

Influenza in Flight >>

Avian influenza is a persistent problem, directly challenging commercial chicken producers, threatening wild bird populations, and providing a reservoir for variants that might emerge as human pathogens. **Lyall *et al.*** (p. 223) have taken the first steps toward producing transgenic domestic chickens that block onward transmission of influenza virus. An RNA “decoy” was made that contained the sequence for the virus’s polymerase enzyme that is essential for replication. In infected chickens, the virus was not able to replicate effectively enough to transmit infection, but the chickens still died from influenza, so some refinement will be needed to make a useful disease-resistant flock. Nevertheless, the strategy offers the potential for significant advantages over vaccination, avoiding the risks from strain variation, cryptic circulation, and resistance.

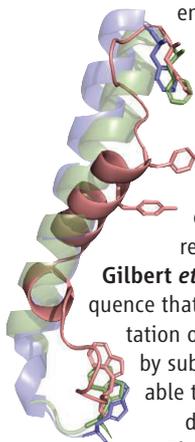


Watching the Restructuring of Working Surfaces

The surfaces of inorganic materials can often restructure if they are heated in an atmosphere of reactive gases—the conditions that industrial catalysts normally encounter during use. Experimental studies of these restructuring processes have been challenging because many surface-sensitive methods work best under high vacuum. Recently, techniques have been developed that allow surface structure to be determined in the presence of gases with partial pressures reaching nearly 1 atmosphere. **Tao and Salmeron** (p. 171) review some of the changes that can occur in nanoparticles, metal surfaces, and catalysts when the vacuum environment is replaced with reactive gases such as nitrous oxide, carbon monoxide, and hydrogen.

Controlling Inflammation

Lipids that mediate the inflammatory response are synthesized from arachidonic acid by the enzyme 5-lipoxygenase (5-LOX). An intrinsic instability of 5-LOX has been proposed to regulate its activity. Structures of related enzymes have shown that the C terminus penetrates the enzyme so that the main chain carboxylate of the C-terminal residue binds the catalytic iron. **Gilbert *et al.*** (p. 217) identified a sequence that probably destabilizes the orientation of the C terminus in 5-LOX and, by substituting this sequence, were able to purify a stable enzyme and determine its crystal structure. The structure is consistent with the



proposed mechanism of enzyme inactivation and provides a basis for the design of 5-LOX-specific inhibitors.

Books, Books, and More Books

The printed word has great power to enlighten, but it is impossible for an individual person to read more than a fraction of all books written, let alone to apply quantitative methods to analyze linguistic and cultural changes as they manifest themselves in words appearing in books. **Michel *et al.*** (p. 176, published online 16 December) performed an informatic analysis of approximately 4% of all books printed ranging from the year 1800 to 2000 and present analyses of the evolution of grammar, obsolescence of words, and which kinds of people become famous, when, and for how long. They also dissect the impact of censorship and suppression, notably during the Nazi period, which the authors term “culturomics.” The analysis suggests new ways to think, not only about books and text analysis but also about culture, history, and the social sciences.

Computer Scientists Learn from Flies

Designing distributed networks of computers that work together to solve a problem without any single processor receiving all of the inputs or observing all of the outputs represents a difficult problem. **Afek *et al.*** (p. 183) noted the similarity of this problem to the process of patterning of sensory bristles on the fruit fly. By studying the developmental process in the fly and modeling

its mechanism, the authors derived an algorithm that works efficiently to solve the computer science problem of identifying what is known as a “maximal independent set” that may prove useful in the design of wireless networks.

Quantum Half-Measures

Superfluid properties of fermionic systems stem from the pairing of the constituent fermions that then undergo Bose-Einstein condensation. Usually, the pairs are made up of spins of opposite orientation. When such superconductors are exposed to a magnetic field, they either expel it entirely or form a lattice of vortices, each encompassing a precisely quantized magnetic flux. However, spin triplet phases observed in the exotic superconductor, Sr_2RuO_4 , have been predicted to support vortices with half the flux of regular vortices. **Jang *et al.*** (p. 186) measured the magnetization of pieces of Sr_2RuO_4 with annular geometry and observed the formation of magnetization steps of half the usual height, consistent with the presence of half-quantum vortices, which may help in future quantum computing applications.

