EDITED BY STELLA HURTLEY AND PHIL SZUROMI

<< Old Olmec Writing

The Olmec civilization of Central America [~1200 to 400 years before the common era (BCE)] may have been the precursor to later complex societies such as the Maya (100 to 600 CE) and Aztec (1200 to 1500 CE), yet unambiguous evidence of earliest Olmec writing is lacking. **Rodríguez Martínez *et al.*** (p. 1610; see the news story by **Lawler**) report the discovery of a stone block from Veracruz, Mexico, inscribed with an unknown system of writing. Taken from a gravel quarry, the block has been dated to the first millennium CE, which is earlier than previous finds. The glyphs, still undeciphered, bear similarity to other Olmec imagery, and the pattern is consistent with a system of writing.

Ethereal Ethane

Scientists predicted that Titan's surface should be awash with liquid ethane, but the low and mid-latitudes of this saturnian moon are merely moist, and dunes prevail rather than seas. **Griffith *et al.*** (p. 1620; see the Perspective by **Flasar**) argue that a large cloud near the north pole of Titan spotted by Cassini's Visual Infrared Mapping Spectrometer may harbor the missing ethane. Similar to Earth, cold air downwells near the winter pole and causes the formation of stratospheric polar clouds. Solid ethane snow may frost the surface at the pole if the conditions are cold enough.

Themes and Variations in Secretion and Endocytosis

Cells need to secrete a variety of proteins from the cell surface and also need to internalize some of these surface proteins, as well as other external proteins. **McNiven and Thompson** (p. 1591) review the mechanisms involved in the formation of coated exocytic transport vesicles as they are exported from the Golgi complex en route to the plasma membrane and compare and contrast them with the formation of coated endocytic vesicles.

European Meltwaters

At the height of the last glaciation, a combination of low sea level and the position of the Fennoscandian and British ice sheets caused much of the runoff from continental Europe to flow through an enormous river that flowed into the Atlantic Ocean through what now is the English Channel, called the Channel River. **Ménot *et al.*** (p. 1623) present a record of Channel River activity between about 30,000 and 5,000 years before the present. Its flow began to swell around 22,000 years ago, reached a peak between 19,000 and 17,000 years ago, and ended abruptly then at the start of Heinrich Event 1. This record should help allow models to determine what effect the melting of European glaciers at the end of the Last Glacial Maximum had on ocean circulation, as has been done for the melting of the Laurentide Ice Sheet on the other side of the Atlantic Ocean.

Seeking the Genome for the Trees

Although the genomes of some model plants such as *Arabidopsis* and rice have been sequenced, they are different in many key ways from their long-lived, woody relatives, the trees. **Tuskan *et al.*** (p. 1596; see the cover and the news story by **Stokstad**) present the genome sequence of the black cottonwood, *Populus trichocarpa*, which has undergone two whole genome duplication events, one of which occurred at the same time as in *Arabidopsis*. The *Populus* genome has evolved more slowly than *Arabidopsis*, with reduced rates of nucleotide substitution, tandem gene duplication, and gross structural rearrangements of chromosomes. Comparisons of the gene families between *Populus* and *Arabidopsis* reveal a complex pattern, with *Populus* expansions in disease resistance, meristem development, metabolite transport, and cellulose and lignin biosynthesis.

Reducing Crashes to Taps

During the past 30 years, molecular beam techniques have uncovered numerous details of molecular collisions and reactions. A major limitation, however, has been the inherent velocity spread in these beams, which hinders the study of collisions at very low energy. This regime is of interest because of the complexes that can form when weakly attractive forces are not overwhelmed by translational momentum. **Gilijamse *et al.*** (p. 1617) use inhomogeneous electric fields to slow down a beam of OH radicals through Stark deceleration, while maintaining a very narrow velocity spread. The rotational-state dependence of OH scattering events with a beam of xenon atoms was determined for a collision-energy range extending below 1 kilocalorie per mole.

