EDITED BY STELLA HURTLEY AND PHIL SZUROMI

It's All in the Mix

The Deep Impact spacecraft's projectile encounter with comet 9P/Tempel 1 excavated pristine material from deep within its nucleus. **Lisse *et al.*** (p. 635, published online 13 July) traced its mineral composition of the ejecta in infrared spectra taken with the Spitzer Space Telescope. The mixture of materials seen in the ejecta are usually found in very different environments: highly volatile organic ices; clays and carbonates that form in aqueous environments; and highly crystalline silicates formed at temperatures exceeding 1000 K. These results have implications for the structure and dynamics of the proto-solar nebula 4.5 billion years ago.

Moon Mystery Takes Shape

The peculiar shape of the Moon has puzzled scientists since Laplace drew attention to it in 1799. The Moon's axes have been swelled by spinning and tidal stretching, but the deviations are too large for a body in the current lunar orbit. One explanation is that the Moon's orbit was different early in its history when its shape froze as the lunar magma ocean solidified. However, models have so far failed to fit the precise lunar dimensions. **Garrick-Bethell *et al.*** (p. 652; see the Perspective by **Innanen**) show that the Moon's shape can be explained if it had been in an eccentric orbit 100 million years after its formation. If the lunar magma ocean solidified during a period of substantial lunar eccentricity, when the Moon's semimajor orbital axis was about 22 to 28 Earth radii, the "fossil bulge" seen today in the lunar gravity field can be matched. The authors constrain the possible orbits; permitted ones that include a high-eccentricity synchronous orbit, and one with a 3:2 resonance of spin frequency to orbit frequency, as is presently the case for Mercury.

Assessing Aerosol Effects

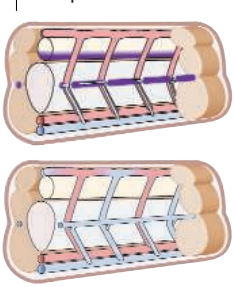
Most of the uncertainty about how climate will change in coming decades centers on aerosols, largely because of a poor understanding of the effects that they have on the properties and abundance of clouds—estimates of the net radiative effect of aerosols range from 0 to 5 watts per square meter. **Kaufman and Koren** (p. 655, published online 13 July; see the Perspective by **Bréon**) address this dilemma by comparing measurements of the attenuation of sunlight by aerosols in the absence of clouds, made by a worldwide network of automatic instruments, to the fraction of time that clouds cover the sites. Cloud coverage was positively correlated to the concentration of aerosols in the air, and negatively correlated with how much sunlight was absorbed by the aerosols. This finding was independent of the type of aerosol or location, which suggests that much of the correlation arises from aerosol effects on cloudiness.

Imaging Shells of Cold Atom Insulators

The ability to tune the intersite interaction strength and site occupancy of atomic condensates confined to optical lattices make them ideal systems to explore electronic correlations in condensed matter physics. **Campbell *et al.*** (p. 649) probed the superfluid–Mott insulator transition of a Bose-Einstein condensate in a three-dimensional optical lattice. Using high-resolution microwave spectroscopy usually associated with atomic clocks, they resolved the layered structure of the Mott shells and directly imaged their spatial distribution.

Netrins Expand Their Repertoire

The axons that neurons extend elaborate a complex interconnected network. Similarly, the circulatory system is a complex interconnected network of vessels. **Wilson *et al.*** (p. 640, published online 29 June) now show that the blood vessels and axons respond similarly to netrins, which were originally identified as axonal guidance factors. The receptors that each tissue uses to read the netrin signals, however, are different, and netrins promote angiogenesis through unknown receptors. Netrins stimulated tissues suffering from diabetic or ischemic damage to grow new blood vessels by signaling endothelial cells to manage proliferation and migration.



Gender Gap in Patenting

The reasons for gender disparity in the workplace are a contentious subject. **Ding *et al.*** (p. 665) present a large-scale study of more than 4000 life scientists and show that women scientists patent their findings at less than half the rate of men. Although the gender gap is decreasing, interviews reveal that professional network differences and traditional views of academic careers are still factors.

