EDITED BY KRISTEN MUELLER AND JAKE YESTON

OCEAN SCIENCE

What Keeps the Storms Away?

The number of hurricanes that develop over the Atlantic Ocean each year and the number that make landfall in North and Central America are two distinct quantities. The difference between the two has great practical consequence, as hurricanes that remain offshore cause few deaths and do little damage to human property or infrastructure. What controls hurricane tracks, then? Wang *et al.* looked at sea surface temperature data from 1970 to 2009 and found that the size and location of the Atlantic warm pool help to steer hurricanes by influencing both where over the Atlantic they form and to what extent ensuing atmospheric circulation patterns push the storms away from the eastern seaboard of the United States. When the Atlantic warm pool is large, storms form more to the east, further from potential landfall, and the winds along their paths blow more strongly toward the northeast, also reducing the chance that the storms ultimately reach a vulnerable coast. Although these are not the only factors that control hurricane tracks, consideration of the sea surface temperature fields of the North Atlantic Ocean may help improve forecasts of potential hurricane dangers. — HJS

Geophys. Res. Lett. **38**, L19702 (2011).

PLANETARY SCIENCE

Why No Clay Up North?

The surface of Mars can be divided into two major regions: the northern lowlands and the southern highlands. The lowlands, covering around 1/3 of the planet, are thought to have once been the site of an ancient, great northern ocean. However, this hypothesis is at odds with the record of the presence of clay deposits. These sediments, whose formation requires the presence of liquid water, are widespread in the southern highlands but very scarcely distributed in the northern lowlands. Using a climate model, Fairén *et al.* determined the surface temperatures on early Mars, assuming a southern supercontinent and a northern ocean. The model temperatures imply that the northern ocean would have had to be a glacial ocean similar to the seas in Earth's polar regions. Calculations of the rate of clay formation at subzero temperatures support the lack of clays in the northern lowlands, because their formation would have been inhibited at those cold temperatures. Moreover, the presence of glaciers surrounding the northern ocean would have limited the transport of continental sediments into the ocean, as is the case in the Arctic and Antarctic coastal regions of Earth. — MJC

Nat. Geosci. **4**, 667 (2011).

ECONOMICS

Resource Investment

As Newton famously noted, researchers stand on the shoulders of giants, building on accumulated knowledge. But the mere production of knowledge does not ensure its use by others; societal benefit depends also on mechanisms for storing and accessing knowledge. Researchers have sought to understand how different institutions and policies can promote knowledge use and impact. To explore impacts of institutional resources in the life sciences, Furman and Stern studied the American Type Culture Collection (ATCC). Among the world's largest bio resource centers, ATCC maintains and distributes a vast collection of cell lines and microbiology cultures. Because each specimen deposited in ATCC is accompanied by an initial characterization in a journal article, bibliometric analyses of article citations provided tools to assess impacts of ATCC. Besides comparing articles that did and did not link to ATCC specimens, the authors also analyzed the timing of citation "boosts," because the deposition of specimens at ATCC often did not occur until sometime after the initial journal article describing the specimen. The ATCC-deposit citation boost ranged from 57 to 135%, was higher for articles in less prestigious journals, and was concentrated on follow-up research into more complex subject matter. A rough approximation of "cost per citation" suggested that funders might consider increased investments in ensuring access to existing research rather than focusing so much on new research. — BW

Am. Econ. Rev. **101**, 1933 (2011).

HYDROLOGY

Rolling Down the River

All rivers naturally move loads of sediments, from coarse sand grains rolling along riverbeds to tiny clay and silt particles carried in suspension. When sediment load gets too high though, either naturally or from human activities, biodiversity suffers and water quality deteriorates. Identifying the sources of increased sediment loads, which can vary with such regional factors as land use and precipita-

