EDITORS' CHOICE

edited by Gilbert Chin

MOLECULAR BIOLOGY

The Dangers of Nonsense

A nonsense mutation is a single base change that converts an amino acid–coding triplet nucleotide into a codon specifying translational termination. Catching such a defective messenger RNA (mRNA) before a truncated and potentially harmful protein is synthesized is the job of the nonsense-mediated mRNA decay (NMD) pathway. The mechanisms involved are not yet understood, but it has been noted that these mutations also can perturb the splicing of the pre-mRNA in a phenomenon termed nonsense-mediated altered splicing.

Liu *et al.* have analyzed the effects on splicing of a nonsense mutation in the breast cancer susceptibility gene *BRCA1*. This mutation is located in an amino acid–coding or exonic region of the gene and appears in vitro to cause exon skipping; this would result in aberrant removal of an exon during mRNA processing. Losing an exon can result in deleterious effects on protein function or in a shift of the reading frame and entry into the NMD pathway. — GJC

Nature Genet. **27**, 55 (2001).

EVOLUTION

Californians Are Different

Many species of organisms have wide distributions, yet exhibit little obvious phenotypic variation across their range. A case in point is the common raven, which occurs across most of the Northern Hemisphere. Can such taxonomic simplicity conceal hidden genetic complexity to the point where a single species might need to be reclassified into several?

Omland *et al.* used mitochondrial and nuclear DNA sequences to assess patterns of genetic variation in ravens sampled from most of their geographic range. They find that there is a deep genetic split between the ravens of California and those of the rest of the world (including North America), possibly sufficient for the two to be classified as separate species. The present-day ranges of the two groups come into extensive contact, and there is evidence of genetic mixing in these zones, suggesting that they may be remerging after an extensive period of isolation and differentiation. — AMS

The common raven *Corvus corax*.

SOURCE: BERND HEINRICH

Proc. R. Soc. London Ser. B **267**, 2475 (2000).

IMMUNOLOGY

Keeping B cells in Suspense

B lymphocytes found within germinal centers continue to divide without maturing into plasma cells, long after they encounter foreign antigen. By deferring maturation, these cells gain the opportunity to generate and select mutations in their antibody genes that increase the antibody's binding affinity for antigen. Reljik *et al.* examined the role played by the transcriptional repressor BCL-6 in delaying the terminal differentiation of germinal center B cells. Expression of BCL-6 blocked the activity of cytokines that would otherwise have slowed cell division and initiated maturation. These effects of BCL-6 appeared to be mediated via inhibition of the effect of signal transducer and activator of transcription-3 (STAT-3) on the transcription of B-lymphocyte-induced maturation protein–1 (Blimp-1), a protein which is known to be responsible for guiding B cells toward maturity. — SJS

J. Exp. Med. **192**, 1841 (2000).

CELL BIOLOGY

Phagosome Proteome

The biochemical characterization of intracellular compartments has a long and respected history. The goal is to define each of the components of an organelle, and to understand how it gets there and what its function in the organelle is.

Garin *et al.* have combined traditional subcellular fractionation techniques with modern proteomics technology to provide a detailed analysis of the constituents of the phagosome, an organelle created by cells when they engulf and digest particles, such as bacteria, from the extracellular milieu. Macrophages were fed latex beads, which permitted a straightforward purification by flotation of phagosomes away from other organelles of the endocytic and secretory pathways. The purified phagosomes contained over 140 proteins, including degradative enzymes, the vacuolar proton pump, and membrane fusion machinery. The degradative enzymes appeared to be acquired sequentially during phagosome maturation. In addition, a surprising number of apoptosis (or programmed cell death)-related proteins also were found in the phagosomes, indicating an unanticipated role for the phagosome in assessing a cell's state of health. — SMH

J. Cell Biol. **152**, 165 (2001)

CHEMISTRY

Just Add Water

Supercritical carbon dioxide has been studied in part because it is an environmentally benign solvent and a candidate to substitute for organic solvents in many industrial processes. It also has important advantages in environmental remediation, because a supercritical phase has no liquid-vapor interface and

GEOPHYSICS

Impact Revisited

In a recent paper, Mory *et al.* suggested that a large impact crater might be buried in western Australia. The size of this crater would make it one of the largest impacts in the last 600 million years, and the range of possible dates of the impact would span several major extinction events including the end-Permian and end-Triassic extinctions.