Sweet But Not Sticky

Under normal conditions, immunoglobulin G (IgG) antibodies are anti-inflammatory, yet during infection, they can protect the body by recruiting inflammatory cells or pathways. **Kaneko *et al.*** (p. 670; see the Perspective by **Burton and Dwek**) now show that IgG can alternate between these states by modifying the sialylation of polysaccharides on the nonvariable part of the IgG that is responsible for binding and activating receptors on immune cells. These receptors bind sialylated forms of IgG less strongly, which signals the cell to load its surface with inhibitory proteins. However, under situations of immune challenge, the sialic acid residues are lost, which allows IgG

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to bind more tightly and so turn up inflammatory signaling. By switching activity in this way, IgG antibodies may restrict their pro-inflammatory effects to periods of infection and so limit the potential for inadvertent harm resulting from their activity.

Cilia and Signaling

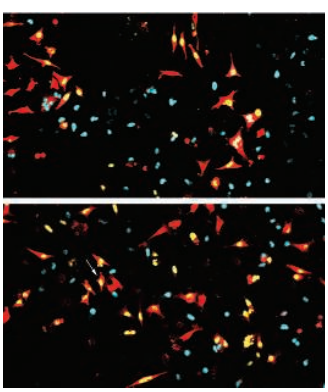
Nearly all vertebrate cells have a primary cilium, a specialized hairlike organelle that projects from the cell surface. The importance of primary cilia in sight, smell, and touch is well established. However, as reviewed by **Singla and Reiter** (p. 629), these organelles have recently been identified as key players in fundamental signal transduction pathways, which may explain why ciliary defects underlie such a wide range of human diseases.

Linking the Clock and the Cell Cycle

The circadian clock is linked to the cell cycle in ways that are not clear. **Pregueiro *et al*.** (p. 644; published online 29 June; see the cover) investigated the relation between these two fundamental cellular processes in the fungus *Neurospora*. When a gene called *period-4* (*prd-4*) contains a mutation, *Neurospora's* clock runs with a shorter period. The protein PRD-4 is orthologous to checkpoint kinase 2, a mammalian cell cycle regulator, and PRD-4 is both regulated by and regulates the circadian clock. DNA damaging agents can reset the clock in a time-of-day dependent manner, and this circadian-phase resetting is wholly dependent on PRD-4.

Understanding SNARE-Mediated Membrane Fusion

Cellular membrane fusion involves the formation of a four-helix bundle with contributions from vesicle and target membrane SNARE (soluble NSF attachment protein receptor) proteins. SNAREs constitute the minimal fusion machinery and can promote the fusion of liposomes. **Pobbati *et al*.** (p. 673) dissected the SNARE assembly process in greater detail. In vitro experiments with liposomes showed that SNARE assembly was initiated at the N-terminal region of the four-helix bundle and that was sufficient to drive rapid liposome fusion. **Giraudo *et al*.** (p. 676, published online 22 June) used a system in which SNARE proteins, which are normally expressed on intracellular membranes, are "flipped" so that they are exposed at the cell surface. Cells expressing such flipped SNARES fuse spontaneously. By introducing a fusion clamp (complexin) and a calcium sensor (synaptotagmin), cell-cell fusion can be regulated by calcium in a comparable way to the regulation seen during neurotransmitter release.



CREDIT: GIRAUDO *ET AL.*

Emotions, Rationality, and Decision-Making

Theories of economic decision-making traditionally assume that humans are fundamentally rational creatures. However, humans are reproducibly irrational in a number of characteristic ways. One of the most impressive examples is the so-called "framing effect," where merely casting an option in a positive or negative way has a dramatic influence on subsequent choice. **De Martino *et al*.** (p. 684; see news story by **Miller**) identify the integration of emotional biases arising from an amygdala-based decision-making system as the underlying cause of the framing effect. Most remarkably, they can predict which individuals are most rational, that is, relatively immune to the framing effect.

Malaria Repression

While investigating the mechanisms that control gene expression during the sexual stages of malaria parasites, **Mair *et al*.** (p. 667; see the Perspective by **Hajduk**) discovered an RNA helicase that binds to and represses a spectrum of parasite messenger RNAs. The helicase is found in cytoplasmic P-granules, ribonucleoprotein complexes containing translationally repressed mRNAs, which are stored ready for activation after fertilization. Parasites that lack the helicase are developmentally defective after gamete fusion. Understanding this key developmental transition in the complex life cycle of the malaria parasite may point to new leads for malaria control.

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Who's helping scientists stay one jump ahead?

Photo: Dr. Martin Levy

"I read my *Science* when I'm at the skatepark with my son. It's great to be out in the fresh air. And an interesting cover picture will often provoke questions and interesting conversations with parents and kids alike."

AAAS member Lorraine J. Kuhn, Ph.D.

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