902 (2009).

CELL BIOLOGY

A Store Manager

Cells stockpile nutrients and metabolites in storage compartments that can be raided when environmental conditions change. Lipid droplets are dynamic cellular caches of neutral lipids, such as triacylglycerol, which can be used as high-energy reserves, signaling molecules, and membrane building blocks. On the other hand, lipid droplets have been implicated in devastating metabolic diseases, such as diabetes and atherosclerosis, and are found in almost all cells from yeast to mammals. Nevertheless, relatively little is known about how they are formed.

Eastman *et al.* have established that the protein SPG20 (also known as spartin) regulates lipid droplet formation. Using cultured human cells, they found that SPG20 localized to lipid droplets and interacted with the lipid droplet–associated protein TIP47. SPG20 localization was regulated by WWP1, a member of the HECT-ubiquitin ligase family that modulates diverse cellular functions by tagging proteins with ubiquitin. Further, mutations in SPG20 have been linked to the rare neurological disease Troyer syndrome, which is characterized by muscle spasticity and limb paralysis; a disease-associated SPG20 mutant did not localize to lipid droplets. — HP*



Spartin (red) coats lipid droplets (green).

J. Cell Biol. **184**, 881 (2009).

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Colliding Light Beams

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