

edited by Gilbert Chin

ECOLOGY/EVOLUTION

Competition Begins at an Early Age

The nestlings of brood parasites such as cuckoos and cowbirds, even if unsuccessful at ousting outright the eggs or nestlings of the host bird, compete with the host nestlings for provisioning by the parents. As a consequence of this competition, host nestlings frequently do not survive to fledge.

In a study of brown-headed cowbirds that parasitized song sparrow nests in Canada, Zanette *et al.* find that such mortality can result in sex-biased survival. The sex ratios of song sparrow nestlings and fledglings in parasitized nests differed significantly from those in unparasitized nests, with a much lower proportion of female chicks surviving in the former. In mixed-sex broods in unparasitized nests, female song sparrow chicks are already at a developmental disadvantage compared to females in single-sex



Song sparrow (*Melospiza melodia*) parent and fledglings.

broods, and the presence of cowbird chicks appears to exacerbate this intraspecific, intersexual competition. Thus, in areas where cowbirds are common, the brood parasites have the potential to affect song sparrow demography and sex ratio. These findings confirm recent theories that suggest that parasites and predators can alter the sex ratio of their host and prey populations. — AMS

Ecology 86, 815 (2005).

GEOPHYSICS

Sliding Under Lake Tahoe

The Great Basin of the United States is called that because, over the past 40 million years, the crust has been extending broadly. The locus of extension, which is characterized by faulting and volcanism, has moved from the center of the basin to its eastern and western margins, notably forming Death Valley, California. Along the western margin, the extension is complicated by its interaction with the San Andreas fault, a major strike-slip fault, and is now impinging on the Sierra Nevada Mountains (which have some of the highest elevations in North America).

Kent *et al.* have determined the recent extension at the margin in the Lake Tahoe area (on the border between California and Nevada) by dating and mapping offset shorelines and ancient avalanches into the lake. This history implies that the region is extending by about 0.5 mm/year, enough to produce a magnitude 7 earthquake approximately once every 3000 years. Such a quake could generate waves in Lake Tahoe approaching 10 m, or even much higher waves if the earthquake were to induce a slide into the lake as has happened in the past. — BH

Geology 33, 365 (2005).

EVOLUTION

Coming Up for Air

The emergence of organisms from the ocean onto land was made possible by a suite of adaptations, not least of which were the integrated biomechanical changes that were required for bodily support and locomotion in a 1g world, as compared to a buoyant and

VIROLOGY

Retooling Degradation Factories

After breaching the outer defenses and establishing themselves inside a eukaryotic cell, viruses subvert existing cellular machinery in order to produce their progeny. When human cells are infected by poliovirus, new viruses are manufactured on cytoplasmic vesicles that are bounded by a double membrane. Jackson *et al.* examined the origin of these virus factories and found that they appear to be derived from autophagosomes, cellular compartments that ordinarily are used in the disposal of defunct organelles. It seems that after cellular invasion, the incoming virus becomes associated with membranes that mature into autophagosomes. Stimulation of autophagy in infected cells actually increased poliovirus yield, whereas inhibition reduced it. Although autophagy is known

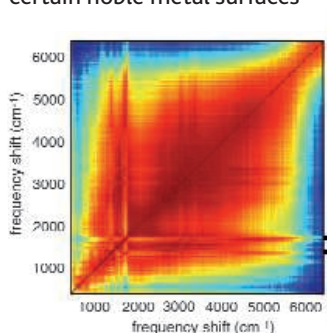
to be important in the cellular clearance of some microbes (such as *Mycobacterium tuberculosis*), for poliovirus and for related rhinoviruses, these destructive organelles are actually exploited to increase the efficiency of viral replication. — SMH

PLoS Biol. 3, e156 (2005).

CHEMISTRY

Correlating Continua

Surface-enhanced Raman scattering (SERS) occurs on certain noble metal surfaces

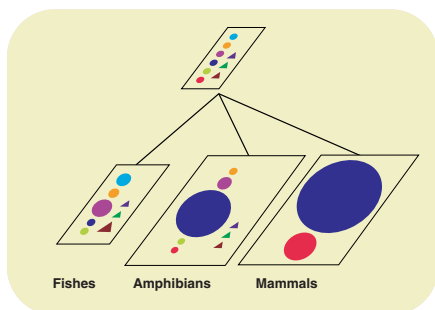


Two-dimension correlation map for the native silver particles.

that are rough or have high curvature, such as colloidal particles. Moore *et al.* have probed the nature of the broad continuum states that usually accompany the sharp, highly enhanced molecular vibrations by performing a two-dimensional covariance and correlation analysis of single-molecule SERS spectra. Vibrational modes for the species on the native silver particles prepared in citrate solution are correlated with a continuum that peaks at 3000 cm^{-1} , but when the same particles were exposed to rhodamine 6G, the vibrational features correlated to a continuum that peaks at 1600 cm^{-1} . Neither continuum has sharp features of its own and thus appears to be associated with the particles, either as active sites or a surface species, that have molecular specificity. — PDS

J. Am. Chem. Soc. 10.1021/ja043651u (2005).

incompressible aquatic environment. Sensory systems also had to adapt, and Niimura and Nei have examined the evolutionary dynamics of the genes encoding olfactory receptors in a phylogenetic analysis based on draft genome sequences from fish, frog, and chicken, along with already available genome data from mouse and human. They find that the most recent common ancestor (MRCA) of fishes and tetrapods carried at least nine distinct groups of olfactory receptors. Present-day fish have inherited eight of



Ancestry of mammalian olfactory receptor groups α (red) and γ (blue).

these, but have lost group α , which is one of two groups extant in mammals and birds, the other being group γ . The number of olfactory receptors in groups α and γ has expanded enormously (numbering about 1000 in mouse), and they are proposed to have become specialized for the detection of airborne molecules, whereas olfactory receptor genes (presumed to have retained their competence for sensing water-soluble odorants) in the other groups were discarded. — GJC

Proc. Natl. Acad. Sci. U.S.A. 102, 6039 (2005).

