EDITED BY KRISTEN MUELLER AND JAKE YESTON

ECOLOGY

## Not Extinct After All?

Extinction is forever, but determining when a species has truly become extinct is tricky, particularly for species that live in remote regions. In such regions, species are often categorized as extinct when no individuals have been seen for decades. This "absence of evidence" is imperfect, however, and occasionally individuals resurface. Up until now, such rediscoveries have been serendipitous and rare, but Garrick *et al.* now show that modern genetics has the potential to help facilitate such rediscoveries. Sampling of 20% of the giant tortoise population on Isabela Island in the Galápagos revealed a clear genetic signature of recent hybridization between the native species and pure members of a species from Floreana Island, thought to be extinct since the mid-1800s. Using rapidly evolving nuclear and mitochondrial markers, in conjunction with population simulations, they determined that 0.5% of the sampled individuals on Isabela had a 99% chance of having a pure Floreana parent. Furthermore, nearly a third of the Floreana descendents were less than 15 years old, which suggests that the hybridization events were the result of a healthy, reproductively active population of pure Floreana tortoises on Isabela. — SNV

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MATERIALS SCIENCE

## Carnivorous Cloth

The surface of most objects exposed to the environment eventually becomes colonized by living microrganisms, which may have a variety of, but not necessarily malign, effects. For example, edible molds form coatings on cheese which impart delicious odors and flavors and protect the

interior from invasion by spoilage organisms. Taking inspiration from camembert, Gerber *et al.* have developed a living fabric composed of a base layer of impermeable polymer and a nanoporous surface film sandwiching agar inoculated with the mold *Penicillium roqueforti*. The pore size of the surface film was adjusted to prevent release of mold spores but allow ingress of gases and nutrients. If food (glucose) was "spilt" onto the experimental fabric, the mold grew as it consumed the stain, changing the opacity of the material. The fabric was fairly resistant to being rinsed by ethanol or washed by soap, but desiccation did inhibit growth. The drawback: It took 11 days for the mold to consume the glucose, but perhaps that's okay if you are waiting for your favorite tie to clean itself. More significantly, such fabrics have obvious bioremediation or biomedical applications, especially if, for instance, antibiotic-producing molds can be incorporated. — CA

*Proc. Natl. Acad. Sci. U.S.A.* **109**, 90 (2012).

CELL BIOLOGY

## Gained in the Translation

Natural selection favors cells or organisms that are able to adapt quickly and effectively to changes in their environment. Baumgartner *et al.* report new insights into such regulation in a relatively simple system in which yeast cells growing in medium containing galactose respond to the presence of glucose by decreasing the half-life of mRNA encoding the GAL1 protein, which functions in conversion of galactose to glucose 6-phosphate. By following responses of individual cells in a microfluidic device that was used to change the medium around the cells, they showed that the decreased abundance of GAL1 mRNA was critical for signaling to cells to increase their growth rate in response to abundant glucose. Total amounts of mRNA in the cell did not change. Instead, GAL1 mRNA and the cyclin CLN3, whose translation promotes cell division, competed for access to a localized pool of ribosomes or other components of the translation machinery. Reciprocally, enhanced translation of CLN3 was detrimental to production of GAL1 when cells were grown in galactose. Thus, removal of excess transcripts is an important component that allows yeast cells to optimize growth rates in a glucose-rich environment. — LBR

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CLIMATE SCIENCE

## How Wet Will It Get?

Theory and models agree that global mean precipitation should increase as global warming continues, but they differ on the extent of that increase, and even different models vary by a factor of 3 in their predictions of how much more rain will fall. Why do models differ so dramatically? Pendergrass and Hartmann examine how black carbon forcing influences the amount of global mean precipitation calculated by models used in the A1b scenario (assuming rapid economic growth and a balance of fossil fuel and non–fossil fuel energy sources) of the IPCC'S AR4, and find that black carbon has a significant effect on clear-sky atmospheric shortwave absorption, which drives precipitation changes, whereas the radiative forcing supplied by $CO_2$ does not substantially affect the model spread. Therefore, they conclude, black carbon forcing differences between models can explain a substantial portion, but not all, of the inter-model spread in global mean precipitation in the A1b scenario of AR4. These results may help reconcile disagreements between models, leaving the differences between models and theory still to be bridged. — HJS

