

edited by Gilbert Chin

METEORITICAL HISTORY Heads Up

In 1766, Domenico Troili published a 120-page book about a stone in Villa Albareto, Italy. Eyewitnesses had reported a loud explosion, followed by



A piece of history.

whistling sounds as if a cannon had been fired. The stone, which looked fiery to some and dark and smoky to others, had fallen out of the sky and created a crater nearly a meter deep. The still-warm object was broken into pieces, which were kept by opportunistic villagers. Troili obtained some of the pieces and described a heavy, magnetic rock with rusty grains of iron sulfide (FeS), partially covered by what appeared to be a burnt and blackened crust. Troili concluded that it had been hurled skyward by a subterranean explosion.

By this time many observations of falls had been recorded, yet no one had made a connection between these fiery flying rocks and material from outer space; volcanism, lightning, or divine intervention were among the more plausible explanations of the time. Troili has been credited with explaining the origin of meteorites, as shown by a citation to him in 1863, at which point stoichiometric FeS, which is found only in meteorites, was renamed troilite.

Marvin and Cosmo argue that Ernst F. F. Chladni, who had

compiled many observations of falls, determined, by calculating the velocities of meteors and fireballs, that these rock fragments originated from space, created by planet formation or planetary collisions. Chladni's seminal book of compilations and calculations was published in 1794, and he has been (and should continue to be) recognized for his risky and fundamentally correct explanation of the origin of meteorites. — LR

Meteorit. Planet. Sci. 37, 1857 (2002).

GEOLOGY Drilling on the Trojan Plain

The location of Troy and the accuracy of Homer's descriptions of the Trojan War in *The Iliad* have been examined and questioned for ages. In the late 1800s, Schliemann laid claim to having unearthed the ancient city on the west coast of Turkey, near the mouths of the Dardanelles and the Simois and Scamander rivers. Nonetheless, many descriptions in *The Iliad* do not correspond to the landscape of the region as seen today, more

than 5000 years after the battle. Tectonic activity and sedimentation in the delta plain, and the construction of levees and canals along the rivers have greatly modified the geography, and the coastline is several kilometers from the ancient city. Kraft *et al.* have used a series of dated drill cores in the region to reconstruct the changes in this landscape from about 7000 years ago to the present, covering the time of the Trojan War. This paleogeography correlates well with the descriptions in *The Iliad* of several battles around Troy. — BH

Geology 31, 163 (2003).

CELL BIOLOGY The Kis of Life

A bacterial plasmid known as R1 expresses two factors that act as killer and rescuer for its host. Killing determinant (Kid) is a toxin that inhibits cell proliferation, and killing suppressor (Kis) acts as an antidote by forming a 1:1 complex with Kid. de la Cueva-Méndez *et al.* show that this pair of proteins, which have evolved to kill bacteria that have lost their resi-

dent plasmid and thus the capacity to maintain synthesis of the unstable Kis component, can function in eukaryotic cells. Kid inhibits proliferation of yeast cells, *Xenopus* eggs, and human cells, and in each case Kis protects. In addition, Kid causes apoptosis (programmed cell death) in human cells, and this activity can be blocked by Kis, too. Thus, by regulating the relative levels of Kid and Kis, it should be possible to produce controllable, selective killing in eukaryotic cells, which may facilitate targeted lineage ablation during development or the elimination of transformed cells. — SMH

EMBO J. 22, 246 (2003).

ECOLOGY/EVOLUTION Widespread Homogeneity

The relationship between the geographical range of a genus of organisms and the rate of speciation within it is disputed. The prevalent view has been that wide distribution might favor speciation through the occupation of a more diverse range of habitat and a greater

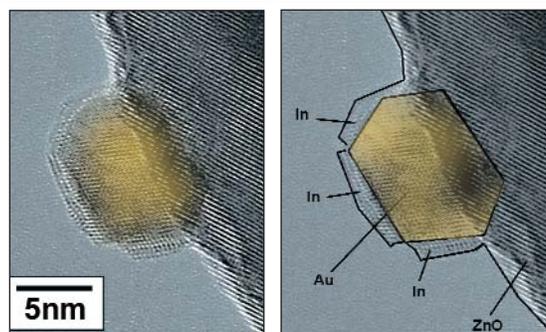
CHEMISTRY Edgy Catalysts

There is renewed interest in gold as a financial investment. It also has attracted attention as a catalyst; the bulk metal is unreactive, but small particles (~5 nm) are highly active in oxidizing CO at room temperature.

