

ECOLOGY

Pulsing Populations of Jellies

One strand of evidence for the deterioration of Earth's oceans is the perception that the seas are becoming overwhelmed by jellyfish. In fact, there has been little global analysis of jellyfish populations and the jellyfish ocean perception as made on the basis of a few scattered reports. Condon *et al.* undertook a meta-analysis using linear and logistic mixed models and effect-size analysis on data ranging from 1790 to 2011. There are many limitations to the available data: The older records are sparse, and the majority of more recent data are from the North Atlantic and Mediterranean. Although strong 20-year oscillations were revealed by the analysis, in fact only a weak upward trend has been observed since 1970. The authors acknowledge that this could be a false negative, but unless more data are collected from more sites, the jury is still out on whether jellyfish will take over the increasingly anthropogenically affected oceans. — CA

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1210920110 (2012).



PLANETARY SCIENCE

No Stellar Explosion Needed

The presence of the decay products of short-lived radioactive isotopes in meteorites provides clues to the astrophysical context of the formation of our solar system. Iron-60, for example, can only be produced in stellar explosions; given its half-life of 2.62 million years, a high abundance of this radioisotope in early solar system materials would imply that a star exploded in the vicinity of the newborn Sun. The abundance of ^{60}Fe , an extinct radioisotope, can be constrained by measuring isotopic variations in its decay product ^{60}Ni : a stable isotope of nickel. Previous estimates disagree, depending on the materials analyzed, which has been interpreted as reflecting heterogeneous distribution of ^{60}Fe among planetary bodies. Based on high-precision

and high-accuracy ^{60}Ni and ^{58}Fe isotope measurements of a variety of meteorites, Tang and Dauphas now show that, contrary to previous results, the initial abundance of ^{60}Fe in the early solar system was uniformly low, precluding the need for a nearby stellar explosion around the time the solar system formed. Instead, ^{60}Fe may have been inherited from the interstellar medium as the result of the long-term chemical evolution of our galaxy. — MJC

Earth Planet. Sci. Lett. 359-360, 248 (2012).

CELL BIOLOGY

Toxoplasma Invasion Revisited

Apicomplexan parasites actively invade their host cell. Invasion depends on an arsenal of secreted invasion factors and the ability of the parasite to glide. The Myosin A (MyoA) motor complex, also

known as the glideosome, is a multisubunit complex localized beneath the plasma membrane of the parasite. It is thought to provide the necessary force to move the parasite forward and is essential for gliding motility in *Toxoplasma gondii* and *Plasmodium*. Gliding mutants, however, retain the ability to invade host cells, albeit at reduced efficiency. To establish whether background expression of the respec-

tive protein in the knockdown mutants might be sufficient to drive host cell invasion, Andenmaten *et al.* generated a conditional recombination system based on dimerizable Cre recombinase, which they used to generate complete knockouts of three proteins—MyoA, the micronemal protein MIC2, and actin—each thought to be essential for host cell invasion in *T. gondii*. Surprisingly, each of the complete knockout mutants could invade host cells, and the MyoA and MIC2 knockouts could be maintained and grown in vitro, suggesting that alternative invasion strategies exist. As expected, parasites lacking MyoA were not able to move by gliding motility and consequently were significantly impaired in host cell egress. — SMH

Nat. Meth. 10.1038/nmeth.2301 (2012).

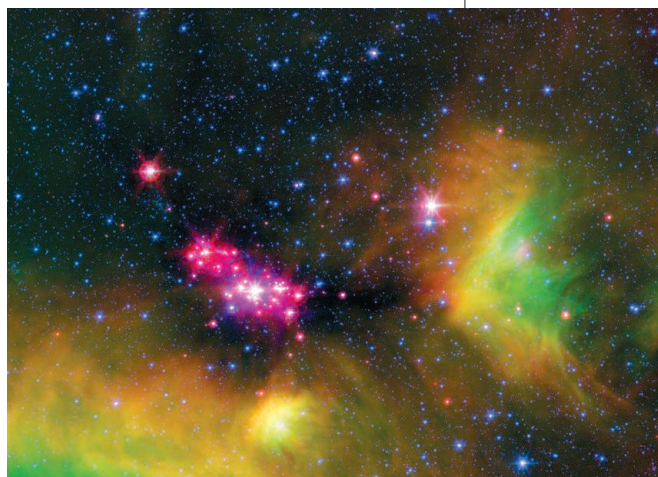
EDUCATION

Assessing Literacy

Scientific literacy, a skill needed beyond the classroom, is being integrated into general education curriculums, resulting in a need to assess students as they develop scientific literacy skills. Gormally *et al.* describe the development of the Test of Scientific Literacy Skills (TOSLS) as a freely available, time-efficient, and psychometrically sound test for use in undergraduate introductory science courses. Using definitions of scientific literacy in education policy documents and survey results from general education faculty, the team identified two major skill categories as measurable outcomes, or TOSLS skills: recognizing and analyzing