Of Aging and Aggregation

Protein aggregation that is associated with late age-onset diseases such as Alzheimer's and

Continued on page 1539

CREDITS (TOP TO BOTTOM): RODRÍGUEZ MARTÍNEZ *ET AL.*; GILIJAMSE *ET AL.*

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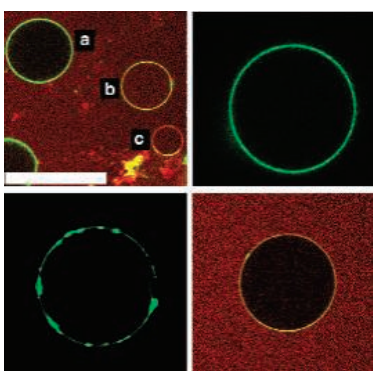
Continued from page 1537

Parkinson's has toxic effects. **Cohen *et al.*** (p. 1604) show, in a worm model of amyloidosis, that the aging process is linked to toxic protein aggregation. Molecules associated with the insulin signaling pathway—a cascade that is linked to aging—also influence aggregation and toxicity. The transcription factor DAF-16 and heat shock protein HSF-1 function to promote aggregation or disaggregation, respectively, of β-amyloid peptides. The authors propose a cellular mechanism hinging on these two factors whereby toxic aggregates are identified and prepared for disaggregation and degradation.

The Rhythm in the Brain

Spontaneous cortical oscillations facilitate synaptic plasticity; correlate with attention and perceptual binding; and may play a role in transient, long-range coordination of distinct brain regions. Exactly how these transient oscillations influence each other and coordinate processing at both the single neuron and population levels is still not understood. **Canolty *et al.*** (p. 1626) show that the amplitude and phase of cortical theta rhythms modulate the power of high gamma band neuronal oscillations in the human electrocorticogram. High gamma activity directly reflects the activation of a local cortical area and is correlated with the functional magnetic resonance imaging blood oxygen level dependent–signal. The much slower theta rhythm is more distributed across the cortex and is associated with novelty, attention, working memory, and exploratory behavior. Importantly, the strength of this theta-gamma coupling is correlated with variations in a battery of cognitive tasks.



CREDIT: HASPER *ET AL*

Two Ways to Kill a Bacterium

In bacterial peptidoglycan synthesis, lipid II is required for the transport of cell-wall subunits across the bacterial cytoplasmic membrane. Lipid II is a target for antibiotics like vancomycin and lantibiotics, such as nisin and mutacin, which are small peptides bearing lanthionine rings. These drugs act by contrasting mechanisms. Vancomycin binds to the pentapeptide of lipid II, whereas lantibiotics bind to the pyrophosphate of lipid II via the lanthionine rings. **Hasper *et al.*** (p. 1636) have discovered that although some lantibiotics aggregate to form pores in membranes, others kill bacterial cells without forming pores. Instead, immobilization of lipid II prevents it from reaching sites where peptidoglycan synthesis occurs, such as at the septum of dividing cells, and blocking cell-wall synthesis.

Caveolin and Liver Regeneration

Caveolin is a key component of caveolae, cell surface invaginations involved in the internalization of a variety of signaling molecules and the uptake of certain viruses. Surprisingly enough, when caveolin knockout mice were generated a few years ago, they appeared to be healthy. **Fernández *et al.*** (p. 1628; see the Perspective by **Brasaemle**) have now examined these mice in more detail and discovered a phenotype in these animals—a profound defect in liver regeneration leading to reduced survival after partial hepatectomy. Problems uncovered included changes in lipid metabolism and cell cycle progression. Treating mutant mice with glucose could circumvent the defect and improve survival after liver damage.

Perfecting Pathogenic Potential

The human pathogen *Mycobacterium tuberculosis* does not have recognizable homologs of secretion machines that are essential for the virulence of many bacterial pathogens. Instead, the ESX-1 system is required for growth of *M. tuberculosis* in macrophages and for controlling host cell response to infection. This system secretes a pair of virulence factors, ESAT-6 and CFP-10, that are essential for *M. tuberculosis* virulence. **DiGiuseppe Champion *et al.*** (p. 1632; see the Perspective by **Ize and Palmer**) identified a C-terminal signal sequence required for directing the ESAT-6/CFP-10 virulence factor complex for secretion from *M. tuberculosis*. Mutations in this signal sequence that prevented interaction with the secretion machine also prevented secretion. The CFP-10 signal sequence also drove secretion of an unrelated protein.

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