

GLOBAL CARBON CYCLE

Uptake uptick

Has global warming slowed the uptake of atmospheric CO₂ by the Southern Ocean? Landschützer *et al.* say no (see the Perspective by Fletcher). Previous work suggested that the strength of the Southern Ocean carbon sink fell during the 1990s. This raised concerns that such a decline would exacerbate the rise of atmospheric CO₂ and thereby increase global surface air temperatures and ocean acidity. The newer data show that the Southern Ocean carbon sink strengthened again over the past decade, which illustrates the dynamic nature of the process and alleviates some of the anxiety about its earlier weakening trend. — HJS

Science, this issue p. 1221; see also p. 1165

ELECTROCHEMISTRY

Improving cobalt catalysts

Tethering molecular catalysts together is a tried and trusted method for making them easier to purify and reuse. Lin *et al.* now show that the assembly of a covalent organic framework (COF) structure can also improve fundamental catalytic performance. They used cobalt porphyrin complexes as building blocks for a COF. The resulting material showed greatly enhanced activity for the aqueous electrochemical reduction of CO₂ to CO. — JSY

Science, this issue p. 1208

NEURONAL IDENTITY

Changing properties of interneurons

Neuronal identity is determined early during development. It is assumed that once a neuron has adopted its identity, this remains stable throughout life. However, Dehorter *et al.* investigated the mechanisms controlling the specification of fast-spiking interneurons. They found that the transcription factor Er81 is crucial for the normal specification of these cells by regulating

the expression of a potassium channel subunit. — PRS

Science, this issue p. 1216

ANTIVIRAL IMMUNITY

Viruses pack antiviral mediators

Viruses often hijack host proteins for their own use, turning host cells into virion-spewing machines. However, Bridgeman *et al.* and Gentili *et al.* now report a sneaky way that the host can fight back (see the Perspective by Schoggins). Host cells that expressed the enzyme cGAS, an innate immune receptor that senses cytoplasmic DNA, packaged the cGAS-generated second messenger cGAMP into virions. Virions could then transfer cGAMP to neighboring cells, triggering an antiviral gene program in these newly infected cells. Such transfer of an antiviral mediator may help to speed up the immune response to put the brakes on viral spread. — KLM

Science, this issue pp. 1228 and 1232; see also p. 1166

CANCER

Shutting off cancer's motor

Glioblastoma is a difficult-to-treat common and aggressive brain tumor. Two mechanisms that contribute to its lethality are proliferation of the tumor cells and their invasion into normal brain tissue. Although these two processes are usually believed to be independent, Venere *et al.* show that a molecular motor, KIF11, plays a role in both. Inhibiting KIF11 with a small molecule blocked the proliferation and invasion of glioblastoma cells and prolonged survival in mouse models of the disease. These findings, together with the availability of a KIF11 inhibitor that is safe for human use, suggest KIF11 as a viable therapeutic target for treating glioblastoma. — YN

Sci. Transl. Med. **7**, 304ra143 (2015).

