



<< Mini Mighty Muscle

Actuators—or artificial muscles—take electrical or chemical energy and convert it into mechanical force. Typically, actuators made from polymers can show large deformations, but cannot generate a lot of force. **Ma *et al.*** (p. 186; see the Perspective by **Kim and Kwon**) describe a polymer composite based on a modified polypyrrole that expands in response to water absorption. The composite was able to generate large stresses and forces, and offered a high work density approaching those of the best conducting polymer electrochemical actuators. Magnetic nanoparticles incorporated into polymer films were used to control the locomotion of the actuator.

Macrophage JNK in Metabolic Disease

Inflammation is thought to be an important driver of diet-induced obesity and insulin resistance. Proinflammatory, M1 phenotype macrophages and the c-jun NH₂ terminal kinases (JNK) are central players in this process. But whether JNK expression is specifically required inside macrophages is unclear. In mice containing a macrophage-specific deletion in both *Jnk1* and *Jnk2*, **Han *et al.*** (p. 218, published online 6 December; see the Perspective by **Ferrante Jr.**) found that the mice were protected against many of the diet-induced metabolic changes, including insulin resistance, despite similar weight gain as control mice on a high-fat diet. This protection was associated with a decrease in the presence of M1 macrophages in adipose tissue.

Tracking Quantum Evolution

The actual process of measuring a quantum system has an effect on the result making the outcome unpredictable. Using a superconducting qubit placed in a microwave cavity, **Hatridge *et al.*** (p. 178) found that a series of partial measurements on a quantum system left the system in a pure state. Looking at the record of the actual measurements allowed the final state of a superconducting-based quantum system to be determined accurately. Such control is crucial for achieving full feedback control of a general quantum system.

Ribosomal Rotaxane?

The ribosome is an extraordinarily sophisticated molecular machine, assembling amino acids into proteins based on the precise sequence dictated by messenger RNA. **Lewandowski *et al.*** (p. 189) have now taken a step toward the preparation of a stripped-down synthetic ribosome analog. Their machine comprises a rotaxane—a ring threaded

on a rod—in which the ring bears a pendant thiol that can pluck amino acids off the rod; the terminal nitrogen then wraps around to form a peptide bond and liberate the thiol for further reaction. The system was able to link three amino acids in order from the preassembled rod.

Pupfish Speciation

Evolution moves along phenotypic trajectories that can be visualized as a topographic landscape of multiple peaks of relatively high-fitness and low-fitness valleys. **Martin and Wainwright** (p. 208) examined the adaptive landscape of three species of *Cyprinodon* pupfishes. These species represent a recent adaptive radiation, each having moved into a difference niche within their specialized environment. Examining replicate hybrid transplants relative to parental types in high- and low-density enclosures, the authors recovered the specialist parental phenotypes and observed higher survival and growth. Thus, high density can drive multiple fitness peaks during the early stages of adaptive radiation.

A Varied Bouquet

Pollinators display innate attractions to odor, but can also learn to associate odor with a nectar reward. **Riffell *et al.*** (p. 200, published online



6 December; see the Perspective by **Knaden and Hansson**) characterized the odor profile for flowers to which hawkmoths are innately attracted and found that the majority contain a distinct chemical profile, which is uniquely represented on their olfactory lobe. The moths could also be trained to associate nonattractive odors with a reward and thus learn novel odor attractions. Though learning altered neurons within the antennal lobe, the innate preferences were not changed.

Optimizing Carbon Nanotubes

Shorter carbon nanotubes are easier to make, but, when assembled into fibers, the resulting fiber properties are much poorer than might be predicted by theory. Conversely, longer carbon nanotubes have much better properties but are harder to process. **Behabtu *et al.*** (p. 182) combined the best of both worlds through scalable wet spinning method, in which they dissolved longer carbon nanotubes and then spun them into fibers that showed excellent strength, stiffness, and thermal conductivity.

Stress Protector

During prolonged fasting, the oxidation of fatty acids leads to increased accumulation of D-β-hydroxybutyrate (βOHB) in the bloodstream. Such increased concentrations of βOHB inhibit class I histone deacetylases. Histone acetylation in turn influences transcriptional activity at various genes. **Shimazu *et al.*** (p. 211, published online 6 December; see the Perspective by **Sassone-Corsi**) found that among the genes showing increased transcription in animals treated with high concentrations of βOHB were two genes implicated in cellular responses to oxidative stress. When treated ahead of time with βOHB, mice were protected from the toxic effects of the oxidative stress causing poison paraquat.