What causes the pattern of sea surface temperature change that is seen in the North Atlantic Ocean? This naturally occurring quasi-cyclical variation, known as the Atlantic Multidecadal Oscillation (AMO), affects weather and climate. Some have suggested that the AMO is a consequence of variable large-scale ocean circulation. Clement et al. suggest otherwise. They find that the pattern of AMO variability can be produced in a model that does not include ocean circulation changes, but only the effects of changes in air temperatures and winds. — HJS


New drug target for Alzheimer’s?

Mouse models do not fully capture the degeneration of brain networks seen in human Alzheimer’s disease (AD). Thus, extensive validation of therapeutic targets in many animal models must precede human clinical research. Huang et al. now show that the absence of G protein–coupled receptor 3 (GPR3), a protein expressed in the brain, alleviated cognitive deficits and reduced amyloid pathology in four disease-relevant mouse models of AD. Furthermore, postmortem brain tissue from a subset of AD patients revealed elevated GPR3. Thus, GPR3 may represent a therapeutic target in AD. — OMS


Stringing together a powerful amplifier

Amplifying microwave signals with high gain and across a broad range of frequencies is crucial in solid-state quantum information processing (QIP). Achieving broadband operation is especially tricky. Macklin et al. engineered an amplifier that contains a long chain of so-called Josephson junctions (see the Perspective by Cleland). The amplifier exhibited high gain over a gigahertz-sized bandwidth and was able to perform high-fidelity qubit readout. Because the amplifier will be capable of reading out as many as 20 qubits simultaneously, it may help to scale up QIP protocols. — JS

Macklin, R. L. et al. Science, this issue p. 307; see also p. 280

Changes over time build neuronal diversity

Although neural progenitors can keep generating new neurons, they can generate different neurons as the organism develops. Two different sections of the Drosophila brain, the mushroom bodies and the antennal lobes, show this characteristic, although the antennal lobes produce more different types of neurons over development than do the mushroom bodies. Liu et al. identified two RNA-binding proteins that manage this change over development in both settings. — PJH

Liu, X. et al. Science, this issue p. 317

For gene enhancers, less is more

Weak enhancer sequences provide just the right amount of gene activity. Farley et al. systematically examined millions of synthetic variants of the Otx enhancer, a motif needed for gene expression in the nervous system of the sea squirt Ciona. Proper gene activity resulted when there were imperfect matches to the motif showing strongest enhancer binding and gene activation. When “optimal” motifs were incorporated,
ectopic expression ensued, with aberrant gene activation outside the nervous system. — BAP

Science, this issue p. 325

SMALL NONCODING RNA
A Gaulish partner in silencing transposons
Small noncoding piRNAs protect animal germline genomes from devastating mutation and rearrangement caused by transposons. In fruit fly ovaries, piRNAs bind to Piwi proteins, and together they are required for the recognition and silencing of these parasitic DNA elements. Yu et al. show that the gene Panoramix acts downstream of the piRNA-driven recognition of transposons to silence their transcription. Panoramix does this by binding newly synthesized transposon RNAs. — GR

Science, this issue p. 339

BIOMATERIALS
Sensing the force digitally
Our skin provides us with a flexible waterproof barrier, but it also contains a sensor array that feels the world around us. This array provides feedback and helps us to avoid a hot object or increase the strength of our grip on an object that may be slipping away. Tee et al. describe an approach to simulate the mechanoreceptors of human skin, using pressure-sensitive foils and printed ring oscillators (see the Perspective by Anikeeva and Koppes). The sensor successfully converted pressure into a digital response in a pressure range comparable to that found in a human grip. — MSL

Science, this issue p. 314; see also p. 274

T CELL IMMUNITY
Dying to impress the immune system
Besides reacting to microbes, T cells can also mount immune responses to fragments of dying cells, which they encounter displayed on dendritic cells. Not all dying cells activate T cells, however, so what differentiates the dying cells that do? Yatim et al. studied two forms of programmed cells death: apoptosis and necroptosis. Using mouse cells in culture and mouse models of inflammatory cell death and anti-tumor immunity, they found that programmed cell death initiated T cell immunity only when the dying cells signaled through the enzyme RIPK1 and the transcription factor NF-κB. — KLM

Science, this issue p. 328

CALCIC SIGNALING
Calcium signals down to the millisecond
Engagement of the T cell receptor (TCR) stimulates Ca^{2+} signaling, which is required for T cell activation. The earliest, short-lived Ca^{2+} signals appear near the sites of TCR stimulation. Wolf et al. performed high-resolution imaging of Ca^{2+} signals within milliseconds of stimulation of the TCR in live mouse and human T cells. Microinjection of cells with the second messenger NAADP, which is generated upon T cell activation, produced a similar spatiotemporal pattern of Ca^{2+} signals in the absence of TCR activation. Both TCR- and NAADP-dependent signals appeared to trigger the release of Ca^{2+} from the endoplasmic reticulum. — JFF


IN OTHER JOURNALS
Edited by Kristen Mueller and Jesse H. Smith

PRIMATE BEHAVIOR
Great apes can anticipate
Humans can process and store memories as events occur. For example, when we rewatch movies, we can recall and anticipate what will happen next. Kano and Hirata tested whether nonhuman primates also possess this skill by presenting bonobos and chimpanzees with short films and tracking their eye movements. In one film, the apes watched as a villain attacked an actor in a King-Kong suit with one of two objects. Twenty-four hours later, the scientists presented the apes with the same scene, but switching the objects location. Most of the apes focused their attention on the previously weaponized object shortly before the attack, indicating that they had memorized the events during the previous viewing and could anticipate what happens next. — LNS


