ECOLOGY

Habitat Histories

The spread of humans around the globe has resulted in the continuing fragmentation of natural habitats. Hence, the science of biodiversity and its conservation increasingly requires an understanding of the dynamics of species persistence in mosaic habitats of varying patch size and history. In an effort to improve predictions of how biodiversity patterns change as humans modify the landscape, Hanski *et al.* have extended the traditional species/area relationship to include a term in the model to account for fragmentation, showing that the traditional model underestimates extinction rates in fragmented habitat. Applied to data for bird populations in the heavily fragmented Brazilian Atlantic forest, the extended model gives improved predictions of local extinctions, especially for species that are better adapted to continuous habitats. In a separate development, Ewers *et al.* have developed an approach that represents the shared history across habitat patches in a similar manner to the way in which phylogenetics represents species relationships. They applied this approach to the biodiversity of forest patches in Brazilian Amazonia and developed a model that uses the history of the formerly connected landscape to predict biodiversity patterns and extinctions in the contemporary fragmented landscape. Their approach provides a mathematical measure of habitat history and facilitates the prediction of the spatial pattern of species that are shared among patches. — AMS

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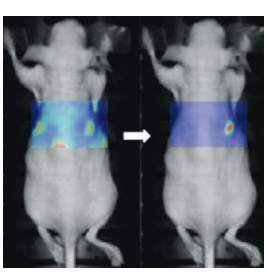
MATERIALS SCIENCE

Beating Fluorescent Background

A challenge for fluorescent imaging of biological samples is that compounds in cells and tissues, such as flavins, autofluoresce. One way to overcome this autofluorescent background is to work in the near-infrared spectral region (wavelengths of 650 to 900 nm). However, even in this region, some background signal is present, so it is desirable to use markers that have longer lifetimes than those of the naturally present molecules (typically tens of nanoseconds). Gu *et al.* describe the use of photoluminescent porous silicon nanoparticles for imaging. The nanoparticles were synthesized by electrochemical etching of the surface of a single-crystal silicon in hydrofluoric acid. This layer was then removed and fractured with ultrasound, and the size-filtered nanoparticles were coated with polyethylene glycol. The luminescent lifetime of the nanoparticles (5 to 13 μs) allowed for time-gated imaging of samples. This approach achieved a greater than 50-fold reduction in background signal in vitro and greater than 20-fold in vivo. The authors used this method to image human ovarian cancer xenografts in a mouse model. — PDS



Nat. Comm. **4**, 2326 (2013).

CHEMISTRY

NO Switching Sides on Copper

For eons, microbes have been shuttling electrons back and forth through nitrogen compounds; some break up N_2 using nitrogenase enzymes, whereas others put it back together via nitrite reductases. In the past century or so, humans have gotten in on the act as well: The Haber process takes N_2 to ammonia (NH_3), whereas at the other end of the cycle, copper catalysts keep noxious nitric oxide (NO) out of exhaust streams by turning it back into N_2. Kwak *et al.* have now uncovered a somewhat unanticipated symmetry between the biochemical and synthetic processes. By using ^{15}N nuclear magnetic resonance and infrared absorption spectroscopy, they gathered compelling evidence for a side-on bonding motif between NO^+ and Cu(I) centers in zeolite catalysts for selective NO reduction. This intermediate resembles the similarly side-bound copper nitrosyl previously observed in a nitrite reductase active site. The authors go on to propose a detailed mechanism for the zeolite reaction by merging their spectroscopic characterization with published kinetic data. — JSY

Angew. Chem. Int. Ed. **52**, 10.1002/anie.201303498 (2013).

NEUROSCIENCE

Axon Bound

Developing mammalian neurons extend multiple neurites, one of which goes on to form the mature axon. Parker *et al.* have identified distinct and opposite roles for two isoforms of atypical protein kinase C (aPKC). In mammals, the gene *Prkcl* encodes aPKC-λ whereas the gene *Prkcz* encodes aPKC-ζ along with a truncated enzyme PKM-ζ, which lacks the N terminus of aPKC-ζ. In embryonic rat hippocampal neurons, aPKC-ζ was present at the tip of the neurite destined to become the axon, where it associated with polarity complex proteins Par3 and Par6. At the other neurites, Par3 was bound to PKM-ζ, which competed with aPKC-λ for binding to Par3 and inhibited, rather than promoted, axon formation. Thus, competition for binding of the two isoforms, which is then stabilized by feedback, may underlie the symmetry-breaking process that yields the typical neuronal morphology of a long axon and multiple dendrites. — LBR

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