



## EVOLUTION

### Unraveling the Origin of Cotton

The origin and evolution of *Gossypium hirsutum*, the most widely planted cotton species, is an unsolved puzzle because of its hybrid origin from Old and New World species. To better understand the evolution of cotton, Palmer *et al.* shotgun sequenced 454 2000-year-old archaeological samples of cotton from Africa and South America. On the basis of their results and comparisons with genetic data from extant species, they assigned the African lineage to the species *G. herbaceum* and the South American lineages to the species *G. barbadense*. From these data, the authors show that *G. barbadense* shows overall genome stability with few changes in the placement and number of transposable elements over the past 2000 years. In contrast, *G. herbaceum* showed significant differences in transposable element composition over time. On the basis of these results, the authors postulate that the ancient *G. herbaceum* lineage is more like the ancestral form of one of the original species parents of *G. hirsutum* than that of the extant lineages. Furthermore, they suggest that cotton genome evolution is characterized by bursts of transposable element activity followed by genome stability. — LMZ

*Mol. Biol. Evol.* 29, 10.1093/molbev/mss070 (2012).

## CLIMATE SCIENCE

### Seasonal Subtleties

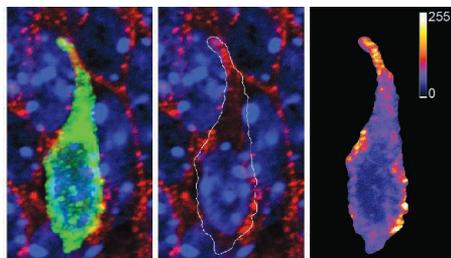
Much has been made of an alleged lack of global climate warming over the past decade, a condition to which climate change deniers repeatedly have referred in their attempts to argue that global temperatures do not support the consensus view that climate warming is continuing as expected. Have we been looking in the right place for evidence that climate still is getting hotter, though? Cohen *et al.* provide evidence that we have not. Using a combination of observational data and climate modeling for the period between 1988 and 2010, they show that warming has continued apace and that the seeming slowdown in the upward march of global annual average temperatures is a reflection of marked seasonal differences: Only in the winter has it not gotten warmer. Therefore, by looking only at yearly averages, some have missed the warming that never has stopped and have been afforded a chance to argue incorrectly that global warming is a fiction, even though both the observational record and climate models clearly show that pauses in the temperature rise lasting decades are both common and expected for a warming climate. — HJS

*Geophys. Res. Lett.* 39, L04705 (2012)

## NEUROSCIENCE

### Setting the Right Course

Neurons are remarkably asymmetric, with a cell body surrounded by dendrites and a single axon. Such asymmetry requires that the orientation of the neuronal growth axis be defined early in the development of the neuron. Gärtner



*et al.* looked at mouse hippocampal embryonic neurons in the first stages of polarization *in vitro* to determine how this process occurs. They found that the first neurite formed even before the orientation of the Golgi and centrosome, previously believed to be the key orchestrators of polarity. Initiation of the first neurite instead involved the polar concentration of the cell adhesion molecule N-cadherin. Added N-cadherin could be used to artificially specify neurite position, which would then signal the rearrangement

of the internal organelles in a cytoskeleton-dependent fashion. Similar early polarization of N-cadherin was observed in embryonic neurons *in situ*. Furthermore, embryos with defective neuronal N-cadherin failed to properly align their neurons and had defects in neuronal migration. Thus, localized N-cadherin signaling appears to provide a cornerstone for very early events in hippocampal neuron polarization and outgrowth. — SMH

*EMBO J.* 10.1038/emboj.2012.41 (2012).

