exchange reactions, which allows the material to flow at high temperatures while still retaining a cross-linked structure. —MSL
Science, this issue p. 62

RESEARCH ECONOMICS

Patents from papers both basic and applied
Public funding for research depends on the idea that the resulting knowledge translates into socially valuable outcomes, such as medicines. Such linkages are easier to assert than to prove. Li et al. studied 27 years of grant-level funding by the U.S. National Institutes of Health. About 10% of grants are directly cited by patents, suggesting some technological application, and 30% of grants are cited in research articles that are then cited in patents. Five percent of grants result in papers cited by patents for successfully approved drugs, compared with less than 1% that are cited directly by such patents. These patterns hold regardless of whether the research is more basic or applied. —BW
Science, this issue p. 78

EMERGING INFECTIONS

Fighting filoviruses with antibody therapy
Ravn and Marburg viruses cause hemorrhagic fever with high morbidity rates in humans. Mire et al. tested the ability of previously identified human monoclonal antibodies to protect guinea pigs from lethal infection. One candidate antibody was administered 5 days after otherwise lethal Marburg or Ravn infection in nonhuman primates and was able to reduce clinical symptoms and confer almost uniform protection. This antibody is a promising therapeutic that could be helpful in future filovirus outbreaks. —LP

VIRAL GENOMICS

The evolution of giant virus genomes
Some giant viruses encode a genome larger than that of some bacteria, but their evolutionary history is a mystery. Examining the genomes within a sample from a wastewater treatment plant in Austria, Schulz et al. assembled a previously undiscovered giant virus genome, which they used to mine genetic databases for related viruses. The authors thus identified a group of giant viruses with more genes encoding components of the protein translation machinery, including aminoacyl transfer RNA synthetases, than in other giant viruses. Phylogenetic analyses suggest that the genes were acquired in an evolutionarily recent time frame, likely from, and as an adaptation to, their hosts. —LMZ
Science, this issue p. 82

BIOMEDICAL ENGINEERING

Nanoparticles for drug delivery in lungs
Engineering drug-delivery nanoparticles for adhesion to mucus can increase their residence times in lungs. Schneider et al. alternatively developed mucus-penetrating nanoparticles that exhibit greater retention in the lung and enhanced drug-delivery capability. Retention was related to the size of the particles; those smaller than the average mesh spacing of airway mucus were able to penetrate it, thus defeating physiologic mucus clearance. The result was a more effective and uniform distribution of the particles within the mucus and greater efficacy in a mouse model of acute lung inflammation. —PLY

MICROBIOME

Immune sensor maintains gut microbiome
Emerging evidence indicates that the immune system can influence microbiome composition. Chen et al. now report that patients with active ulcerative colitis have low expression of NLRP12, which is best known for its role in immune responses. The authors further show that the function of NLRP12 in immune regulation contributes to the maintenance of the intestinal microbiome. Mice that were deficient in NLRP12 had a consistent predominance of the Erysipelotrichaceae family of bacteria, which correlates with greater colon inflammation in both humans and mice. Replenishing the colons of mice with specific “good” bacteria reduced inflammation and resulted in overall better colon function. In addition, neutralizing the inflammatory cytokines interleukin-6 and tumor necrosis factor with blocking antibodies also restored protective bacteria. —PNK

NEUROSCIENCE

Where to keep information about others?
Because humans are social animals, it is important for us to store information about others, such as how they look and sound, who they are, and our general impressions. Little is known about how and where in the brain this kind of information is stored. Wang et al. invited subjects to learn biographical facts about a number of imaginary individuals and later scanned their brains during a memory test. They found that portions of a brain region called the anterior temporal lobe represented knowledge about other people in an abstract form. Different content areas of this knowledge—social status, personality traits,
and identity—were represented in discrete nodes within a distributed person-identification circuit. —PR S

**QUANTUM MECHANICS**
Fine-tuning a quantum witness
Quantum entanglement produces correlations between particles that cannot be described classically, and it is a resource sought out in many applications to leverage the quantum advantage over classical operation. However, determining whether particles are entangled is a complex process that can require a set of measurements (the witness) to establish the extent of the correlations between them. Shanhandeh et al. describe a protocol that should simplify the job of the witness somewhat. Using already known information about the systems, they demonstrate that entangled and unentangled states can be distinguished using fewer measurements. Extendable to larger systems, the simplified but enhanced witness should prove useful in quantum devices for which verifying entanglement is required. —ISO

**NEURODEVELOPMENT**
Folate manages cell shape during neurulation
During neurulation in vertebrate embryos, a topologically flat surface pinches off a tube to form the central nervous system. Deficiencies in folate can cause failure to close that tube, leading to birth defects such as spina bifida. Balashova et al. used the amphibian *Xenopus laevis*, in which neurulation is externally visible on developing embryos, to parse what goes wrong. The analysis points to a key role of folate receptor-α, found at the right time and place—at the apical surface of the neural plate—where it interacts with cytoskeletal and adherens junction components. The changes in tissue shape that signify neurulation follow from changes in the shape of the constituent cells: As cellular apices constrict, the tissue folds. Folate seems to function here not in its metabolic capacity, but as a signal modifying cellular shape. —PJH

**CORAL REEFS**
Threats of coastal hypoxia
Global alarm about the fate of tropical coastal coral reefs has recently been heightened by bleaching events brought about by El Niño. Altieri et al. focus on a potential additional source of mortality: “dead zones” resulting from hypoxic conditions. These zones of low dissolved oxygen are well known along temperate coasts but are now a potential threat in tropical coastal waters, too. The hypoxic event recorded by the authors on the Panamanian coast led to coral bleaching and mortality of reef organisms. Corals in tropical waters elsewhere may be at risk from similar events. —AMS

Dead zones, often seen in temperate regions, may be a threat to coral reefs.

**GEOCHEMISTRY**
What goes down comes back up
Earth’s oceans are thought to have come from a slow outgassing of water from the mantle during planet formation. However, we also know that volatiles can be recycled during subduction of ocean crust. Kendrick et al. turned to a suite of geochemical data to look at the impact of recycling on volatile outgassing, which turns out to dominate the volatile budget. Their results point to a heavily processed mantle in which volatiles are introduced by subduction and released as crust dehydrates. This discovery implies an early Earth in which surface water was recycled into the mantle and outgassed back onto the surface, without the need to invoke deep mantle reservoirs. —BG
Nat. Geosci. 10.1038/ngeo2902 (2017).

**CHIRAL SEPARATIONS**
Selecting drugs with peptide networks
Molecules containing a chiral center exist as enantiomers, or inequivalent mirror images. For drug molecules, purifying the active enantiomer can be critical because the other can have adverse side effects. Navarro-Sánchez et al. synthesized a metal organic framework with Cu(II) centers and peptide linkers (Gly-L-His-Gly) through a slow diffusion process and showed that it can separate the enantiomeric forms of two common drugs, metamathetamine and ephedrine, by selective adsorption. Simulations suggest that hydrogen bonding drives preferential binding. More than 50% of the (+)-ephedrine enantiomer is adsorbed in under 4 min in solid-phase extraction. —PDS

Changes in cell shape signaled by folate lead to changes in tissue shape.
Fine-tuning a quantum witness
Ian S. Osborne

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