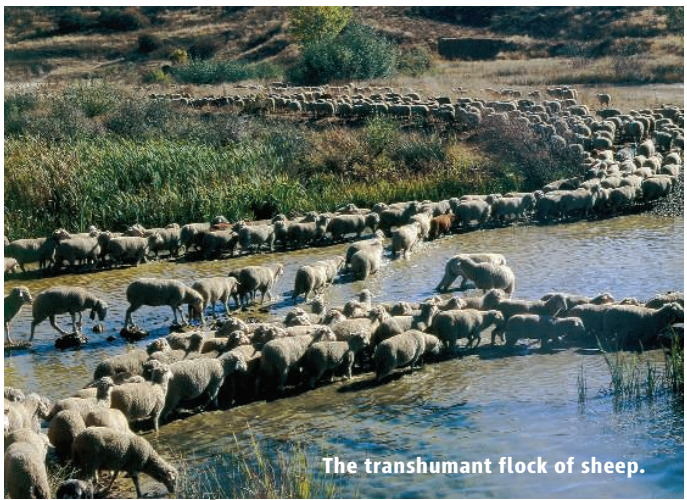
EDITED BY GILBERT CHIN AND JAKE YESTON



The transhumant flock of sheep.

ECOLOGY/EVOLUTION

A Traditional Mode of Travel

It is well known that many plant species have seeds that are capable of dispersing over long distances, borne on the wind or carried in the gut of migrating birds or on the hide of migrating mammals. But ecologists have long been frustrated by the logistical problems of gathering hard data on such dispersal and of performing useful experiments.

Manzano and Malo have taken advantage of a traditional livestock herding practice in Spain, which involves driving merino sheep from the Cantabrian Mountains in northern Spain to Extremadura in the southwest. Marked seeds of several common animal-dispersed herbaceous species were pressed onto the fleece of the sheep as they passed through central Spain, and seeds still adhering to the animals were counted at regular intervals on the journey south. Retention patterns varied for different species: After 28 days and 400 km, 5% of *Plantago lagopus* (plantain) and 47% of *Trifolium angustifolium* (clover) seeds were still attached to sheep. These are the longest dispersal distances recorded for these species, by two orders of magnitude, and confirm the potential for migrating ungulates to facilitate plant dispersal. — AMS

Front. Ecol. Environ. **4**, 244 (2006).

DEVELOPMENT

Moving Toward the Middle

The active expression of genes has been shown to correlate with intranuclear localization, with the periphery believed to represent a site of transcriptional repression. Ragoczy *et al.* sorted murine fetal liver cells into four fractions representing cells in progressive stages of erythroid maturation and monitored the location of the β-*globin* locus. As an erythroid cell matures, the β-*globin* locus moves away from the nuclear periphery and toward the interior. Because globin gene expression begins before nuclear repositioning, transcription appears to be necessary for translocation. The globin locus control region was also required for repositioning closer to the interior of the nucleus, and RNA polymerase II residence coincided with β-*globin* locus relocation during maturation. In analyzing other gene loci and cells, positioning was found to be gene- and cell type–specific. — BAP

Genes Dev. **20**, 1447 (2006).

GEOLOGY

Akilia in the Old Days

Deciphering the early history of Earth's surface and the clues to the evolution of life it provides has been complicated greatly by the fact that few sedimentary rocks older than ~3.5 billion years are exposed. Moreover, these samples have been subjected to cycles of high-temperature metamorphosis and strong deformation, often to the point that simply recognizing the rocks as sediments can be problematic. One of the most discussed sequences, thought to be among the oldest, is exposed in an area of roughly 0.01 km^2 on the island of Akilia, West Greenland. Trace minerals in some of these rocks have been suggested to harbor carbon isotopic evidence of Earth's earliest biosphere.

Ancient rocks of Akilia.

Manning *et al.* have sought to reconstruct the history and assess the origin of these rocks by marshaling detailed mapping studies, dating of complexly zoned zircons in magmas cutting the sequence, and a wide variety of other chemical data. The weight of their analysis argues for an origin through chemical precipitation from a body of water fed by hydrothermal vents, and the oldest zircon dates support an age of more than 3.8 billion years. Thus, these rocks may offer a long-sought glimpse into Earth's early surficial history; stay tuned. — BH

Am. J. Sci. **306**, 303 (2006).

CHEMISTRY

Chiral Inference from Interference

When light impinges on a molecular sample that lacks inversion symmetry, two photons can mix to generate a third photon bearing the sum of their respective frequencies. This sum frequency generation (SFG) process is often used to characterize surfaces spectroscopically, because if the bulk environment below is centrosymmetric, the signal depends exclusively on the surface properties. SFG also arises from the irradiation of bulk chiral liquids and could, in principle, offer greater sensitivity for their characterization than the commonly applied circular dichroism or optical rotatory dispersion techniques. However, because SFG intensity scales quadratically with chiral susceptibility, it fails to reveal absolute stereochemical configurations; one enantiomer gives rise to the same signal as the other.