## PSYCHOLOGY

### Collective Power

What percentage of Americans own pets? This question obviously has an answer; just as obviously, any single individual is unlikely to know it or to be able to offer a close estimate. Nevertheless, the average of a number of such guesses may end up quite close indeed. Using questions of this type, covering U.S. commerce, geography, and demography, Minson and Mueller describe a study of how individuals and pairs perform when asked to answer these questions and how ready they are to incorporate input from outsiders. They found that pairs generated estimates that were closer to the true values than individuals working on their own were able

to do. On the other hand, when individuals were given a chance to revise their estimates upon hearing of the judgments of others, they did so to a greater extent than the pairs, so that the original accuracy advantage enjoyed by the pairs disappeared. It appears that the justifiably greater confidence exhibited by the pairs in the first stage may have led them to discount the value of the opinions of others. — GJC

*Psychol. Sci.* **23**, 10.1777/0956797611429132 (2012).

## EVOLUTION

## The Great Gene Giveaway

The vast majority of genes in eukaryotes are inherited vertically; that is, they are transferred through sexual or asexual reproduction from parent(s) to offspring (i.e., from one generation to the next). Prokaryotes are not quite so obliging. Among bacteria and archaea, there is a substantial amount of lateral (or horizontal) gene transfer; that is, genes being exchanged between unrelated organisms independent of reproduction.

Christin *et al.* use comparative studies of DNA sequences (phylogenetics) to provide evidence of repeated lateral gene transfers occurring in plants. Different species of the grass lineage *Alloteropsis* use either the C3 or the more recently evolved C4 photosynthetic pathway to fix carbon from the air. Analysis of two enzymes critical for the C4 pathway reveals that individual C4 *Alloteropsis* species seem to have picked up these nuclear genes from four other genera of grass: *Setaria palmifolia*, found in South Africa; *Themeda quadrivalvis*, in Australia; and a Cenchrinae species; with the first transfer, from Melinidinae, occurring before the species divergence of *Alloteropsis*. Lateral transfer may have occurred because of the close physical proximity of the different plant species, all of which are wind-pollinated, resulting in the transfer of pollen between them. Acquisition of the C4 genes may then have provided a selective advantage, because C4 is more efficient than C3 photosynthesis. — GR

*Curr. Biol.* 10.1016/j.cub.2012.01.054 (2012).

## MATERIALS SCIENCE

## A Gentle View of Organics

The electronic properties of devices based on organic small molecules strongly depend on the architecture and organization of the active molecules, which can change over space and time. Thus, effective analytical probes must operate not only with fine temporal and spatial

resolution but also over large sample sizes, without altering or damaging the specimens. Altoe *et al.* show that scanning transmission electron microscopy can be applied to the study of thin organic films. Damage to the samples is avoided through a low electron dose administered with scanned parallel beams, with the beam diameter determined by the sensitivity of the particular material. The authors mapped the structure of thin films of pentathiophene butyric acid (5TBA) and two of its derivatives. For Langmuir-Blodgett processed films of 5TBA, they observed islands approximately 1  $\mu\text{m}$  in diameter, each comprising one or two crystalline domains with different lattice orientations. The authors also identified regions with lower diffraction intensity, which they associated with a high defect concentration—a factor of critical importance when troubleshooting poor performance in organic electronic devices. — MSL

*Nano Lett.* **12**, 10.1021/nl203776n (2012).

## TOXICOLOGY

## What's Fed to the Fish

Human activities send a dizzying number of organic small molecules into various bodies of water, and the first step in assessing the dangers they may pose is to determine how much of each compound gets sequestered (and possibly transformed) in fish and other aquatic organisms. Direct uptake measurements are time-consuming and challenging, so validated models would be of great use, but thus far studies that compare different models across a broad spectrum of experimental data have been scarce. Stadnicka *et al.* strive to make progress in this vein by measuring correlations of model predictions with literature data on the uptake of 39 organic compounds in two different fish species: rainbow trout and fathead minnow. In particular, they compare the accuracy of one-compartment models treating fish as a single continuous system with that of a physiologically based toxicokinetic model incorporating more fine-grained distinctions between accumulation in fatty tissue and in organs such as liver and kidneys. On the whole, the models fared similarly, matching measured concentrations to within an order of magnitude for 68% of the compounds, though predictions were poor for minnow accumulation of certain polar compounds, such as phenol and its derivatives. — JSY

*Environ. Sci. Technol.* **46**, 10.1021/es2043728 (2012).



# Science

## Seasonal Subtleties

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