Reimold and Koeberl now question whether an impact structure has been appropriately identified, both with respect to the deformation features identified in rocks and minerals sampled from drill cores and in the geophysical data of the structure itself. Mory *et al.* reply by providing additional images and discussion of the claimed shock features as well as some new age information on alteration in the basement rocks. — BH

Earth Planet. Sci. Lett. **177**, 119 (2000); *Earth Planet. Sci. Lett.* **184**, 353 (2000); *Earth Planet. Sci. Lett.* **184**, 358 (2000).

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thus no surface tension. An important disadvantage, however, is the low solubility of hydrophilic compounds and metals in supercritical carbon dioxide. Ligands can be added to increase the solubility of metals, but often they need to be added in large excess. This has hampered the use of supercritical carbon dioxide, for example, in metal extraction from contaminated waste.

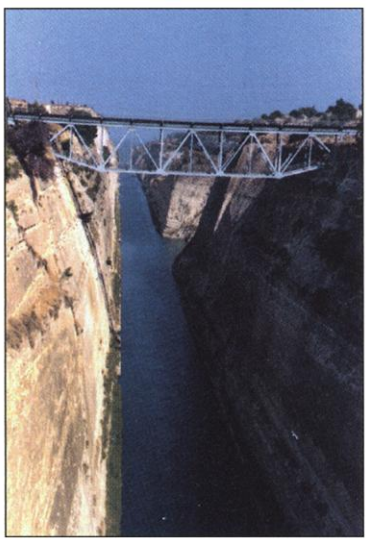
Yates *et al.* use a different approach based on the surfactant-assisted formation of a microemulsion of water droplets in supercritical carbon dioxide. They show that these small droplets of water efficiently remove copper from a contaminated surface; copper is highly soluble in water, and the supercritical phase infiltrates small pores that would be inaccessible to bulk water. Very little surfactant is required, and the water and carbon dioxide phases can be separated readily by reducing the pressure. This approach may be particularly useful when extracting small amounts of metal dispersed in a large volume of solid waste. — JU

Chem. Comm. **2001**, 25 (2001).

GEOPHYSICS

Parting the Gulf of Corinth

The Aegean region has one of the highest rates of seismicity and extension in Europe. It consists of three major rifts: the North Aegean trough, the Evvia graben, and the Corinth rift. The region is actively deforming between the India-Eurasia collision zone (represented by the North Anatolian fault that cuts across Turkey and connects to the northern Aegean region) and the Africa-Eurasia collision zone (represented by the Hellenic Arc subduction zone that connects to the southern Aegean region). Previous studies in the Gulf of Corinth, the main part of the Corinth rift, indicate that the deformation measured from geodetic data does not match that determined from seismic data.



The Corinthian Canal, at the southeastern end of the Gulf of Corinth.

CREDIT: MANFRED LEITER

Briole *et al.* have completed an extensive global positioning system (GPS) campaign from 1990 to 1995. They have measured about 14 millimeters per year of extension in the western gulf and about 10 millimeters per year in the eastern gulf. Their model accounts for the deformation by requiring most of the slip to occur on low-angle normal faults within a more narrowly defined vertical depth along the rift margins than that used in previous models. These normal faults would account for the seismicity, while aseismic creep in the shallow crust (due to water and sediments in the central gulf) and in the deeper crust (due to a decollement at the brittle-to-ductile transition zone of the crust) would explain the additional geodetic deformation. Thus, while the gulf is rifting noisily by normal faulting in medium-sized earthquakes, it also is extending quietly by creeping near the surface and at depth. — LR

J. Geophys. Res. **105**, 25605 (2000).

ATMOSPHERIC SCIENCE

Remote Inversions

The consequences of global warming caused by greenhouse gas emissions have made it imperative to improve our understanding of the fate of CO_2 emitted by burning of fossil fuels. One way in which both the sources and sinks of atmospheric CO_2 can be determined is by inversion: analyses of the CO_2 content of air collected regularly in flasks at a variety of locations around the world are used to calculate where the CO_2 came from and where it went. The greatest uncertainty associated with this method arises from the incomplete global coverage provided by existing sampling stations.

One possible way to overcome this limitation would be to use satellite measurements of atmospheric CO_2 concentrations, instead of station data. This would make possible much better spatial and temporal coverage and would minimize the effects of vertical transport in the troposphere. Rayner and O'Brien have calculated how precise space-based atmospheric CO_2 concentration measurements would have to be for this technique to equal or surpass the performance of the existing surface network. Their estimates create a target for evaluating the feasibility of different satellite data retrieval schemes, a necessary first step in improving atmospheric inversions. — HJS

Geophys. Res. Lett. **28**, 175 (2001).