EDITORS' CHOICE

EDITED BY KRISTEN MUELLER AND JAKE YESTON

ATMOSPHERIC SCIENCE

What's in a Name?

Last month, as the Grímsvötn volcano delayed air traffic across Northern Europe, travelers were reminded of the more extensive delays in 2010 from another Icelandic volcano. The Eyjafjallajökull volcano resulted in the cancelation of nearly 100,000 flights, due primarily to fears that ash particles would damage the engines of planes passing through or near the volcanic plumes; however, little data existed on the composition of the ash, which can be highly variable depending on magma source and water content. Baker *et al.* now report analysis of whole-air samples collected during three flights through the plumes to determine the quantity of oxidants capable of influencing atmospheric chemistry. Based on the depletion of nonmethane hydrocarbons, chlorine radicals probably didn't contribute to any substantial decrease in the levels of ozone or hydroxyl radicals. Gislason *et al.* found that the properties of the ash particles themselves changed over time as the eruption became less explosive. Initially, they were sharp and hard, but as glacier meltwater mixed with the volcano, salty surface coatings formed on the ash. The link between chlorine-containing salts on ash surfaces and the inferred chlorine radical concentrations is still unknown. — NW

Geophys. Res. Lett. **38**, 10.1029/2011GL047571 (2011); *Proc. Natl. Acad. Sci. U.S.A.* **108**, 7307 (2011).

EDUCATION

A Destination in Time

Deep time, the scale used to measure evolutionary, geologic, and cosmological events, is a difficult concept to teach. By using Google Earth, Parker created a locally adaptable analogy that can be used to teach the relative order of events and the comprehension of the magnitude of deep time. A distance scale of 0.5 mm, a distance still visible to the eye, to 1000 km, a distance that most students have traveled, was correlated to a time scale where 18 years, the average age of Parker's introductory college students, was set to equal to 0.5 mm. Big Ben, a familiar reference point for the students located 126 km away from the lecture hall, was used as the point corresponding to the origin of Earth. By overlaying this newly created linear scale onto a corresponding Google Map, students were able to match key events, such as the extinction of the dinosaurs or the emergence of eukaryotic cells, to the distance that familiar landmarks were from the lecture hall. As for measuring his own success, on a scale of 1 to 5, with 5 being very good, Parker scored a 4.5 from his students, with the majority indicating that they were "blown away" at finally appreciating the true magnitude of deep time. — MM

J. Coll. Sci. Teach. **40**, 23 (2011).

ECOLOGY

Protect the Cavities, Please!

Many vertebrate species that live in forests depend on tree cavities for nesting and shelter. Only a small proportion of these cavity-dependent species, however, actually excavate holes in trees. These species are thus dependent on either the few excavating species, mostly woodpeckers, or decay to create the cavities. This has led to the prioritization of protection for cavity excavators in the hopes of mitigating the impact of the harvest of large old trees, in which decay-created cavities are found. Cockle *et al*. looked at the use of excavated and nonexcavated cavities and at cavity persistence across continents and found striking differences among regions. Woodpeckers were responsible for a large proportion of functional cavities in North America, and these tended to persist over time. In contrast, most cavities used for nesting or shelter in Europe and South America were created by decay, and those that were excavated actively were short-lived. In Australia and New Zealand, all cavities are created by decay, a process that may take over 200 years. These results suggest that cavity excavators may be able to ameliorate some impacts of tree harvest on cavity-nesting species in North America, but that this approach will not work in other regions. — SNV

Front. Ecol. Environ. **9**, 10.1890/110013 (2011).

CHEMISTRY

More Precious Than Platinum?

Solid oxide fuel cells (SOFCs) complete their electric circuit by transporting reduced oxygen ions through a solid electrolyte from cathode to anode. When ceramic oxides are used as the reduction catalyst, the SOFC needs

CREDITS (TOP TO BOTTOM): FOTOSEARCH; MARTJAN LAMMERTINK/CORNELL LABORATORY OF ORNITHOLOGY

Published by AAAS

to operate above 700°C. Platinum catalysts can operate at lower temperature, but they are very expensive and easily poisoned by small concentrations of carbon monoxide (CO) or hydrogen sulfide (H_2S) in the fuel source. Holme and Prinz used density functional theory calculations to design a non-noble metal catalyst with a d-band center near that of platinum, so that only weak metal-oxygen bonds would form. The authors started by looking at alloys of copper and zinc, and found that the best composition was Cu_5Zn_8. When Ag substituted for Cu at the adsorption site, the absorption energy was very close to the ideal value. Particles and dense layers were then fabricated, and the best results were obtained for $Ag_xCu_{5-x}Zn_8$ with an overcoating of Ag. This alloy showed promising performance (though still below that of Pt) and, importantly, had better resistance to H_2S and CO poisoning. — MSL

J. Phys. Chem. C **115**, 10.1021/jp2022538 (2011).

PHARMACOLOGY

Combo That, Please!

