even death. Balmer et al. now show that the blood vessels of the healthy liver form a barrier to runaway gut bacteria. However, in animal models of liver disease and gut dysfunction and in patients with nonalcoholic liver disease, the liver is unable to capture these escapees. The bacteria then leak into the blood system, activating immune responses that break down the mutualistic relationship between the gut microbes and the host. This type of breakdown is an important complication of liver disease. — OMS


BONE PHYSIOLOGY

Another way of growing strong bones

To stay strong, bones are constantly rebuilding themselves. Thyroid hormones regulate this process by entering cells and binding to nuclear receptors, which travel to the nucleus, where they change gene expression. However, these hormones also stimulate rapid cellular changes that do not require gene regulation. Kalyanaraman et al. found a different form of nuclear receptor in bone cells. When bound to thyroid hormones, this receptor increased the numbers of bone cells and protected them from death. When the researchers treated mice lacking thyroid hormones with a compound that mimicked the effects of this receptor, their bone cells grew normally. — JFF


NEUROSCIENCE

Decisions, decisions, decisions...

Flies, like humans, deliberate before making perceptual judgments: They ponder difficult decisions longer than they do easy ones. DasGupta et al. measured reaction times in flies choosing between different smells. Mutations in a particular gene, they found, could cause indecision. Mutations in the same gene are implicated in intellectual disability, learning deficits, and language impairment. — PRS

Science, this issue p. 901.

NEUROSCIENCE

How the brain responds to fairness

Many people consider freedom of choice and fairness fundamental values, but what are their neural bases? To probe the question, Aoki et al. had pairs of people put their heads in functional magnetic resonance scanners and then play a game. When both players were offered an equal number of choices, they were more likely to report feeling happy, and their brain scans showed increased activity in the area called the ventromedial prefrontal cortex. In contrast, when the combined absolute number of options available to players increased, so did activity in the ventral striatum. Because these regions have been implicated already in value processing, these results may illuminate how a sense of fairness evolved in the human brain. — PRS


IN OTHER JOURNALS

Edited by Kristen Mueller and Jesse Smith

CANCER IMMUNOLOGY

Origins of tumor macrophages

To help the immune system fight cancer, it is important to understand the origins and functions of immune cells in tumors and the surrounding tissues. One type of immune cells, macrophages, is present both in tumors and in nearby noncancerous tissue, but the relationship between these two cell populations is unclear. Franklin et al. found that tumor-associated macrophages in mouse mammary cancers differed in form, function, and origin from macrophages found in nearby noncancerous mammary tissue. Moreover, when they removed macrophages from the tumors but not the other mammary tissue, tumors shrank and cytotoxic T cells—another kind of immune cell that kills tumor cells—infiltrated the tumors. Tumor-associated macrophages may thus be an important therapeutic target. — KLM

Science, this issue p. 921.

CELL MOTILITY

Cells need to stay in shape, too

To move efficiently, people need to stay in shape—and the same is true for cells. Burnette et al. looked at the 3D organization of contractile fibers used by living animal cells as they crawled about on a surface. The cells adopted a wedge-like shape with a wide, flattened front end dragging a slim rear. To keep moving, the cells used a counterbalanced contraction-adhesion system. At the top of the cell, a network of contractile fibers made from actin and myosin (the same proteins used in muscles) coupled to noncontracting stress fibers anchored to the cell’s surface. Understanding how cells move is important for understanding normal development, wound healing, and metastasizing tumor cells. — SMH

**RESEARCH | IN OTHER JOURNALS**

**HOST DEFENSE**

**Cas proteins help acquire immunity**

Bacteria and archaea are under constant attack from foreign genetic elements. The CRISPR-Cas immune system affords protection from such invaders. Upon encountering foreign DNA, the CRISPR-Cas system creates DNA fragments that match the sequences of the invading foreign DNA and then inserts these DNA fragments, or “spacers” into the microbe’s genome. That way, the next time the organism encounters something similar, it can quickly recognize it and defend against it through an RNA interference–like mechanism. By solving the crystal structures and performing additional biochemical analysis, Núñez et al. now uncover the specific functions of the enzymes Cas1 and Cas2. Acting as a complex, Cas1 and Cas2 help bacteria and archaea acquire DNA spacers and insert them correctly into the host genome. — VV