Mohr *et al.* have prepared gold catalysts on zinc oxide (ZnO) supports and show that they promote the selective hydrogenation of the C=O bond (instead of the more reactive C=C bond) of unsaturated aldehydes. The activity and selectivity of these catalysts depend not only on particle size but on particle shape, too—for example, particles may be rounded or twinned. Many of the gold particles are single crystals with sharp facets and a narrow size distribution. When the authors added a second metal, indium, it preferentially coated the outer faces of the particles, leaving the edges free. By varying the amount of indium, the authors showed that hydrogenation of the C=O group of acrolein occurred at the edges of the particles rather than on the surfaces. Such detailed insights into nanoparticle catalysis may help to tune performance and enhance selectivity. — JFU

J. Am. Chem. Soc. 10.1021/ja027321q (2003).

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Indium covers the faces, but not the edges, of gold nanoparticles.

likelihood of the emergence of dispersal barriers. But a negative relationship is also plausible: A wider distribution might be facilitated by biological characters, such as good dispersibility or wide ecological tolerance, that would tend to depress speciation.

Using fossil and extant molluscs, Jablonski and Roy find evidence in support of a negative relationship between speciation rate and distribution. Cretaceous gastropods from the Atlantic Coastal Plain of what is now eastern North America show a significant inverse relationship between species production rates over 35 million years and geographical range; 13 clades of living bivalves and gastropods distributed globally show no relation between species richness and range. This result suggests that the factors that lead to wide distribution also tend to dampen speciation rates, at least in marine molluscs. — AMS

Proc. R. Soc. London Ser. B 10.1098/rspb.2002.2243 (2003).

BIOCHEMISTRY

Laissez-faire Versus Keynesian

How enzymes lower the activation energy of reactions has almost as many answers as there are enzyme structures. Hur and Bruice use molecular dynamics simulations to compare and contrast a pair of intramolecular rearrangements: chalcone to (*S*)-flavanone and chorismate to prephenate. Both enzymes (chalcone isomerase and chorismate mutase) achieve comparable rate enhancements, decreasing the energy barrier from about 25 kcal/mol for the aqueous reaction to about 15 kcal/mol. However, the former relies on actively abetting nucleophilic attack by an enolate, whereas the latter merely watches after capturing the rare chorismate conformer in which the Claisen rearrangement is already primed and ready to go. — GJC

J. Am. Chem. Soc. 10.1021/ja0293047 (2003).

APPLIED PHYSICS

Integrating Color Displays

Electroluminescence occurs when carriers are injected into wide band-gap semiconductors such as gallium nitride (GaN) and excite light-emitting centers. The wavelength of the emitted light can be controlled with rare earth dopants, and thus there is considerable effort being made toward developing these materials for large-area flat-panel displays. Wang *et al.* introduce a processing route involving several steps of deposition and patterning in which

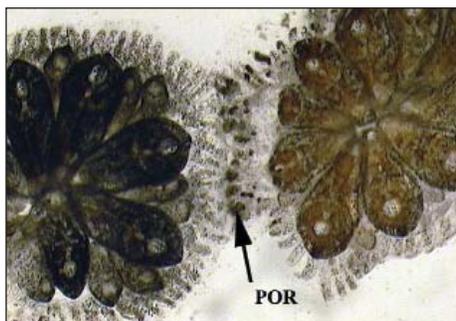
a lift-off technique is used, with liquid glass as the sacrificial layer at each step. Their process is compatible with the high-temperature growth of the GaN layers and conventional wet-processing techniques. They demonstrate the fabrication of laterally patterned red-, green-, and blue-emitting regions on a single substrate. — ISO

Appl. Phys. Lett. **82**, 502 (2003).

IMMUNOLOGY

An Early Sign of Adaptive Immunity

The urochordates represent an early step in the evolutionary lineage of vertebrates. Urochordate larvae develop a notochord and nervous system, chordate features that are then lost in the adult phase of the organism, as observed in the



The point of rejection between two colonies (central zooids surrounded by vascular ampullae).

sessile, and sometimes colonial, sea squirt. Khalturin *et al.* show that the adults may share other features with higher vertebrates.

On physical contact, two *Botryllus* colonies either fuse into one or reject each other in a process determined by a single, highly polymorphic genetic locus reminiscent of the vertebrate major histocompatibility (MHC) locus. By screening for changes in gene expression during the process of acceptance or rejection, they identified a gene, *BsCD94-1*, that encodes a membrane protein similar to the CD94 class of natural killer (NK) receptors. This protein is found on the surface of a group of granulocyte-like *Botryllus* blood cells. In mammals, NK lymphocytes distinguish between normal cells (self) and foreign cells (nonself). Thus, rejection of incompatible transplants in vertebrates may function via a process with evolutionary roots in sea squirts. — PJH

Proc. Natl. Acad. Sci. U.S.A. **100**, 622 (2003).

Laissez-faire Versus Keynesian

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