CANCER IMMUNOTHERAPY

Gut microbes affect immunotherapy
The unleashing of antitumor T cell responses has ushered in a new era of cancer treatment. Although these therapies can cause dramatic tumor regressions in some patients, many patients inexplicably see no benefit. Mice have been used in two studies to investigate what might be happening. Specific members of the gut microbiota influence the efficacy of this type of immunotherapy (see the Perspective by Snyder et al.). Vétizou et al. found that optimal responses to anticytotoxic T lymphocyte antigen blockade required specific Bacteroides spp. Similarly, Sivan et al. discovered that Bifidobacterium spp. enhanced the efficacy of antiprogrammed cell death ligand 1 therapy. — KLM
Science, this issue, pp. 1079 and 1089; see also p. 1031

ECOLOGY

How herbivores affect ecosystems
Abiotic forces, such as fire and water, have powerful effects on ecosystem structure and function. Animals that eat plants also have strong effects in natural systems, but their impacts are harder to assess. Hempson et al. measured how herbivores affect vegetation across Africa (see the Perspective by Gill). Four distinct herbivory regimes emerge from the analysis, characterized by forest antelopes, arid-region gazelles, high-diversity savannah fauna, and bulk feeders (such as elephants), which have had equivalent impact to those of fire and water on shaping ecosystems. — SNV
Science, this issue p. 1056; see also p. 1036

GEOLOGY

Salted away no longer?
Rock salt deposits are thought to be impermeable to fluid flow and so are candidates for nuclear waste repositories. Ghanbarzadeh et al. found that some salt deposits in the Gulf of Mexico are infiltrated by oil and other hydrocarbons. If these salt domes are not completely isolated from the surrounding environment, they will not be suitable for deep geological waste storage sites. — BG
Science, this issue p. 1069

GENOME EDITING

Virally cleansing the pig genome
Transplants from pigs could be a solution to a shortage of human organs for transplantation. Unfortunately, porcine endogenous retroviruses (PERVs) are rife in pigs and can be transmitted to humans, risking disease. L. Yang et al. integrated CRISPR-Cas into the pig cell genome, where continuous induction of the Cas9 editing enzyme

RESEARCH

Protein folding starts in the ribosome
Holtkamp et al., p. 1104

EVOLUTION

Evolutionary routes to blue
Animal coloration is vital for mate selection, camouflage, warning, and temperature regulation. The evolutionary pressure to get color right leads to tremendous variation among species. The spectacular iridescent blue of some invertebrates is created by microscopic surface structures that interfere with incident light. Hsiung et al. found that nearly identical blue coloration evolved at least eight times in tarantulas via a variety of surface nanostructures. Because these spiders’ vision is poor, the blue color is unlikely to be for sexual display. Natural selection, rather than sexual selection, seems to be operating on the spiders via some as yet unknown pressure. — RLL

IN SCIENCE JOURNALS
Edited by Caroline Ash
MALARIA
How malaria parasites infect the liver
Early in infection, malaria parasites establish themselves within hepatocytes in the liver. Inside these cells, the parasites occupy a so-called parasitophorous vacuole. Kaushansky et al. show that malaria parasites prefer to create vacuoles within hepatocytes that express the EphA2 receptor. Hepatocytes with low levels of this receptor were less conducive to malaria infection. — SMH
Science, this issue p. 1065

PHOTOPHYSICS
Charge separation viewed in reflection
When light strikes a semiconductor, excited electrons travel across the interface. Y. Yang et al. applied ultrafast reflection spectroscopy to probe this process in a gallium indium phosphide system used for hydrogen generation from water (see the Perspective by Hansen et al.). Platinum and titanium dioxide (TiO₂) coatings enhanced charge separation of the excited electrons from the positive holes they left behind. TiO₂, however, was more effective at suppressing the reverse process of unproductive recombination. — JSY
Science, this issue p. 1061; see also p. 1030

ECONOMICS
Predicting unmeasurable wealth
In developing countries, collecting data on basic economic quantities, such as wealth and income, is costly, time-consuming, and unreliable. Taking advantage of the ubiquity of mobile phones in Rwanda, Blumenstock et al. mapped mobile phone metadata inputs to individual phone subscriber wealth. They applied the model to predict wealth throughout Rwanda and show that the predictions matched well with those from detailed boots-on-the-ground surveys of the population. — GJC
Science, this issue p. 1073

