ectopic expression ensued, with aberrant gene activation outside the nervous system. — BAP

**BIOIMATERIALS**

**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

**IN OTHER JOURNALS**

**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

**CALCULOUS SIGNALING**

**Calcium signals down to the millisecond**

Engagement of the T cell receptor (TCR) stimulates Ca²⁺ signaling, which is required for T cell activation. The earliest, short-lived Ca²⁺ signals appear near the sites of TCR stimulation. Wolf et al. performed high-resolution imaging of Ca²⁺ 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 Ca²⁺ signals in the absence of TCR activation. Both TCR- and NAADP-dependent signals appeared to trigger the release of Ca²⁺ from the endoplasmic reticulum. — JFF

**RNA PROCESSING**

**Tipping your RNA cap to stressful times**

RNAs transcribed by RNA polymerase II have a chemical “cap” added to their 5’ ends. The cap binding complex (CBC), which consists of the nuclear cap binding protein (N CBP) 1 and N CBP2, binds to the cap and ensures proper RNA processing and localization within the cell. Gebhardt et al. discovered a second, alternative CBC, which consists of N CBP1 and a previously poorly characterized but highly conserved protein, christened N CBP3. The two

**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

**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...
For gut T cells, it’s location, location, location

Specific members of the gut microbiota promote the development of different subsets of T lymphocytes in the gut, thereby modulating gut immunity. One example is segmented filamentous bacteria (SFB), which drive the differentiation of T helper 17 (T\textsubscript{H}17) cells. The cellular and molecular mechanisms that support this process remain poorly understood. Atarashi \textit{et al.} now demonstrate that several species of bacteria able to adhere to intestinal epithelial cells, including SFB, drive T\textsubscript{H}17 cell differentiation in rodents. Sano \textit{et al.} found that SFB primed T\textsubscript{H}17 cells in mesenteric lymph nodes. However, these cells only produced interleukin-17, their signature cytokine, in regions of the gut where SFB makes contact with epithelial cells that secrete the inflammatory protein serum amyloid A. — KLM


Hydrology

Smart rocks teach river lessons

Rivers are conveyor belts of erosion, transporting material from continents to the oceans. Measuring how larger gravel and cobbles travel along a riverbed is challenging because of the stochastic nature of grain movement and the dependence on infrequent yet powerful flood events. Olinde and Johnson measured bed load transport in Reynolds Creek in the Owyhee Mountains (Idaho, USA) using hundreds of natural and artificial rocks with radio-frequency identification (RFID) tags and accelerometers as passive and active tracers. After a series of flood and snowmelt events, these “smart rocks” provided direct statistics on bed load displacement, in some cases over 7 km downstream, and rest times as a function of discharge. — NW


Quantum electronics

Quantum processing takes to the waves

The power of quantum computers is expected to be realized only once the individual components, the quantum bits (or qubits), can be linked up into a large-scale system. Success also requires that the quantum information be reliably transported from one part of the system to another for processing. With several different approaches being undertaken, Schuetz \textit{et al.} propose that surface acoustic waves could propagate the quantum information across a diverse set of solid-state architectures. With piezoeactive materials forming a connected network between qubits, they show theoretically that the quanta should be able to “surf” the acoustic excitations for a variety of on-chip implementations of a quantum computer. — ISO


Geophysics

Coupled constraints on core formation

The composition of Earth’s core puts important constraints on the formation and evolution of the planet. Badro \textit{et al.} apply a new approach that requires harmony between the geochemistry of the rocky mantle and the seismic wave speed velocities in the metal core. The approach requires a core with more oxygen and less silicon than in older models. Surprisingly, this in turn requires a more oxidized mantle for the early Earth, similar to that of the asteroid 4-Vesta. Core formation then dramatically alters mantle chemistry, producing the more reduced mantle observed today. — BG


Uncontrolled cell growth. In two studies, Creixell \textit{et al.} present theoretical, computational, and experimental analysis of the mechanisms by which mutations might alter a cancer cell’s biochemical regulatory networks. A computational approach helped define the molecular basis of substrate specificity of protein kinases, enzymes well known to contribute to certain forms of cancer. Such understanding can help define mutations that would cause signaling to go awry in cancer cells. Their results support the idea that besides modifications that activate or suppress normal signaling events, cancer cells may also accumulate mutations that actually rewire regulatory pathways. — LBR