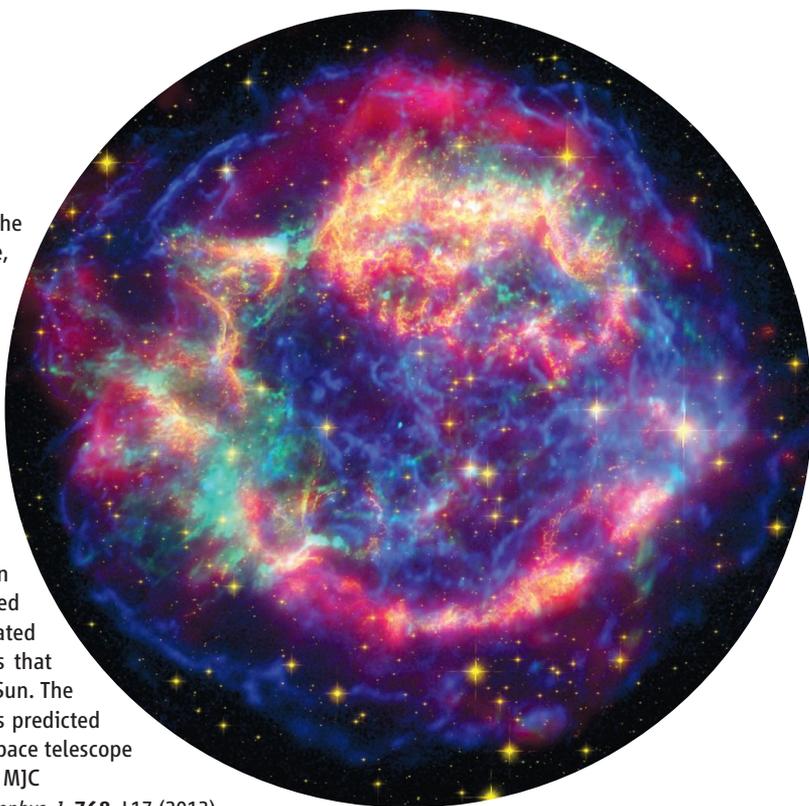


GEOCHEMISTRY

Supernova Grains Identified in the Lab

Primitive meteorites contain grains of materials that predate the formation of the solar system. These materials—which include, among others, diamond, graphite, and various oxides and silicates—were present in the molecular cloud from which the Sun and the solar system formed and were later incorporated into primitive solar system solids. Presolar grains are identified by their unusual isotopic compositions, which can only be explained if they formed outside the solar system, in the outflows or explosions of other stars. Using nano secondary ion mass spectrometry (NanoSIMS) and Auger electron spectroscopy, Haenecour *et al.* report the identification of two silica (SiO₂) grains in the primitive meteorites LaPaz 031117 and Grove Mountains 021710. The oxygen isotopic composition of these two grains is different from those of previously identified presolar SiO₂ grains, and it indicates that the two grains originated from core collapse supernovae: the thermonuclear explosions that end the lives of stars heavier than eight times the mass of the Sun. The presence of SiO₂ dust in matter ejected by such explosions was predicted by theoretical models; recent observations by NASA's Spitzer Space telescope have also suggested their presence in supernova remnants. — MJC

Astrophys. J. **768**, L17 (2013).



ECOLOGY

Palm Monoculture Bad for Birds

The conversion of tropical forest to oil palm plantations has rapidly increased over the past decade, predominantly in Southeast Asia, where such cultivation now dominates over 2 million hectares. Substantial biodiversity loss accompa-



nies such conversion, but little is known of the ecology of the resulting landscape. Azhar *et al.*'s survey of bird faunas in plantations and logged swamp forest in Malaysia shows that guilds were affected in different ways. Notably, raptors were more abundant in plantations than in logged forest, whereas the reverse was true for insecti-

vores and granivores. Patterns within plantations were also influenced by the management regime (e.g., smallholding versus estate) and proximity to forest. Edwards *et al.* surveyed the functional diversity—a measure incorporating foraging, morphology, and behavior—of bird faunas across habitat gradients (from plantation to logged and primary forests) in Borneo. Functional diversity was similar between logged and primary forest but greatly reduced in plantations, with just a few generalist species filling a wide range of functional roles. These studies demonstrate that continued conversion from logged forest to oil palm plantation will lead to further losses of species and functional diversity. — AMS

Ibis **155**, 297; 313 (2013).