IN OTHER JOURNALS

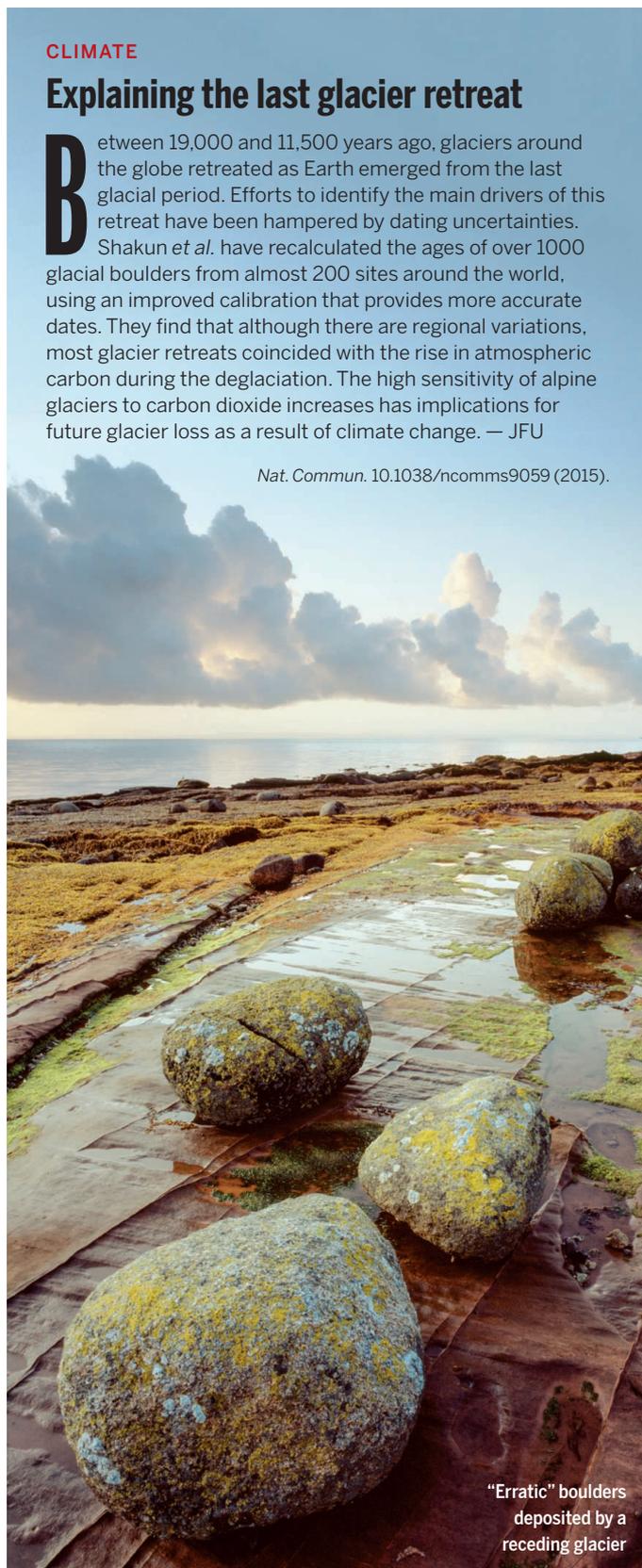
Edited by Jesse Smith and Sacha Vignieri

CLIMATE

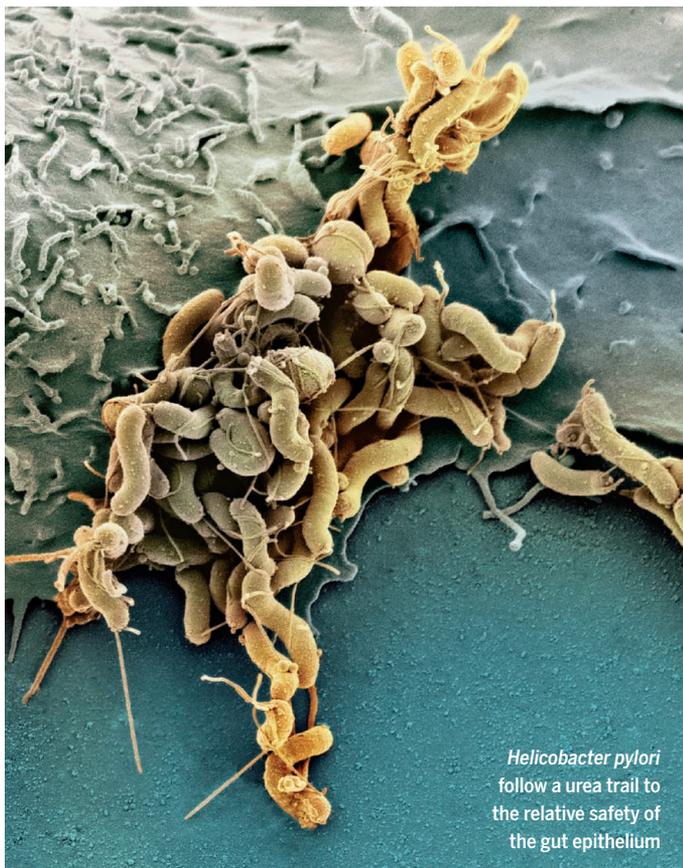
Explaining the last glacier retreat

Between 19,000 and 11,500 years ago, glaciers around the globe retreated as Earth emerged from the last glacial period. Efforts to identify the main drivers of this retreat have been hampered by dating uncertainties. Shakun *et al.* have recalculated the ages of over 1000 glacial boulders from almost 200 sites around the world, using an improved calibration that provides more accurate dates. They find that although there are regional variations, most glacier retreats coincided with the rise in atmospheric carbon during the deglaciation. The high sensitivity of alpine glaciers to carbon dioxide increases has implications for future glacier loss as a result of climate change. — JFU

Nat. Commun. 10.1038/ncomms9059 (2015).



