

## << Sea Ice See-Saw

Global warming is causing a rapid and extensive loss of seasonal sea ice in the Arctic Ocean. This loss is often presented as a general phenomenon, without regard to any possible spatial heterogeneity. Such simple behavior is mostly inferred, however, because there is little evidence of past sea-ice dynamics to allow a more nuanced view.

**Funder *et al.*** (p. 747) present a long-term sea-ice record from northern Greenland and compare it to records from the western Arctic. The results suggest that sea ice in the two regions behaved in a largely complimentary fashion, expanding in the west as it decreased in the east for most of the past 10,000 years.

## Salt Water Gets Fresh

A large proportion of the world's population lives in water-stressed countries, and climate change and population growth will probably add to these numbers. One way to circumvent the limited supply of fresh water dictated by hydrologic factors is to remove the salt from seawater—a virtually limitless resource. Indeed, desalination plants are already in operation around the world, but they are usually expensive and energy intensive. **Elimelech and Phillip** (p. 712) review recent advances in technology and system design that hold the potential to increase the efficiency of seawater desalination while decreasing its cost and environmental impact, potentially making it a viable long-term solution for water scarcity.

## Resistance No Struggle

In the face of the emergence of artemisinin-based drug resistance, we need to find new compounds for the armory against malaria. **Yuan *et al.*** (p. 724; see the cover; see the Perspective by **Cammack**) tested >2800 drugs already approved for use in humans and identified 58 that inhibited almost three-quarters of the parasite strains tested. Despite the diversity of promising compounds, resistance to them was governed by relatively few genes, and drugs that acted on common targets were likely to have common modes of action. Strong geographical patterns were also seen among the resistance phenotypes, confirming that current parasite populations have been shaped by the selective pressure of antimalarials.

## Direction-Dependent Optics

The diode is a key device in electrical engineering and, along with the transistor, has revolutionized the field. The development of optical chips will also require analogous components

capable of one-way operation. **Feng *et al.*** (p. 729) show that quantum mechanical considerations of light propagation and the engineering of optical potentials along the waveguide can lead to one-way propagation in an optical mode. Such an approach for breaking symmetry could prove useful in developing nonreciprocal optical components for on-chip optical communication.

## Cornering Calcium

Manganese can access multiple oxidation states with unusual ease and plays a central role in catalyzing water oxidation during photosynthesis. What's rather less clear is how nature uses not one but four manganese centers, as well as a mysterious calcium ion, to render the process so efficient. **Kanady *et al.*** (p. 733) have taken a step toward resolving this question by preparing a model compound bearing three Mn ions and one Ca ion at four vertices of a cube, with the other vertices occupied by oxygen. Structural and electrochemical characterizations of this compound and a related one with a fourth Mn center in place of Ca suggest that part of the calcium's role may be to stabilize high oxidation states of its Mn neighbors.

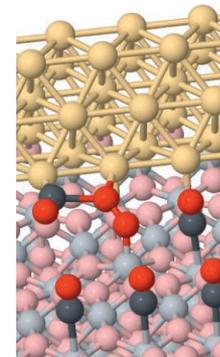
## ENSO and East African Rains

The El Niño Southern Oscillation (ENSO) can affect rainfall in areas far distant from its origin in the equatorial Pacific Ocean. Equatorial East Africa is one of those regions, in which there is more rain during El Niño years and less during La Niña ones. **Wolff *et al.*** (p. 743) explore how long this may have been so by using evidence derived from sediments sampled from Kenya's Lake Challa. The thickness of the annually laminated sediments, which is related to the amount of rainfall, suggests that the variability of precipitation was less pronounced during cold climate intervals such as the Last Glacial period

and more variable during warmer times like today. Future climate warming may thus intensify the hydrological cycle in East Africa.

## Easier at Oxide Sites

During CO oxidation by gold nanoparticles supported on titanium oxide surfaces, it is often assumed that the CO molecules are adsorbed on the gold surface when they react. **Green *et al.*** (p. 736) used *in situ* infrared and temperature-programmed desorption spectroscopy, as well as density functional theory calculations, to show that CO initially reacts not with oxygen atoms on gold sites but with dioxygen that bridges titanium and gold sites at the periphery of the nanoparticles.