*Nat. Struct. Mol. Biol. 10.1038/nsmb.2820 (2014).*

**APPLIED PHYSICS**

**An attractive-sounding proposition**

Dmore et al. are using sound to build a better tweezer—or at least, to show how it could be done. Today’s optical and acoustic tweezers typically use intensity gradients to trap and manipulate the particles. That’s because propagating fields, such as light and sound are usually associated with positive forces—the radiation pressure they create tends to push objects away. In contrast, Demore et al. have figured out how to use sound not just to push, but to pull. They use an array of ultrasonic resonators to show how the wavefront of a propagating beam of sound can be shaped to apply negative radiation pressure, creating a tractor beam. The new technology could give surgeons and astronauts greater dexterity as they perform operations and repairs from a distance. — ISO


**MARINE BIOLOGY**

**Why octopuses don’t get tied in knots**

An octopus’s appendages can form seemingly infinite postures and positions, but somehow they avoid becoming hopelessly entangled. The key appears to be chemicals in the skin, By examining amputated arms from the common octopus (*Octopus vulgaris*), Nesper et al. found that the animal’s suckers would latch on to everything except its own arms. Petri dishes coated with the octopus’s skin, whether intact or ground up into a mush, became “immune” to the zombie arms, suggesting that a substance in the skin repels the suckers. As octopuses are known to dine on their comrades, the substance may also prevent them from eating themselves alive. — NA


**ASTROPHYSICS**

**A chilly little neighborhood object**

There’s a chilly little neighbor lurking near the Sun, just ~7 light years away. Luhman detected the substellar object, a brown dwarf, by tracking the relative motions of objects in infrared images. Unlike the Sun, such low-mass objects cannot sustain the hydrogen fusion necessary to radiate visible light, so they produce energy primarily at thermal wavelengths. The brown dwarf probably has a mass 3 to 10 times that of Jupiter and a temperature near the freezing point on Earth, making it the coldest brown dwarf detected so far. That means astrophysicists will be able to test atmospheric models at new thermal low values. — MMM


**OCEANOGRAPHY**

**What goes in does not come out**

Vast swaths of floating plastic debris in a northern Pacific Ocean region have earned it a grim nickname: the Great Pacific Garbage Patch. But how much plastic really floats in the Pacific? Different research teams use different methodologies, and coverage is often patchy, making data notoriously difficult to obtain and compare. Using data spanning over 40 years, Law et al. report maps of plastic debris concentrations in the Eastern Pacific and estimate that at least 21,000 metric tons of microplastic are floating in the region. However, despite increased plastic production over the past decade, they could not detect an increase in plastic debris over time. Data coverage may be insufficient for capturing such trends. — JFU


**RNA TRANSLATION**

**Yeast’s translational hopscotch**

Ribosomes translate mRNA into proteins sequentially, one codon at a time—except when they don’t. Lang et al. now report that many of the mitochondrial genes in the yeast *Magnusomyces capitatus* are infested with short sequence inserts that should kill the translation of the coded protein and, in theory, the yeast as well, but don’t. Why not? The M. capitatus protein-synthesizing machinery was able to ignore the inserts and make functional proteins. The protein-synthesizing ribosomes recognized a special element in the mRNA that warned of the inserts. The ribosome then "hopped" from the upstream codon to an identical or very similar codon downstream, clean over the insert, leaving the insert out of the protein it made. — GR


**PHOTO:** J. K. MAREZ ET AL., NATURE STRUCTURAL & MOLECULAR BIOLOGY 10.1038/nsmb.2820 (2014) © 2014 NATURE PUBLISHING GROUP; MIKE MACDONALD AND CHRISTINE DEMORE

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