**Behavior**

**Prosocial Ants**

The threat from infectious diseases is a major concern not only for humans but also for other highly social animals. Organisms that live in close quarters are particularly susceptible to infection because of the intrinsically favorable disease transmission dynamics; hence, systems that prevent or ameliorate the spread of disease are likely to be beneficial. Indeed, social insects have evolved a number of behaviors—for example, nursing sick individuals or excluding them from the nest—that help to limit the spread of infection. Uglevig and Cremer demonstrate that in small colonies of the garden ant *Lasius neglectus*, introducing workers infected with living fungal spores (but not dead spores) promptly produced two changes in behavior. First, the infected ants almost immediately reduced their interaction with ant larvae in the brood chamber, apparently helping to protect the most valuable or susceptible individuals in a colony. The absence of aggression by uninfected worker ants toward afflicted individuals suggests that such standoffishness may be due to self-restraint. Second, the uninfected workers increased their brood-care activities, primarily via grooming to remove spores from the infected individuals. Rather than increasing their own incidence of infection, the naïve ants acquired a higher level of resistance to the fungus—providing a form of “social prophylaxis.” — GR


**Materials Science**

**Extra-Strong Sleeves**

The sponge-like structure of metallic foams (up to 80% void fraction) has fostered applications in impact-absorbing materials, acoustic insulation, and lightweight structural materials. More recent attention has focused on periodic cellular materials (PCMs), wherein the remaining mass exclusively forms load-bearing trusses that are loaded in tension or compression rather than bending. A second design strategy for strengthening metals is to reduce grain size to the nanometer scale and thereby localize a larger number of atoms at grain boundaries, reducing their mobility. Suralvo et al. created a PCM by stretching a square punched aluminum sheet to displace half the nodes above and the other half below the initial starting plane. They then electroplated a nanocrystalline alloy of nickel and iron to form a sleeve around the struts and nodes of the trusses, with the thickness controlled over a 75- to 400-μm range by the deposition time. The loading stiffness more than doubled and the peak strength increased 10-fold. The specific strength, which accounts for changes in density, also increased almost threefold. — MSL


**Cell Biology**

**Live Long and Prosper**

Autophagy, the degradation of intracellular components that occurs in response to starvation, is also important in the response to stress and in development and disease—both as a defense mechanism and as a pathological consequence. Simonsen et al. found that *Drosophila* lacking key autophagy-related genes had a reduced life span, and then went on to examine to what extent the promotion of autophagy in the nervous system could affect aging. During aging in the normal fly, the levels of autophagy within neurons fall, leading to the accumulation of ubiquitinated protein aggregates. By increasing the levels of expression of an autophagy-related gene, Atg8a, in aging neurons, the authors were able to increase adult life span by more than 50% and saw a concomitant reduction in the levels of ubiquitinated aggregates in the aging brains. Further, these engineered flies were also more resistant to oxidative stress. — SMH

*Autophagy*, in press: www.landesbioscience.com/journals/autophagy/article/5269

**Ecology/Evolution**

**Disturbing Patterns**

Forest habitats around the world vary widely in the nature of the influence that humans have had on them. Some forests are primary (more or less undisturbed), others are secondary (regrown after human disturbance), and some are entirely artificial (plantations). In our era, the balance of forested area tilts ever more to the secondary and managed end of the spectrum. In this context, Barlow et al. assessed the conservation value of primary, secondary, and plantation forests in the tropics by comparing the species richness of major invertebrate, vertebrate, and plant taxa across replicated sites in Amazonia. A range of patterns was observed. A few taxa (scavenger flies, moths, and grasshoppers) appeared to be more species-rich in the secondary and plantation forests; unsurprisingly, at the other extreme, amphibians, birds, and woody plants were far better represented in the undisturbed forest; small mammals, orchid bees, and fruit flies appeared to be relatively unaffected by habitat type. These data help to

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build a picture of the consequences of land-use change for biodiversity in the tropics and elsewhere, and to suggest ways of ameliorating its effects. — AMS


**BIOPHYSICS**

**Congested Corpuscles**

Sickle cell disease results from a mutation in the gene encoding the β chain of hemoglobin; the mutant protein tends to polymerize, especially so in its deoxygenated form. The extended polymers (HbS) forcibly alter the elasticity of the red blood cell, changing it from a biconcave disc into the sickle shape that gives the condition its name. One outcome is a logjam of corpuscles (known as a vascular occlusion) in small blood vessels. Although there is a clear link between occlusion and the irregular shape of the sickle red blood cell, other factors are likely to influence the process as well. To test for the minimal requirements for occlusion events in the absence of inflammation or coagulation, Higgin's et al. have developed a microfluidic device that allows independent control of geometry (channel size), physics (applied hydrostatic pressure), and chemistry (oxygen tension) under conditions of steady flow. The times to occlusion and resolution (de-occlusion) were measured and used to generate a phase-space representation, revealing that the capacity of blood cells to flow through capillaries was determined by the mechanical properties of the cell and by geometric and hydrodynamic factors. The device was also used to quantitate the improvement in blood flow in samples taken from a patient before and after infusion of (normal) HbA-containing erythrocytes. — SJ


**APPLIED PHYSICS**

**Tinker-Free Interferometry**

The interference of waves, be they photons, atoms, or electrons, and the measured phase shift induced as the waves take a different route around the arms of an interferometer are widely used in applications ranging from global positioning systems and gravity wave detectors down to the more mundane characterization of optical materials. The sensitivity of the interferometer in measuring the phase shift is affected by noise contributions to the signal. To combat this noise, piezoelectric actuators are typically used to adjust the system to an optimum measuring point for maximum sensitivity. This approach has drawbacks, however, for certain applications where the determination of arbitrary phase shifts is important. Pezzé et al. introduce a method and protocol of photon counting at the output paths to determine the phase. They show that the classical, or thermal, noise can be eliminated without bias (i.e., no tinkering with the phase shift is necessary). At this quantum limit, only quantum uncertainty affects the precision of the phase measurement. — ISO

Tinker-Free Interferometry
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