MATERIALS SCIENCE

## Surfactants on Double Duty

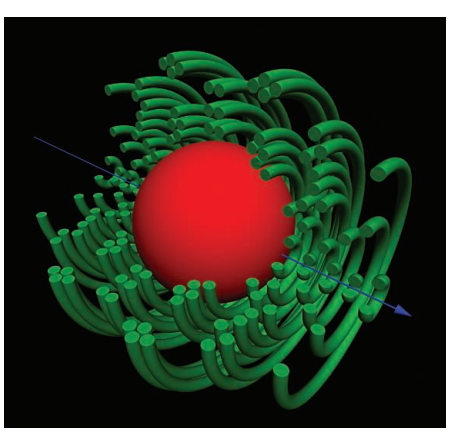
In an emulsion, droplets of one liquid are kept stable within an immiscible second liquid through the use of surfactants; oil-and-water–based salad dressings are a well-known example. Multiple emulsions, comprising multiple shells of the two liquids, are of increasing interest for applications to drug delivery as well as food and cosmetics. However, these emulsions typically need both hydrophobic and hydrophilic surfactants to stabilize the two interfaces. Besnard *et al*. show that a single polymer can be used to modify the curvature of the oil/water interface and thereby promote the phase inversion required to create a multiple emulsion. The material is a diblock copolymer with blocks of polystyrene and a random polymer of styrene and 2-(dimethylamino)ethylmethacrylate monomers (DMAEMA). A change in temperature alters the hydrogen bonds between DMAEMA and water, and thus the hydrophobicity of the polymer. A second phase inversion can also be induced by varying the acidity of the solution within a narrow pH window. Several mixing methods and polymers with different chain lengths were used to generate the emulsions, and in all cases the emulsions showed stability for at least several months. — MSL

*Adv. Mater.* **25**, 10.1002/adma.201204496 (2013).

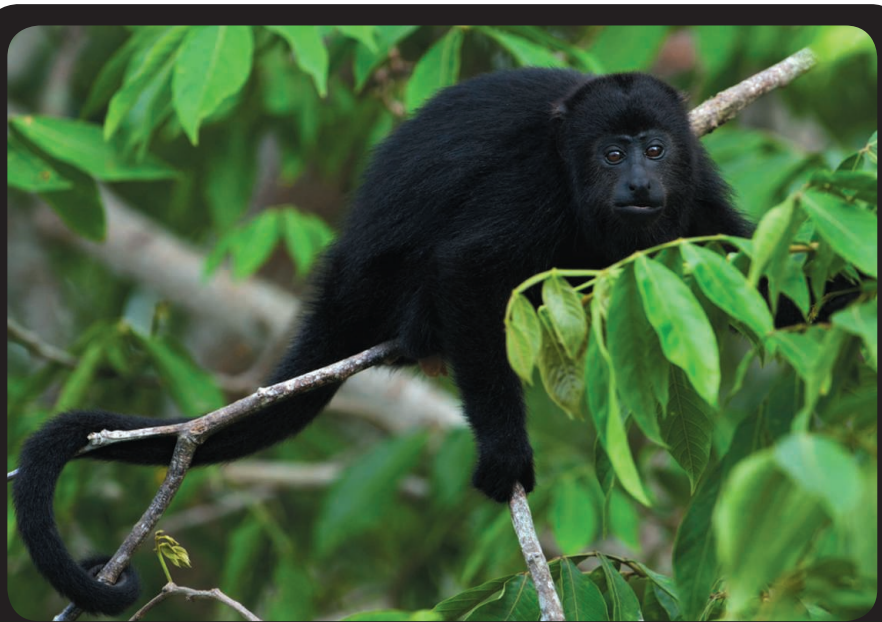
PHYSICS

## Cloaked in Silence

The daily commute can be a trudge. On top of that, you often have to share, involuntarily, in the irritating noise coming out of the headphones of someone intent on going deaf prematurely. Of course, there are also the more serious safety aspects of protection from sudden and loud noise, as well as the peace and quiet provided by good sound insulation. The ideas developed over the past decade in cloaking an object from view using metamaterials and transformational optics can also be carried to other waveforms, including acoustics. Using such ideas, Sanchis *et al*. have designed and fabricated a three-dimensional (3D) acoustic cloak for airborne sound. Their cloak consists of a series of concentric tori that surround a sphere about 8 cm in diameter. Designed by an optimization algorithm and using a 3D printing method to fabricate the directional cloak, initial characterization shows that they can reduce the scattering cross section of the sphere for sound of 8.55 kHz by some 90%. A design modification should be possible to make the cloak omnidirectional. Perhaps it won't be too long before such a cloak can be incorporated into headphone design to stop sound leaking out. — ISO



*Phys. Rev. Lett.* **110**, 124301 (2013).



MICROBIOLOGY

## Not Just a Human Zoo

Human beings are stewpots of microorganisms influenced by a variety of environmental perturbations to the detriment or enhancement of our health. Humans have penetrated and disturbed nearly all habitats on the planet and in their turn influence the symbioses and pathogens in the wild animals they encounter. For example, Amato *et al*. have discovered that the diversity, richness, and composition of the microbiota of Mexican black howler monkeys correlate with the quality of the habitat they inhabit (and eat). Monkeys living in habitats degraded by human activity have simplified microbiomes displaying fewer genes for butyrate production, implying an impact on the monkeys' overall health. In an another example of an anthropogenic perturbation, the health of zoo elephants has been compromised by an emerging, fatal, haemorrhagic herpesvirus disease, which Zachariah *et al*. report also affects working elephants in southern India. It seems that in this case the virus is endemic to Asia and has spread from this focus as humans have spread elephants around the world's zoos. — CA

*ISME J.* **7**, 10.1038/ismej.2013.16 (2013); *J. Wildl. Dis.* **49**, 10.7589/2012-07-193 (2013).