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the use of methods of inquiry, and organizing, analyzing, and interpreting quantitative data. An extensive pilot study that included testing students in a general biology course, individual student interviews, and several rounds of expert faculty evaluation suggested that the TOSLS is able to identify students' scientific literacy skill proficiency. Additionally, the TOSLS was sensitive enough to detect pre- to post-semester learning gains, suggesting that it will be valuable in future assessment efforts. — MM

CBE-Life Sci. Educ. **11**, 364 (2012).

IMMUNOLOGY

An Antiviral Sterol

After viral infection, the production of type I interferons (IFNs) induces an antiviral state through the induction of a large network of genes. How these different pathways induce viral control, however, is incompletely characterized. By using microarray analysis to look for genes induced in response to IFN treatment of mouse macrophages, Liu *et al.* identified *Ch25h*, which encodes cholesterol-25-hydroxylase, as an IFN-stimulated gene with antiviral activity. CH25H mediates these effects by catalyzing the oxidation of cholesterol to the soluble oxysterol 25-hydroxycholesterol (25HC). Pretreatment of cells with 25HC was able to protect these cells against infection with a variety of enveloped viruses, including HIV-1. Further characterization of the mechanism of inhibition revealed that 25HC blocked membrane fusion between the virus and host cells. Viral infection of *Ch25h*-deficient mice and treatment of HIV-1-infected humanized mice with 25HC confirmed the physiological relevance of the authors' findings. Similar findings were reported by Blanc *et al.*, who also revealed that the transcription factor Stat1 was required for IFN-dependent induction of 25HC. — KLM

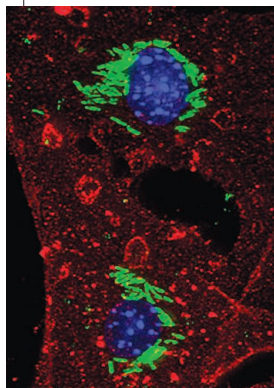
Immunity 10.1016/j.immuni.2012.11.005; 10.1016/j.immuni.2012.11.004 (2012).

MICROBIOLOGY

Bacterial Reprogramming

Cell reprogramming is a phenomenon that occurs *in vitro* and *in vivo*. The former involves the introduction of proteins such as the four "Yamanaka factors" or more recent studies with small molecules, whereas *in vivo* reprogramming can be seen, for example, during gametogenesis. Masaki *et al.* report on another reprogramming event in nature, one that involves host/pathogen interaction. The leprosy-causing bacterium *Mycobacterium leprae* targets differentiated adult Schwann cells, which display considerable plasticity for

regeneration after injury. Upon infection, *M. leprae* induced reprogramming of adult peripheral nerve mouse Schwann cells, converting the host cells to a stemlike fate with the ability to produce chemoattractants and trophic factors that promote macrophage recruitment, bacterial transfer, and survival of infected macrophages. This reprogramming occurred through direct differentiation of



infected Schwann cells to mesenchymal cells and skeletal and smooth muscle cells, as well as through the formation of granuloma-like structures that released macrophages carrying bacteria. Perhaps by understanding the mechanism of bacterial spread via

the exploitation of adult Schwann cell plasticity and the shutting down of Schwann cell gene expression, new therapies to prevent *M. leprae* infection can be developed. — BAP

Cell 10.1016/j.cell.2012.12.014 (2013).

GEOCHEMISTRY

Bombs Below

The political ramifications of clandestine underground nuclear tests are often severe. Therefore, methods must be developed to reliably verify when a test has been completed, without generating false positives. Radiogenic xenon (Xe) is one such tracer produced by nuclear explosions either directly as a fission product or indirectly from unstable iodine precursors; however, it is also generated by nuclear power plants and during the production of radioisotopes for medical use. These sources have different ratios of four Xe isotopes when measured in gas samples, so that there is a typical isotopic range assumed for a weapons test. By incorporating radioactive decay into subsurface transport modeling of the Nevada Test Site in the United States, Lowrey *et al.* suggest that this range may be too narrow. For example, some simulations showed that some signals could be produced by the decay of precursor radioiodine exclusively. More generally, differential transport caused by variations in atmospheric pressure can strongly influence Xe isotopic ratios. Based on their simulations, the Xe signal from the 26 March 1992 test would have met previous criteria for a nuclear weapon only if the test had taken place at certain locations within the Nevada Test Site. — NW

Geophys. Res. Lett. 10.1029/2012GL053885 (2012).