DIABETES IMMUNOTHERAPY
Tweaking Tregulatory affairs
In patients with type 1 diabetes (T1D), immune cells destroy the insulin-producing beta cells of the pancreas. Consequently, prolonged exposure to high blood sugar can damage organs and lead to heart disease and kidney failure. Regulatory T cells (Tregs) are known to be defective in autoimmune diseases, such as type 1 diabetes. Bluestone et al. report a phase 1 trial of adaptive Tregs immunotherapy to repair or replace these cells in type 1 diabetics. The cultured Tregs were long-lived after transfer and retained a broad Treg phenotype. Moreover, the trial showed that transfer therapy was safe, endorsing efficacy testing in further trials. — ACC

NANOMATERIALS
Brighter molybdenum layers
The confined layers of molybdenum disulfide (MoS₂) exhibit photoluminescence that is attractive for optoelectronic applications. In practice, efficiencies are low, presumably because defects trap excitons before they can recombine and radiate light. Amani et al. show that treatment of monolayer MoS₂ with a nonoxidizing organic superacid, bis(trifluoromethane)sulfinimide, increased luminescence efficiency in excess of 95%. The enhancement mechanism may be related to the shielding of defects, such as sulfur vacancies. — PDS
Science, this issue p. 101

WORKFORCE DIVERSITY
Diversity through ADVANCEment
The NSF ADVANCE program aims to increase the advancement of women in academic careers, usually through the implementation of work/life support policies. Tower and Diik developed a policy rating scheme to measure the level of parental leave, tenure clock extension, availability of child...
Imaging with molecular vibrations

The vibrational spectra of biomolecules could in principle image cells and tissue without added markers. Practically, several technical problems need to be overcome to achieve sufficient imaging depths, resolution, and data acquisition speed. Cheng and Xie review emerging bioimaging methods for use in the lab and the clinic. — PDS

Proteins shape up in the ribosome

Proteins consist of linear chains of amino acids. These chains must fold into complex three-dimensional shapes to become functional. Holtkamp et al. “watched” how a small helical protein folds as it is being synthesized by the ribosome. The lengthening polypeptide passes out through the ribosome exit tunnel where folding starts. The initially compact structure quickly rearranges into a native three-dimensional structure as the polypeptide emerges from the tunnel. — GR

The downside of innovation

Evolutionary innovation allows a species to invade a new niche or environment. Generally, the emergence of adaptive traits is thought to lead to diversification. Support for this process in nature, however, is mixed. McGee et al. show that the evolution of secondary jaws in fish may be an example of how innovation can reduce diversification (see the Perspective by Vermeij). Fish with secondary jaws are less able to rapidly ingest fish prey, which puts them at a competitive disadvantage to regularly jawed fish. Such competition could lead to reduced variation and the extinction of lineages with the trait. — SNV

Antidepressants suppress DNA methylation

Some depressed patients show increased DNA methylation and decreased expression of a gene encoding BDNF, a secreted factor important for synaptic plasticity. In cells obtained from depressed patients before treatment, Rein et al. found that an antidepressant, paroxetine, increased expression of BDNF via inhibition of the DNA methyltransferase DNMT1. Paroxetine has similar effects on human blood cells; hence a simple blood test may aid in personalizing treatment for depression. — LKF

Other interneurons, and some neurons, connect to these of interneurons fell into classes of interneurons. Fifteen major neurons in the mature mouse and more than 400 pyramidal afied over 1200 interneurons rrecorded, labeled, and classi- tions of its cell types. Jiang et al. do not completely understand the nbrain’s neocortex, we still do Despite the importance of the brain’s neocortex, we still do not completely understand the diversity and functional connections of its cell types. Jiang et al. recorded, labeled, and classified over 1200 interneurons and more than 400 pyramidal neurons in the mature mouse visual cortex. Fifteen major classes of interneurons fell into three types: some connect to all neurons, some connect to other interneurons, and some form synapses with pyramidal neurons. — PRS

Zeroing in on essential human genes

More powerful genetic techniques are helping to define the list of genes required for the life of a human cell. Two papers used the CRISPR genome editing system and a gene trap method in haploid human cells to screen for essential genes (see the Perspective by Boone and Andrews). Wang et al.’s analysis of multiple cell lines indicates that it may be possible to find tumor-specific dependencies on particular genes. Blomen et al. investigate the phenomenon in which nonessential genes are required for fitness in the absence of another gene. Hence, complexity rather than robustness is the human strategy. — LBR

Genomics

Evolutionary Biology

NEUROSCIENCE

A census of neocortical neurons

NEUROSCIENCE

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BIOIMAGING

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