EDUCATION

Gaming Knowledge

Video games have great potential to support educational objectives. However, problems with video games in an educational setting, including

use of classroom time and limited connections to standardized tests, persist. Sadler *et al.* examined the extent to which high-school students, at general, honors, and advanced levels, learned biological concepts through the use of Mission Biotech (MB), a game designed to support education in genetics and molecular

biology through classroom integration with a supporting curriculum aligned to state science standards. Ten teachers were trained to use MB in a classroom setting and were asked to complete a daily activity log and postimplementation survey. Supporting instructional activities, also aligned to state standards yet independent from the MB interface, were provided. Assessments were designed in coordination with each of MB's four levels and were embedded within the game environment. Results from pre- and post-tests show statistically significant gains in student performance, on both curriculum-aligned and standards-aligned exams. Students at all levels showed gains in knowledge, but the increase was highest among the general-level students. As the United States moves toward implementation of the inquiry-based Next Generation Science Standards, evidence of game-based curriculum supporting student learning increases the potential that video games may have in enhancing science education. — MM

J. Res. Sci. Teach. **50**, 479 (2013).

PHYSICS

Entangling Spin and Light

There are several different approaches to quantum information processing currently under development, including (but not exhaustively) superconducting circuits, nitrogen vacancy defects in diamond, and semiconductor quantum dots. Each one relies on the basic building

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block of a qubit, a two-level quantum system, on which the information can be stored and manipulated. In the semiconductor quantum dot approach, manipulating the spin of a single electron is promising because it has all the requirements: being fast, controllable and stable. A downside, however, has been the issue of scalability. Any useful quantum processor will require a system of many qubits, but getting quantum dots to talk to each other has presented a challenge. Addressing a preliminary point of this issue, Schaibley *et al.* show that the light (a single photon) emitted from the excited state of a charged quantum dot is entangled with the spin of the electron on the dot. The authors argue that by making the single photons emitted from other distinct quantum dots interact, it may be possible to then entangle the spins on these quantum dots and thus realize a scalable architecture. — ISO

Phys. Rev. Lett. **110**, 167401 (2013).

IMMUNOLOGY

Systems Vaccinology

Vaccination is a powerful approach for disease prevention, but why are some vaccines so effective whereas others fail? Obermoser *et al.* begin to answer this question by characterizing the immune response induced in people given either the trivalent seasonal influenza vaccine or the pneumococcal vaccine, both of which induce a protective antibody response. Gene expression profiling combined with functional assays at multiple time points after vaccination revealed that the two vaccines take different routes early, despite a similar ability to induce protective antibodies. The early response to the influenza vaccine was characterized by the induction of an antiviral and, to a lesser extent, inflammatory gene response. In contrast, the pneumococcal vaccine elicited a predominantly inflammatory gene signature. By day 7 after vaccination, a developing antibody response was apparent in all vaccines. The figures are available in an interactive format, where readers can access the vast amounts of underlying data, providing an important resource for the vaccine community. — KLM

Immunity **38**, 831 (2013).

MOLECULAR BIOLOGY

Fried to a CRISPR

The CRISPR-Cas system, found in many bacteria and archaea, is known as an adaptive defense against the invasion of foreign DNA. The bacteria/archaea capture fragments of plasmids

and phages and incorporate them into one or more CRISPR loci. The captured sequences are then transcribed and cleaved into short CRISPR (cr)RNAs, which, when bound by a Cas nuclease complex, are used to target the invading nucleic acid for destruction.

Previous work suggested a link between bacterial virulence and the CRISPR system. Sampson *et al.* now show that in the intracellular parasite *Francisella novicida*, CRISPR-Cas is required for evasion of the host's innate immune system. The *F. novicida* CRISPR locus encodes a small CRISPR/Cas-associated RNA (scaRNA) that has complementarity to both a trans-acting crRNA (tracrRNA) and its own lipoprotein gene. The scaRNA, together with the tracrRNA and Cas9 nuclease, acts to repress expression of the *F. novicida* lipoprotein during host infection. This allows the infecting bacteria to avoid detection by one of the host's pathogen pattern recognition receptors, which binds to bacterial lipoproteins, and activates the host's innate immune response. CRISPR-Cas regulation of endogenous genes may play a broad role in bacterial virulence. — GR

Nature **10.1038/nature12048** (2013).

EVOLUTION

Pico- Pico- Pico-zoa Picozoa

It's not often that a new phylum is described, but the vanishingly small eukaryotes that constitute the equivalent of dark matter of the plankton have now been named the Picozoa. These highly diverse organisms, previously known as (pico)biliphytes, are about 2 to

3 μm in size and dominate aquatic ecosystems. Characterized by the pigment phycobilin and once thought to be photosynthetic, they appear instead to lack plastids and seem to be heterotrophic. Seenivasan *et al.* used a mitochondrial marker to isolate single (pico)billiphyte cells by fluorescence-activated cell sorting and established a first culture. The result was *Picomonas judraskeda*, a colloid

feeder that moves through the North Sea by means of flagellae. This organism is a bipartite cell, joined at the mitochondrion, packaging all the feeding apparatus into one sac and the major organelles with the motility apparatus in the other. — CA

PLoS One **8**, 10.1371/journal.pone.0059565 (2013).