"Erratic" boulders deposited by a receding glacier



Helicobacter pylori follow a urea trail to the relative safety of the gut epithelium

MICROBIOLOGY

Stomach microbe finds a safe haven

Helicobacter pylori causes stomach ulcers and is linked to gastric cancer. How does this microbe survive in the destructive environment of the stomach? Huang *et al.* looked at how *H. pylori* manages to make its way to the gastric epithelium, where it can reside relatively unscathed by the stomach's defenses. *H. pylori* express a protein chemoreceptor, TlpB, that sniffs out urea released by the gut epithelium. The bugs follow a urea trail to the epithelium and simultaneously degrade the urea to generate ammonia and bicarbonate, which can help to buffer the microbe from the stomach acids. The authors watched how the bacteria locate and swim toward epithelia within seconds, attracted by minute amounts of urea. — SMH

Cell Host Microbe **18**, 147 (2015).

PROTEIN DESIGN

Switching off protein production

Controlling protein production is desirable, but current methods are complex, inefficient, difficult to generalize, or not quickly reversible. Chung *et al.* describe a small-molecule-assisted shutoff (SMASh) tag that is

genetically added to a target protein and allows reversible shutoff of various proteins in multiple cell types. The tag includes a site that is cut by a protease and a degron sequence that targets the protein for rapid destruction. Active protease cuts the tag from newly synthesized protein so that it does not disrupt protein function.

However, inhibiting the protease with a clinically approved drug protects the tag, and the degron sequence causes the protein to be rapidly degraded. Stopping the drug restores protein production. — VV

Nat. Chem. Biol. **10**, 1038/nchembio.1869 (2015).

MATERIALS SCIENCE

Brushing up on being soft and squishy

Polymer gels can be thought of as a netlike structure of cross-linked linear polymer chains swollen with solvent. Because these materials are mostly liquid, they can be quite soft and squishy, but this means that solvent loss, which makes the gels sticky, also is a concern. Cai *et al.* fabricated very long poly(dimethylsiloxane) chains with a bottle-brush structure: long backbone macromolecules heavily decorated with short side chains (a bit like a hairy caterpillar), which prevent the long chains from entangling. When crosslinked, these chains formed soft gellike materials with a tunable elastic modulus that was dependent on the crosslink density. — MSL

Adv. Mater. **10**, 1002/adma.201502771 (2015).

METABOLOMICS

Terroir quantified

Wines are characterized not only by year but by vineyard. Anesi *et al.* used chromatography and microarrays to analyze the metabolomes of one variety of the Corvina grape variety grown in different settings in Italy. The study spanned 3 years in order to average effects due to variation in temperature, sunlight, and rainfall. Shifts in the composition of volatile and nonvolatile compounds that correlate with altitude, viticultural practices, and characteristics of the soil revealed the signatures attributable to terroir. — PJH

BMC Plant Biol. **10**, 1186/s12870-015-0584-4 (2015).

NEURODEVELOPMENT

Brain development hamstrung

Mutations in a zinc-finger transcription factor known as Zic2 cause problems in cortical development and can result in schizophrenia symptoms. Studying embryonic mice, Murillo *et al.* show that this protein supports migrations of several types of neural cells during brain development. The loss of Zic2 hobbled Cajal-Retzius cells, which lay the groundwork for further brain development, as well as cells destined to build key relay and integrative centers in the brain. Normal in number, the stranded Cajal-Retzius cells release their signaling molecule reelin in the wrong places. The migration problems may also range through neural development, affecting cells from the prechordal plate to the neural crest that emigrate from the neural tube. — PJH

J. Neurosci. **35**, 32 (2015).

EDUCATION

Assessing chemistry one class at a time

Before changes in a curriculum can be proposed, it is necessary to assess the current state of the course. Fox and Roehrig did exactly that when surveying undergraduate physical chemistry courses in the United States. Data were collected about issues such as depth versus breadth of content, types of assessments, teacher preparation, and beliefs about the challenging nature of physical chemistry, allowing more-informed decisions to be made about the future of physical chemistry education. Two main themes uncovered by the survey, "how can instructors clearly translate learning goals into assessments" and "how can instructors gain more teacher preparation experience," are relevant to all science disciplines and can be used as a starting point for future science education research. — MM

J. Chem. Edu. **10**, 1021/acs.jchemed.5b00070 (2015).