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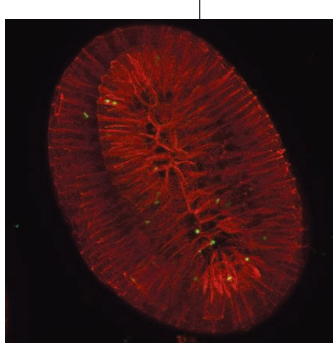
tion, is critical for implementing remediation strategies. As a case study for determining the mechanism of sediment transport on the scale of several watersheds, Belmont *et al.* integrated a number of data sources—including geochemical tracers, hydrologic field measurements, and remote sensing—from tributaries or lakes in Minnesota along North America's largest river, the Mississippi. Over the past 150 years, not only has the amount of fine-grained sediment increased by a factor of 10, but the sources have also changed. Historically, upland erosion of soil contributed most of the sediment load; however, the new data suggest that up to 70% of the sediment comes from the erosion of riverbanks and ravines themselves. The shift is probably a function of both natural and anthropogenic activity, including increased precipitation and extensive modification of drainage networks for agricultural purposes. — NW

Environ. Sci. Technol. **45**, 10.1021/es2019109 (2011).

MICROBIOLOGY

Rapid Transport

E-cadherin is a species-specific receptor for the foodborne pathogen *Listeria monocytogenes* but it is located out of reach beneath the tight junctions formed between gut epithelial cells. Does the dynamic nature of the intestinal epithelium, which is being remodeled constantly, with cells being shed and mucus secreted, allow for E-cadherin to be accessed? Taking a step back from molecular studies of pathogen cell invasion, Nikitas *et al.* watched how *Listeria* invades the body, using humanized mice and two-photon and confocal microscopy. They found that E-cadherin is not perpetually out of sight but becomes exposed to the intestinal lumen when cells are extruded and cell junctions are disrupted by contracting goblet cells or folds in the villi. Once inside the cell, the bacteria have no need for any other virulence factors, neither listeriolysin-O nor ActA (which polymerizes the cell's actin). All that is required is the bacterial surface protein InlA for rapid apico-basal translocation mediated by the cell's microtubules and exocytosis into the lamina propria. Thirty minutes after invasion, and *Listeria* had entered the spleen undetected by immune surveillance and a systemic infection was established. — CA



CREDIT: NIKITAS AND LECUIT

J. Exp.Med. **208**, 10.1084/jem.20110560 (2011).

PSYCHOLOGY

That's Not Yours!

Much ink has been spilled in arguments about what it is that children have learned when they begin to grasp the possibility that other people's beliefs can differ from their own. But what do children comprehend of other people's rights, such as the ownership of property? Rossano *et al.* describe experimental results indicating that 3-year-old children exhibit a more sophisticated understanding of the rights conferred by ownership—in this instance, the disposal of a cap or scarf—than 2-year-olds. Children of both ages complained when their own hat was thrown away by a puppet, and they did not protest when the puppet threw away his own article of clothing; the key distinction was that older kids registered a normative objection when the puppet discarded a hat belonging to a third party (the experimenter). In their introduction to an edited collection, Friedman and Ross enumerate the reasons why research on the developmental origins of ownership will yield findings of interest. — GJC

Cognition **121**, 219 (2011); *New Dir. Child Adolesc. Dev.* **132**, 1 (2011).

CELL SIGNALING

Enlightening the Load

If you have driven a car with a manual transmission, you are aware that the response to the throttle is quite different when the drive train is connected to a "load" (when the clutch is engaged and the engine drives the wheels) than when it is not (when the engine spins freely with the clutch disengaged). Jiang *et al*. explored whether a similar concept of "load" applies to biochemical signaling systems; that is, whether the dynamic properties of a signaling mechanism were altered in the presence or absence of substrate molecules that are targets of the system. Combined experiments and mathematical modeling showed that the presence of substrate could alter the response time of the system, increasing it when one of the enzymes in the signaling system was operating at a maximal rate (saturated) but decreasing it when the enzymes were operating in a linear manner. The authors discuss how such effects of downstream targets on the responsiveness of signaling systems might be used to design appropriate responses when modifying biological systems or designing synthetic ones. — LBR

Sci. Sig. **4**, ra67 (2011).