CHEMISTRY

Bimetallic Bases

The typical notion of a chemical base is a reactive molecular anion bound to a charge-balancing metal cation. Although the influence of anion structure on reactivity has long been appreciated, the metals are often regarded as interchangeable bystanders. Recent work suggests that the cations can play a strong role, however, particularly when two of them cooperate.

Andrikopoulos *et al.* prepared a hybrid base of butyl sodium and magnesium bis(tetramethylpiperide). The butyl anion in the complex strips a proton from the *meta*-carbon in toluene, three carbons away from the more acidic methyl group. The origins of this unexpected reactivity

were clarified by determining a crystal structure and by performing density functional calculations. The Mg cation stabilizes the deprotonated *meta*-carbon, whereas the Na cation interacts with π electrons above the phenyl ring.

Similarly, García *et al.* treated aminophenylphosphine (a phenyl ring bearing adjacent NH_2 and PH_2 groups) successively with butyl lithium and bis(dimethylamido)tin. In the resulting product, which is not produced by either base alone, all four protons have been stripped from the N and P centers. Crystallography revealed a complex structure in which four of the amido phosphide molecules are stabilized by a network of six Sn and four Li cations. — JSY

Angew. Chem. Int. Ed. 10.1002/anie.200500379; 10.1002/anie.200500340 (2005).

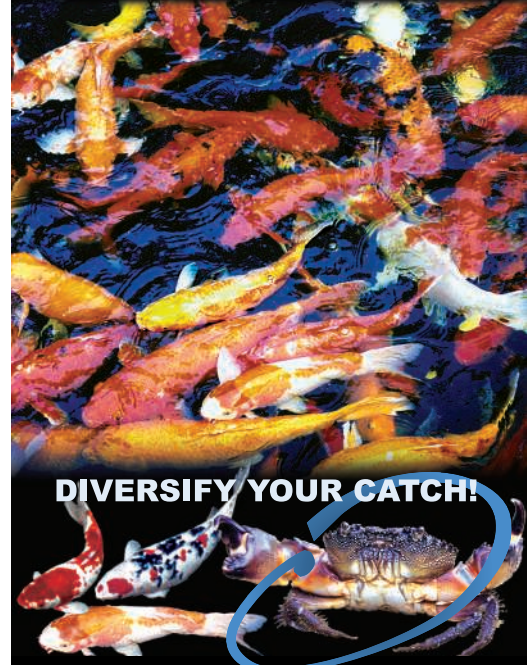
PSYCHOLOGY

Learning About Bias at an Early Age

Interpreting what someone else says can involve making an assessment of what that person believes or wants. In the former kind of situation, adults and children (from about 3 years of age onward) are capable of appreciating that what the speaker knows may not be an accurate representation of reality—that is, what is said appears to be true from the speaker's point of view, but is in fact not true because the speaker holds a false belief. In the latter type of situation, adults are aware that self-interest can lead one to make statements that are outright lies (motivated, intentional errors), reflect biases (motivated but unintentional errors), or simply are plain old mistakes.

Mills and Keil have examined how children evaluate these kinds of statements. In the first setting, where the outcome of a footrace was ambiguous, second- and fourth-graders, unlike kindergartners, were less apt to believe contestants who claimed to have won as compared to those who admitted defeat. In another setting in which the outcome was unambiguous, kindergartners, second-graders, and fourth-graders all were inclined to label erroneous claims aligned with the speaker's self-interest as lies and those aligned against as mistakes; however, sixth-graders demonstrated the beginnings of an awareness of how self-interest might unintentionally induce a misstatement and hence identified some of the erroneous claims as the products of bias. — GJC

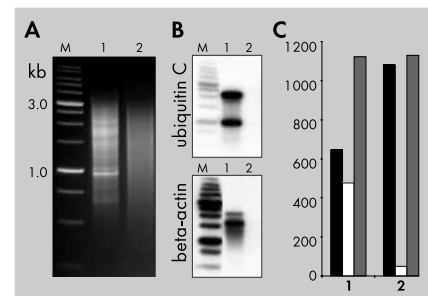
Psychol. Sci. 16, 385 (2005).



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Typical cDNA normalization result. (A) Agarose gel electrophoresis of cDNA samples; (B) Virtual Northern blot analysis of abundant transcripts in these samples; (C) Sequencing of randomly picked clones: black columns - unique; white - non-unique; grey - all sequences. 1 - non-normalized cDNA; 2 - TRIMMER-DIRECT-normalized cDNA; M - 1 kb DNA size markers.

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