## Cycling in Place

F<sub>1</sub>-ATPase is an adenosine triphosphate-driven motor protein in which a rotor rotates in a stator ring. The stator is comprised of domains that hydrolyze ATP and change their conformation depending on the nucleotide bound state. However, it is unclear whether the ring displays intrinsic cooperativity or whether interactions with the rotor are required to control the conformational and catalytic states and generate torque. **Uchihashi *et al.*** (p. 755; see the Perspective by **Junge and Müller**) used atomic force microscopy to image conformational transitions directly in an isolated stator ring. Conformational states propagated cyclically around the ring in a counterclockwise direction. Thus, the stator ring alone displays cooperativity that drives sequential power stroking of the catalytic domains.

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## Who's Calling?

In many species, females prefer elaborate traits in males, such as large antlers or complex songs. Such preferences could select for ever-increasing elaboration in a process known as runaway selection. Female túngara frogs show clear preferences for males with more elaborate calls, as do the bat predators of these frogs. However, **Akre *et al.*** (p. 751; see the Perspective by **Rowe and Healy**) show that in both cases the preference is actually dependent upon the ratio of call components between a pair of callers. Thus, it is not the complexity of a call, but the perception of the receiver, that matters.

## Martian Waves

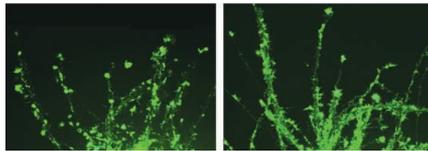
The presence of liquid water on present-day Mars is a highly debated topic, not least because of its importance to the question of habitability. Using data from NASA's Mars Reconnaissance Orbiter, **McEwen *et al.*** (p. 740) describe observations of transient and recurring slope features that form only at the times and places that reach the warmest temperatures in the shallow subsurface of Mars. The observations might be explained by flowing liquid, salty water and suggest the potential for small places where water could reach the surface of Mars.

## Convergent Degradation

Agaricomycete fungi can establish a mutualistic symbiotic interaction with trees (biotrophy) as well as saprotrophic associations with dead wood. **Eastwood *et al.*** (p. 762, published online 14 July) sequenced the genome of the "dry rot" fungus *Serpula lacrymans* and performed comparative and functional genomics on a range of divergent fungal nutritional modalities. Brown rot evolution may have occurred through the fusion of aspects of saprotrophy and biotrophy from a common white rot fungal ancestor. Furthermore, these fungi may have coevolved with their host trees.

## Development's a No-Go Without a Nogo Antagonist

In fluorophore-assisted light inactivation (FALI), antibodies are used to target a fluorophore to a protein of interest, which, upon appropriate illumination, can then be used to specifically reduce the function of the target protein. **Sato *et al.*** (p. 769) used FALI to screen a pool of antibodies to find proteins that influenced development of olfactory neurons in mice and identified LOTUS (lateral olfactory tract usher substance). Another screen for proteins that could interact with LOTUS identified Nogo receptor-1 (NgR1), which prevents regeneration of nerves in adult mammals. During development, LOTUS appears to keep other ligands from activating NgR1, which might otherwise prevent proper migration of axons.



## Malignant Modification

Many human leukemias are characterized by chromosomal translocations that join two unrelated genes. The resulting fusion proteins are specific to cancer cells and can cause uncontrolled cell growth. One of the most common fusion genes in acute myelogenous leukemia encodes an oncogenic fusion protein called AML1-ETO, a transcriptional regulator. **Wang *et al.*** (p. 765, published online 14 July) studied mouse models as well as leukemic cells from patients, and found that the oncogenic activity of acute myelogenous leukemia-ETO requires that the protein carry a specific posttranslational modification (acetylation of lysine 43). Targeted removal of this acetyl group could thus be a useful therapeutic strategy for AML1-ETO-linked leukemias.

## Google Heads

One of the central themes of memory research has been to understand the encoding of the actual object, word, or face to be remembered and subsequently retrieved. Research into encoding and how it influences recognition and recall has tended to focus on the contents of memory. Dimly remembered items might be searched for in any number of sources, and **Sparrow *et al.*** (p. 776, published online 14 July) describe a series of experiments documenting the primacy of search over encoding. When people were provided with new information, they were more inclined to devote memory capacity to location rather than content.

CREDIT: SATO ET AL.