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EDUCATION

## Physical Meets Virtual

Studies designed to evaluate the relative educational merit of two modes of laboratory instruction—physical manipulatives (PMs) consisting of real-world physical apparatus, or virtual manipulatives (VMs) consisting of computer-based simulations—have produced inconsistent results. These studies have examined PM and VM used individually in a sequential order, revealing little insight into whether a blended PM/VM combination would enhance students' learning. Using a laboratory unit on light and color, Olympiou and Zacharia identified the affordances of PM and VM that support students' conceptual understanding and developed a framework that blended them accordingly. To test the framework's effectiveness, the authors randomly assigned freshmen in an introductory physics course to PM, VM, and PM/VM groups sharing the same instructors and laboratory space, and administered conceptual tests before, during, and after the study. Analysis showed no difference in pretest scores, yet revealed that the blended PM/VM framework enhanced students' understanding of light and color concepts more than PM or VM alone. Test scores from the PM and VM groups were similar, implying that for this study, the use of either was equally effective. More research on how to optimize PM and VM blends is needed before generalized conclusions can be reached. — MM

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BIOTECHNOLOGY

## Watching DNA Charge Ahead

A prospective alternative approach to direct DNA sequencing is to monitor changes in ion current as a DNA strand translocates through a nanopore. However, the speed of the translocation process—about 1 base per microsecond—exceeds the response speed of the electronics needed to amplify the small changes in current when measured with microelectrodes in solution. A field-effect transistor (FET) close to the pore should have sufficient speed and sensitivity to resolve these signals, but charge signals might be screened by the high ionic strength of the solvent. Xie *et al*. fabricated a silicon nanowire FET with a very short channel length (200 nm) on a silicon nitride membrane. They then etched a nanopore (7 to 10 nm in diameter) through the membrane and along the edge of the nanowire, and measured ion currents and FET signals for translocation of 2.6-kbp double-stranded DNA in 1 M KCl. The signal from the nanowire FET tracked that of the ion current measurement if a hundredfold dilution (10 mM KCl) was used in the receiving solution. Measurement of base-pair changes for single-stranded DNA will require further improvements in signal-to-noise ratio and spatial resolution. — PDS

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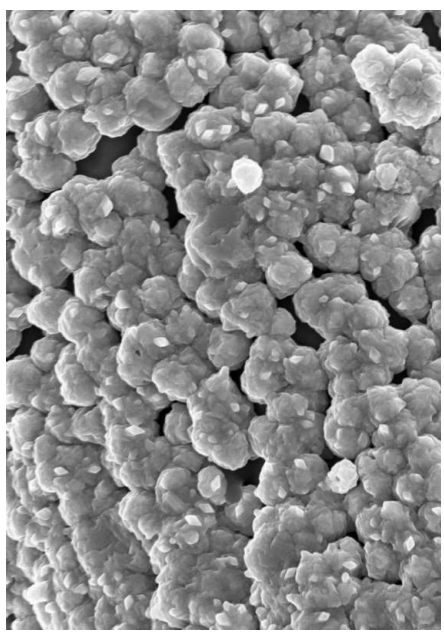
MATERIALS SCIENCE

## A Layer-by-Layer Amplifier

A number of biological specimens, such as butterfly wings or diatom frustules, have been used as templates for making optical, catalytic, or electrical materials. This requires a process that conformally coats the template while retaining its detailed features. Diatom frustules are of particular interest because each species generates a unique shell morphology. Fang *et al.* have developed a wet chemical process to convert the silica shell wall into free-standing copper or nickel structures. The key steps are functionalization of the hydroxyl-bearing surfaces with an aminosilane, followed by layer-by-layer deposition of polyacrylate and polyamine, which amplifies the concentration of surface amines. The structures are then treated with palladium chloride, which acts as a catalyst for the electroless deposition of copper or nickel. The fidelity of the original diatom structures was greatly enhanced through the use of this layer-by-layer amplification technique, with deposition of much finer metal particles and almost no loss of the original template features. The authors were able to extend the process to multilayered copper/gold structures or multicomponent nickel/phosphorus alloys. — MSL



CREDIT: FANG *ET AL., J. MATER. CHEM.* **22**, 1305 (2012)

*J. Mater. Chem.* **22**, 1305 (2012).