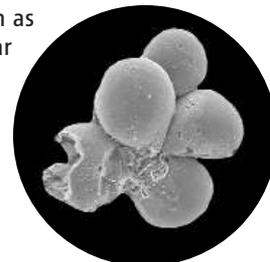




The Early Bird...and Snail

Because many of the earliest well-described birds are from extinct lineages, it has been difficult to resolve the early evolution of the lineage that led to modern birds. An early ornithuran bird, *Gansus yumenensis*, has been known only from fragmentary fossils. **You et al.** (p. 1640) now describe several fossils which show that this Early Cretaceous bird has many derived features. It was also well adapted for an aquatic-amphibian lifestyle—the fossils even show what appears to be webbing in the feet. The early embryos of some animals, such as mollusks, develop through the formation and cleavage of polar lobes to form functionally specific cells. **Chen et al.** (p. 1644 please see the news story by Unger) describe fossils of what appear to be polar-lobed embryos in rocks dated to the Late Precambrian in China. This developmental strategy originated near the time that the first animals appeared.



Community Standards Needed

Until very recently, the study of natural selection has been largely restricted to examining individual candidate genes in comparison to theoretical expectations. Large, genome-wide data sets represent resources that are fundamentally changing the way selection can be studied. **Sabeti et al.** (p. 1614) describe key genetic indicators of selection and critically review statistical tests and candidate loci in the human genome and suggest that community standards are needed for the field to move forward.

Inorganic Chemistry of Oil

The reduction reactions that organic carbon underwent during its initial low-temperature preservation on the way to petroleum have been obscure (other than that the process retained distinct biomarkers of the original source that have proven highly useful in paleoecology). The reactions, which saturate double bonds, have long been thought to be the work of bacteria. **Hebting et al.** (p. 1627, published online 11 May; see the cover and the Perspective by **Hayes**) now show through both laboratory experiments and field studies that the major reactions proceeded inorganically and involved hydrogen sulfide and other sulfur species.

Counting Electrons Coming and Going

As electronic devices shrink, the flow of electrons through the device can become quan-

tized. For metrology and noise-measurement applications, it is crucial to be able to determine how the electrons flow through the device. Single electrons can be counted in one direction, but scattering and back flow occur that can affect the statistics and transport parameters. Using a pair of coupled quantum dots, **Fujisawa et al.** (p. 1634) counted electrons flowing through their device in either direction. They see the expected antibunching behavior of electron flow and show that the device can operate as a sensitive ammeter in the attoampere regime.

Balance of Forces in Emulsions

When a sand pile is compacted, not all of the grains are in close contact; the forces are actually transmitted through chains of connected particles. **Zhou et al.** (p. 1631) show that this phenomenon also occurs between liquid droplets in concentrated emulsions. High-resolution confocal fluorescence microscopy was used to measure contact areas between droplets, from which the forces that create the deformation regions could be calculated. The chains arise because the largest forces on a drop tend to be directed opposite to one another. Thus,



the net force on each drop is zero when the system is mechanically stable.

Centrifuging Mineral Melts

Trace elements can be used to infer the history of magmas if their partitioning between crystals that may remain in the magma's source region and the resulting melts is understood. Although data on the fractionation between crystals and melts can be obtained in conventional experiments, it has been difficult to assess the effect of melt composition, which requires separation of the melts at high temperatures and pressures in an experimental charge for analysis. **Schmidt et al.** (p. 1646) spun a high-pressure piston-cylinder apparatus rapidly enough to create a giant centrifuge reaching accelerations of 3000*g*. The data allow development of a theory incorporating melt composition into fractionation factors.

Together, We Are Strong

Although cortical neurons respond reliably to thalamic inputs, the proportion of thalamic synapses on cortical neurons is quite small. Previous studies suggested that thalamocortical responses are reliable because the synapses transmit more efficiently than others. **Bruno and Sakmann** (p. 1622; see the Perspective by **Alonso**) developed a technique for studying individual synaptic connections in the intact brain that allowed paired recordings to be made in living animals. In the intact animal, the relia-

Continued on page 1571

Continued from page 1569

bility and amplitude of synaptic transmission were as low as had been estimated previously for intracortical connections. However, the strong synchrony of thalamic neurons maintained substantial activation of cortical neurons without any need for further intrinsic cortical amplification.

Running on Empty

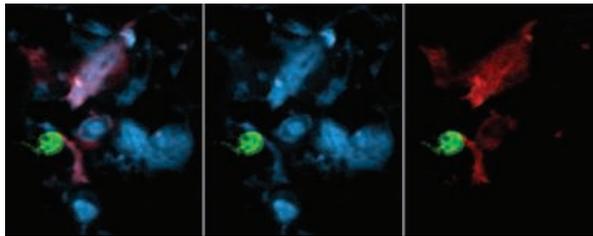
Cancer cells often change their mode of energy production from aerobic respiration to glycolysis. **Matoba *et al.*** (p. 1650, published online 25 May) now link this switch to mutations in the tumor suppressor gene, p53. p53 controls the expression of a factor that is needed to assemble the cytochrome c oxidase complex, a major site of oxygen consumption in mitochondria. When p53 is inactivated, as it is in many cancers, respiration decreases and alters cellular metabolism.

Metabolic Information Highway

The several distinct tissues that contribute to the maintenance of energy balance in mammals must somehow communicate with one another. For example, the liver sends metabolic signals to peripheral adipose tissue, but the underlying mechanisms are poorly understood. Studying a mouse model, **Uno *et al.*** (p. 1656) found that these tissues communicate by means of a neuronal pathway consisting of the afferent vagus nerve from the liver and efferent sympathetic nerves to adipose tissues. This pathway is involved in the regulation of energy expenditure, systemic insulin sensitivity, glucose metabolism, and fat distribution between the liver and periphery, and it may also help protect the animal from the metabolic disturbances that are set in motion by excess fat storage.

Passing Through

In the immune system, B cells and T cells both recognize antigen and thought to do so by distinct means. T cells require specialized antigen-presenting cells, called dendritic cells (DCs), to pick up protein at peripheral tissues, which they then process and present as peptides to T cells within the organized lymphoid tissues. Using intravital imaging in mice, **Qi *et al.*** (p. 1672) reveal that some B cells encounter antigen in a rather similar way on DCs as they exit from the blood and before they migrate to the specialized B cell regions of the lymph nodes, called follicles. B cells that recognized antigen in this way started to show signs of activation and slowed down their migratory behavior within T cell-rich areas. Such slow-moving, activated B cells would increase their chances of garnering the critical help of T cells required for them to produce antibodies.



Inflammation, Amplification, and Aggravation

Many details of how inflammatory pain is amplified at the spinal dorsal horn have been uncovered in recent years, but a unifying cellular model is still missing. **Ikeda *et al.*** (p. 1659) identified a synaptic pain amplifier that is turned on by low-frequency conditioning stimulation and by natural noxious stimulation. In vivo, a low-frequency afferent barrage can raise Ca^{2+} concentration in nociceptive spinal cord neurons sufficiently to induce long-term potentiation. This process causes amplification of pain-related information at the first synapse in pain pathways.

Brainy Birds

Do animals have “theory-of-mind,” that is, the ability to understand that other animals have thoughts and feelings? **Dally *et al.*** (p. 1662, published online 18 May) provide evidence that western scrub-jays might attribute different knowledge states to specific individuals. When it comes to protecting their hidden caches of food, scrub-jays keep track of precisely who was watching and when, and use this information to combat the threat that particular individuals pose to their caches.

CREDIT: QI ET AL.

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