Toluene Transformation

In addition to functioning as a solvent, the aromatic hydrocarbon toluene is a raw material for synthesis of a variety of pharmaceuticals, cosmetics, and agrichemicals. However, currently applied oxidation methods are somewhat inefficient and often require corrosive conditions. **Kesavan *et al.*** (p. 195) now show that nanoparticles composed of a gold and palladium mixture can catalyze the oxidation of toluene to a commercially useful ester, benzyl benzoate, with high yield and selectivity. The reaction uses O_2 as oxidant and proceeds in the absence of solvent.

Harnessing Janus Behavior

Clusters of atoms or particles will behave in ways intermediate between single atoms or particles and bulk material. **Chen *et al.*** (p. 199) designed colloidal Janus particles with a charged surface on one half and a water-hating surface on the other. This schizoid nature caused the particles to cluster and pack in specific arrangements, which could be controlled through the addition of salt. With the right balance of forces, chiral helices formed with occasional spontaneous switch in handedness when connections between neighboring particles were broken and reformed.

The Strength of Convection

The rate of formation of deep water in the North Atlantic has a major effect on the overturning circulation of the Atlantic Ocean, which in turn affects global climate. A great deal of information about ocean overturning circulation can be had by determining the amount of radiocarbon throughout the water column. **Thornalley *et al.*** (p. 202; see the Perspective by **Sarnthein**) provide radiocarbon records from five deepwater sites in the North Atlantic, spanning the interval from 22 to 10 thousand years ago, to reconstruct the history of North Atlantic deepwater formation. The data suggest connections between the strength of overturning circulation, the origins of different water masses, and patterns of atmospheric circulation, which have a strong influence on land temperatures and global climate.

Rise of the Dinosaurs

Dinosaurs emerged in the Triassic and became dominant toward its end, some 220 million years ago. One of the best records of the early evolution of dinosaurs is preserved in the Ischigualasto Formation in northwestern Argentina. To understand controls on this early evolution, **Martinez *et al.*** (p. 206) traced the abundance, emergence, and extinctions of dinosaurs and other vertebrate species, and they describe a basal theropod that clarifies some early dinosaur relations. By 230 million years ago, dinosaurs were both the dominant carnivores and small herbivores in this region. Other herbivores gradually became extinct locally, implying that the dinosaurs did not suddenly expand into vacant niches.



Write Your Worries Away

Tests and exams are stressful for many people. Students who “choke” at an exam may perform less well than their knowledge base warrants. Such results can accumulate to generate reduced educational achievements and expectations. Studying young adults performing math tests, **Ramirez and Beilock** (p. 211) found that a brief intervention—writing about their anxiety about the upcoming exam—helped students to do better in the exam. Perhaps by acknowledging their fears, students were able to tame distracting emotions.

Death of the Salmon

Despite large reductions in fisheries harvests, wild salmon stocks in Canada are suffering high levels of mortality before they manage to reproduce—40 to 95% of fish are dying each year en route to their spawning grounds. **Miller *et al.*** (p. 214) have found a consistent association between fish mortality and a specific genomic expression signal. The past 10 years have seen unprecedentedly warm river temperatures, and salmon have died in greatest numbers in “hotspots” along the river system, possibly as a result of poor oxygen availability and disease, with some stocks being more severely affected than others.

The Power of Women’s Tears

Emotional tears are thought to be uniquely human and have puzzled biologists and psychologists for many years. Using a double-blind study comparing female emotional tears with control saline, **Gelstein *et al.*** (p. 226, published online 6 January) investigated whether human tears may convey a chemosignal. Even though the tears could not be smelled, tears nevertheless decreased the sexual appeal of women’s faces. Female tears also lowered sexual arousal and reduced testosterone levels in men. A subsequent brain-imaging study highlighted differences in functional activation in the brain. Emotional tears thus seem to contain chemosensory signals related to sociosexual behavior.

CREDIT: MIKE HETTNER, PAUL SERENO, AND TODD MARSHALL

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