GENETICS

## Relying on Our Ancestors

Human populations exhibit differences in linkage disequilibrium, the loss of association between alleles that are located close together on the same chromosome. These differences result in genome-wide association tests—which look for genetic markers associated with a phenotypic trait—finding few significant variants and requiring very large sample sizes. Diversity among linked alleles, such as in people of African descent who on average exhibit more genetic diversity than other populations, helps pinpoint genetic variants associated with traits. Wu *et al*. investigated the genetic architecture of loci as-

*Continued on page 123*

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sociated with lipids in people of African, Asian, and European descent to elucidate functional variants in lipids among and between populations. Sequential conditional analyses identified complex patterns of variation in previously identified loci within and among populations, as well as novel genotypes associated with lipid levels. Thus, utilizing population structure helps identify the genetic underpinnings of human phenotypic variation. — LMZ

*PLoS Genet.* **9**, e1003379 (2013).

CLIMATE SCIENCE

## Where's Warming?

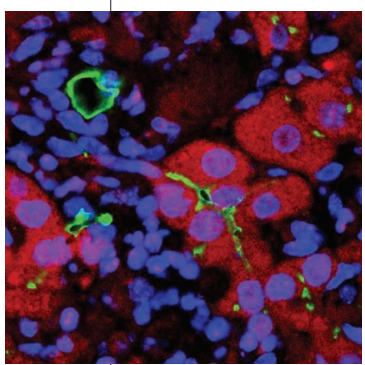
The addition of greenhouse gases to the atmosphere caused by fossil fuel burning and other anthropogenic activity has caused temperatures at the surface of Earth to increase significantly over the past century and a half, and rapidly during the interval from around 1975 until the early years of the 21st century. However, sea surface and surface-air temperatures have not risen over most of the past decade, encouraging some to question the continued reality of global warming, despite the fact that similar variability also can be seen in the instrumental records of the past century. The real question, then, is not whether climate warming has stopped, but where in the earth system the heat resides that would have caused the expected warming? Naturally, the first place to look is in the ocean, because that is where most of the heat taken up due to global warming is stored. Accordingly, Balmaseda *et al*. conducted a reanalysis of changes in the global ocean heat content from 1958 through 2009 and found that much of the warming has occurred below depths of 700 m, rather than in the surface ocean, and that much of that redistribution is due to changes in surface winds over that period. This helps to explain why air temperatures have not reflected this heating and shows that global warming is continuing, but out of our daily reach. — HJS

*Geophys. Res. Lett.* 10.1002/grl.50382 (2013).

DEVELOPMENT

## Following a New Program

As illustrated in Greek mythology, in which an eagle feeds on Prometheus' liver each day, the amazing regenerative properties of the liver have long been known. An intriguing feature of liver regeneration is that it is context-specific: Excising part of the liver results in the growth or proliferation of existing cells, whereas exposure to toxic agents drives the accumulation of cells that have a biliary phenotype. Yanger *et al*. sought to determine whether cellular plasticity plays a role during liver response to injury and found that indeed it does. Toxin-induced injury of mouse hepatocytes generated cells that had the morphological, structural, and molecular features of normal biliary epithelial cells (BECs). Similar to BEC development, Notch signaling was required. Normal hepatocytes are binucleated; likewise, so were the BEC-like cells that were generated in response to injury, which suggests a hepatocyte origin. As cells went through the hepatocyte–to–BEC-like cell transition, they displayed an intermediate state where they co-expressed transcription factors of both cell types. The conversion of adult hepatocytes to BECs may find applicability in treatment of conditions with loss of these cells in humans. — BAP



CREDIT: K. YANGER *ET AL., GENES & DEVELOPMENT* **27** (21 MARCH 2013) © 2013 COLD SPRING HARBOR LABORATORY PRESS

*Genes Dev.* **27**, 10.1101/gad.207803.112 (2013).

IMMUNOLOGY

## Type 2 for Tissue Regeneration

Although we classically think of the immune system as important for warding off foreign invaders, once the invaders are squashed, it sticks around to help pick up the pieces. The specific mechanisms by which the immune system supports tissue repair can differ from tissue to tissue and overall are not very well understood. Heredia *et al*. investigate this in the context of skeletal muscle injury and specifically look at the role of type 2 immunity, which has previously been implicated in tissue repair. The signature type 2 cytokines interleukin (IL)–4 and –13 were up-regulated in response to skeletal muscle injury in mice, and the use of genetically modified mice demonstrated that signaling through the IL-4 receptor was required for muscle repair. Surprisingly, the primary source of IL-4 was eosinophils, not macrophages, which had been shown previously to infiltrate damaged tissue and make IL-4. Within damaged tissues, fibro/adipogenic progenitor cells, which have the potential to give rise to either fibroblasts or adipocytes, responded to IL-4 and were induced to support myogenesis rather than differentiating into adipocytes. Moreover, they were necessary for the clearance of necrotic debris. — KLM

*Cell* 10.1016/j.cell.2013.02.053 (2013).



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