CANCER
Disrupted signaling networks in cancer
For personalized cancer therapy to succeed in the clinic, scientists need to identify and understand how genetic mutations in tumor cells can drive CBCs have both redundant and specific functions, with the alternative CBC seemingly being specifically critical for survival under stressful conditions, such as viral infection. — GR

Nat. Comm. 6, 10.1038/ncomms9192 (2015).
PLANETARY SCIENCE

New Horizons’ views of Pluto

The flyby of Pluto and its moon Charon by the New Horizons spacecraft generated news coverage around the world. Now Stern et al., report the first scientific results from the high-speed encounter. The surface of Pluto is surprisingly diverse, with large regions of differing brightness and composition. There is ample evidence for ongoing rich geologic processes that act to sculpt its surface. Charon’s surface is similarly complex, with numerous relief structures and varied coloration. Pluto’s atmosphere is extensive but less dense than expected, whereas Charon has no detectable atmosphere. — KTS

Science, this issue p. 292

SYNTHETIC BIOLOGY

Keeping a leash on cancer-killing cells

Redirecting the immune system to attack tumor cells is proving to be an effective therapy against cancer. However, when patients are exposed to T cells engineered to recognize and attack cancer cells, there is a risk of runaway or excessive activity or of off-target effects, both of which can themselves be deadly. Wu et al. designed T cells expressing chimeric antigen receptors that recognize and attack cancer cells with an additional control system. This mechanism would allow a doctor administering the therapy to turn the engineered T cell “on” or “off” by administering a small molecule that is required along with cancer cell antigen to stimulate the T cells and activate their tumor cell–killing properties. — LBR

Science, this issue p. 293

CATALYSIS

A direct route from acids to alcohols

Making alcohols via hydrogen addition to C=O bonds is among the most widely applied reactions in chemistry. The transformation has also garnered renewed interest for generating commodity chemicals from biomass. Korstanje et al. now show that a cobalt compound can catalyze hydrogenation of the C=O bonds in carboxylic acids. These constitute a particularly challenging substrate class, given the propensity of many other catalysts to degrade under acidic conditions. The cobalt catalyst tolerates a versatile substrate range, and the Earth abundance of the metal bodes well for long-term utility. — JSY

Science, this issue p. 294

SEPARATION MEMBRANES

Grabbing CO₂ from wet gas streams

It is a challenge to extract CO₂ from typical gas streams, such as the flue gas from a power plant. This is because any water in the stream tends to prevent CO₂ absorption and may also degrade the absorbing material. Datta et al. developed a microporous copper silicate that avoids these problems. Most other materials have sites that absorb both water and CO₂ at the same sites, and in that fight, the water tends to win. Although their material still absorbs water, it has separate sites for the CO₂ absorption. It also shows good stability despite the absorbed water and can be reused. — MSL

Science, this issue p. 302

ORGANIC SYNTHESIS

Getting a handle on a cross-linking motif

Although protein backbones consist exclusively of amino acids, various other molecules in the cell often get latched on afterward in a process termed posttranslational modification. In one such motif, called glucosepane, the side chains of lysine and arginine form a condensed cross-link through a reaction sequence with glucose. Formation of this cross-link is of interest in diabetes research. Draghici et al. now report a chemical synthesis of glucosepane outside the broader environment of a surrounding protein (see the Perspective by Boger). This synthesis should facilitate more precise characterization of the structure and function of the motif in vivo. — JSY

Science, this issue p. 294; see also p. 275

T CELL IMMUNITY

How T cells maintain their identity

Although best known for their pathogen-fighting prowess, T lymphocytes also ensure that the immune response does not run amok. A subset of T cells called regulatory T cells (Tregs) performs this function by, for example, making sure T cells only attack pathogens and not self. T cells can exhibit plasticity in their functions in the face of an inflammatory stimulus. Kim et al. sought to identify the molecules that ensure the stable maintenance of Tregs. Using genetically modified mice, they found that both CD4⁺ and CD8⁺ Tregs require the transcription factor Helios to stably maintain their identity. — KLM

Science, this issue p. 334

OCEANOGRAPHY

Understanding abyssal hill spacing

The most prominent topographic features on Earth are abyssal hills found on the bottom of the ocean floor. Olive et al. wanted to understand the spacing and size of these hills. They used a model that combines magma supply and the mechanical response of the crust. The model explains observations of hill spacing around mid-ocean ridges. Crustal topography appears to be a poor recorder of changes in magma supply. However, magma supply changes may be faithfully recorded at the base of the crust. — BG

Science, this issue p. 310

TRANSCRIPTION

A tripartite gene silencing complex

The formation of specialized cell types during development involves the silencing of genes not required in those cell types. An important player in this silencing process is the polycomb repressive complex 2 (PRC2), which methylates histone H3 on lysine residue 27 (H3K27me). Jiao and Liu determined the x-ray crystal structure of a functional PRC2 complex from a thermophilic yeast species (see the Perspective by Schapira). The intimate association of the three subunits confers stability to PRC2. The structure also reveals how the reaction product, H3K27me, stimulates PRC2 allosterically and how a cancer-associated histone mutation blocks the PRC2 active site. — GR

Science, this issue p. 291; see also p. 278

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**PLANETARY SCIENCE**

**Close encounter with Mars**

On 19 October 2014, comet Siding Spring passed Mars, close enough for numerous spacecraft and rovers on the red planet to study it. In a Perspective, Lisse explains that the comet came from the Oort Cloud in the far reaches of the solar system. Little is known about the Oort Cloud comets, few of which ever visit the inner solar system. The flyby yielded unprecedented data about the size, chemical composition, and other properties of Siding Spring. It also showed that comets can deposit substantial amounts of material in planetary atmospheres. — JFU

*Science* this issue p. 277