The increasing incidence of drug-resistant strains of pathogenic bacteria and the decreasing frequency of discovery of wholly new antibiotics have induced physicians to consider administering more than one drug at a time. How to design these regimens is explored in two studies.

Bollenbach and Kishony have studied the effects of a trio of antibiotics, two of which target the small and large ribosomal subunits, with the third being an antifolate. Applying these two at a time in varying concentrations to an *Escherichia coli* library revealed that the transcriptional response is primarily governed by the overall effect of restraining growth and secondarily predicted by either the average (if the two drugs were agonistic) or the lower bound (for the antagonistic pairings).

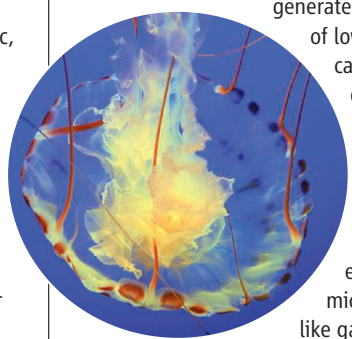
Ejim *et al.* have screened a chemical database of nonantibiotic drugs for compounds that enhance the efficacy of minocycline against *E. coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Salmonella enterica*. One of the candidates was loperamide (Imodium); the mechanism of synergy probably involves changes in membrane permeability on the basis of in vivo tests in a mouse model of infectious colitis. — GJC

Mol. Cell **42**, 413 (2011);
Nat. Chem. Biol. **7**, 348 (2011).

ECOLOGY

Jelly Takeover

Jellyfish are unpalatable to most potential consumers, apart from the hardiest. As the numbers of sea turtles and large fish have plummeted and phytoplankton blooms have increased, the jellies have moved in, and increasing numbers and volumes of jellyfish blooms are being reported. Locally, jellyfish can vacuum up a wide range of swimming prey, thus tipping food web dynamics and potentially altering biogeochemical outputs. Condon *et al.* have discovered that jellyfish blooms in tributaries of the Chesapeake Bay generate large quantities of low nitrogen–high carbon—content dissolved organic matter: jelly-DOM. This in turn selects for normally rare (in the marine environment) microorganisms, like gamma-proteobacteria, which apparently outcompete other microbial taxa to consume the jelly-DOM rapidly. However, their metabolic efficiency is poor, and they respire 45 to 73% of the dissolved carbon generated during a bloom, rather than recycling the carbon in the food web or allowing it to fix and sediment. So the consequences of shifting marine food webs to a preponderance of gelatinous creatures may affect not only fisheries but also atmospheric warming. — CA



Proc. Natl. Acad. Sci. U.S.A. **108**, 10.1073/pnas.1015782108 (2011).

REPRODUCTION

Live Long and Procreate

Speaking in generalities, once an animal leaves its reproductive phase, death is around the corner. Exceptions to this rule can be seen in humans, where postreproductive females continue to assist offspring and often subsequent generations. Another exception seems to be the nematode *Caenorhabditis elegans*. In *C. elegans* populations, only a small percentage of worms exist as males, with the majority of worms being self-fertilizing hermaphrodites. Hermaphrodites can live 70% of their life after bearing all their progeny. Because there was no clear explanation for why this would be, Mendenhall *et al.* explored the fertility of hermaphrodites mated with young males. They found that progeny could be generated by this method much later than "selfed" progeny, up to day 18, which corresponds to the animals' average life span. "Old" gonads reactivated when worms were mated in later life, and reproductive capacity was enhanced upon starvation or dietary reduction. — BAP

J. Gerontol. A Biol. Sci. Med. Sci. **66A**, 10.1093/gerona/glr089 (2011).

CREDIT: FOTOSEARCH

Published by AAAS