Ji *et al.* address this limitation by detecting the interference between the SFG response of a chiral liquid and the response of a quartz crystal below it. Samples of (*R*)- and (*S*)-binaphthol could be differentiated clearly from the ultraviolet spectra emergent upon irradiation with overlapped near-infrared and visible laser pulses. Because the response is highly sensitive to the

CREDITS (TOP TO BOTTOM): JESÚS GARZÓN; MANNING *ET AL.*, *AM. J. SCI.* **306**, 303 (2006)

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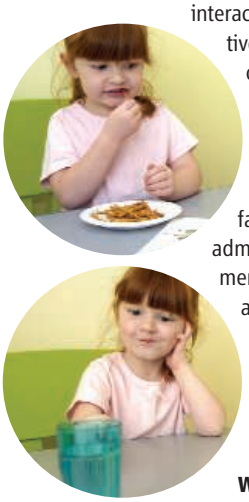
orientation of the quartz crystal, the authors propose using the binaphthol spectrum to calibrate alignments in future experiments. — JSY

J. Am. Chem. Soc. **128**, 10.1021/ja060888c (2006).

PSYCHOLOGY

Tired, Hot, and Thirsty

Recent studies, particularly those using brain imaging, have begun to probe the influence of emotional states, such as the dread that builds up in anticipation of a painful stimulus, on the calculation of preferences, such as choosing between an earlier, severe shock versus a later, milder one. Most of these experimental designs have manipulated high-level feelings (for instance, outrage at an unfair allocation) and concluded that there are interactions between cognitive and emotional processing. Do low-level, visceral drives have a similar impact?



Working up a thirst.

Nordgren *et al.* induced a state of fatigue in students by administering an effortful memory task and then asked them to attribute another student's incomplete test preparation, described in a vignette, to fatigue or to a lack of motivation. They found that fatigued subjects (referred to as being in a "hot" state in comparison to "cold" nontasked controls) were more likely to explain the actor's behavior as caused by fatigue and that this predilection persisted even when subjects were instructed to avoid letting their own tiredness influence their attribution. Atance and Meltzoff show that this inability to look beyond one's current visceral state can be revealed by asking children who have just eaten two dozen pretzel sticks whether they prefer water to more pretzels now (yes, they do) and also what they will want to have tomorrow—water, again, despite the strong preference of unfed subjects to choose pretzels both for today and for tomorrow. — GJC

Psychol Sci. **17**, 635; 583 (2006).

EVOLUTION

Breaking Down the Tree of Life

Double-stranded breaks in DNA are repaired by members of the *recA/RAD51* gene family. The resolution of these breaks through crossover events is also important in creating genetic diversity. Eubacteria have a single *recA* homolog, whereas eukaryotes and archaea have at least two each.

Lin *et al.* have surveyed the evolutionary history of the *recA/RAD51* gene family and traced three major lineages: the *RADα* and *RADβ* subfamilies that are found only in archaea and eukaryotes, and the *recA* subfamily that is found in eubacteria as well as in plants and protists (possibly introduced via horizontal gene transfer from the organelles). This suggests that the original *recA/RAD51* gene existed in the ancestor of all cellular organisms, with a single copy maintained within the eubacteria. In contrast, gene duplications in the common ancestor of eukaryotes and archaea resulted in the *RADα* and *RADβ* subfamilies, which experienced further gene duplications before the diversification of animals and plants. The authors propose that the origin and retention of multiple *recA* homologs may represent evolutionary innovations that contributed to the success of the eukaryotes. — LMZ

Proc. Natl. Acad. Sci. U.S.A. **103**, 10.1073/pnas.0604232103 (2006).

CHEMISTRY

A Better Blend

The optimization of material properties in preparing mixtures of two distinct polymers is often impeded by the tendency of the blends toward phase separation. One possible solution is the incorporation of a third component to stabilize the interfaces. Clays can be useful for this purpose because they consist of platelets that can intercalate or flake apart (exfoliate), offering a large surface area for interaction.

In this vein, Si *et al.* explored the impact on a variety of polymer blends of adding montmorillonite clays modified with organic surfactant. They found first that the organoclay mixed favorably with poly(methylmethacrylate) (PMMA), polycarbonate (PC), and poly(styrene-*co*-acrylonitrile) (SAN), but not with polystyrene (PS). Nonetheless, in PS/PMMA blends, the clay platelets localized at the interfaces and influenced domain morphology. In PC/SAN blends, the degree of dispersion between the polymers increased with increasing organoclay concentration, with a bicontinuous morphology observed for concentrations above 5%. The added surfactant proved crucial, because unmodified clays did not aggregate at the interfaces but instead dissolved in one of the polymer components. Similar observations across a range of additional polymer mixtures, including a slurry of styrofoam and scrap plastic, highlighted the potential utility of such clays for recycling applications, which require the blending of incoming waste streams that comprise a wide variety of polymeric materials. — MSL

Macromolecules **39**, 10.1021/ma060125+ (2006).

CREDIT : MARIO DIGNARD/STUDIO CREATIONS