Improved hydrogels allow for more varied applications
Zhang and Khademhosseini, p. 500

IN SCIENCE JOURNALS
Edited by Stella Hurtley

COMPUTER SCIENCE
Artificial intelligence masters poker
Computers can beat humans at games as complex as chess or go. In these and similar games, both players have access to the same information, as displayed on the board. Although computers have the ultimate poker face, it has been tricky to teach them to be good at poker, where players cannot see their opponents’ cards. Moravˇ cík et al. built a code dubbed DeepStack that managed to beat professional poker players at a two-player poker variant called heads-up no-limit Texas hold’em. Instead of devising its strategy beforehand, DeepStack recalculated it at each step, taking into account the current state of the game. The principles behind DeepStack may enable advances in solving real-world problems that involve information asymmetry. —JS
Science, this issue p. 508

NOISE POLLUTION
Shhh, you’re disturbing the ecosystem
Species in nature reserves are experiencing increased pressure from human encroachment in many forms. One type of pressure that is rarely discussed but perennial is human-produced noise. Buxton et al. looked at the degree to which such noise has affected protected areas across the United States. Human-produced noise doubled background noise levels in a majority of protected areas and substantially affected critical habitat areas for endangered species. —SNV
Science, this issue p. 531

INFLAMMATION
A way to switch off IBD
Inflammatory bowel diseases (IBDs) such as ulcerative colitis and Crohn’s disease are associated with defective interleukin-10 (IL-10) signaling. Although IL-10 plays an essential role in the control and resolution of inflammation, the mechanisms responsible for its anti-inflammatory actions remain unclear. Ip et al. show that in response to inflammation, IL-10 controls cellular metabolism in macrophages by inducing the mTOR inhibitor DDIT4 and preventing glucose uptake (see the Perspective by Kabat and Pearce). In mouse models and patient samples, defective IL-10 promoted accumulation of damaged macrophages and exacerbated inflammatory signals. Targeting mTORC1 thus might help to treat IBD and related disorders. —PNK
Science, this issue p. 513; see also p. 488

HUMAN GENETICS
On the history of Bantu speakers
Africans are underrepresented in many surveys of genetic diversity, which hinders our ability to study human evolution and the health of modern populations. Patin et al. examined the genetic diversity of Bantu speakers, who account for one-third of sub-Saharan Africans. They then modeled the timing of migration and admixture during the Bantu expansion. The analysis revealed adaptive introgression of genes that likely originated in other African populations, including specific immune-related genes. Applying this information to African Americans suggests that gene flow from Africa into the Americas was more complex than previously thought. —LMZ
Science, this issue p. 543

METHANE CHEMISTRY
A watery route from methane to methanol
Methanol production is an expensive, energy-intensive process that initially overoxidizes methane to carbon monoxide. Sushkevich et al. used copper sites in a zeolite to oxidize...
methane to methoxy intermediates; they then added water to release methanol and hydrogen while reoxidizing the copper. This inexpensive process could prove useful at gas well sites for producing an easily stored and transported liquid from excess gas that at present is burned away. —JSY

Science, this issue p. 523

NEUROSCIENCE

Give us our daily protein

Protein is an essential component of our food, and protein intake thus must be actively regulated. Liu et al. identified a neural circuit that encodes protein-specific hunger in fruit flies. In protein-deprived animals, this circuit acted to simultaneously promote protein consumption and restrict sugar intake. Lack of protein induced changes in the protein-specific, but not sugar-specific, branch of this circuit. —PRS

Science, this issue p. 534

DRUG DEVELOPMENT

Finding drugs for fragile X syndrome

The intellectual disability called fragile X syndrome is associated with abnormal synaptic morphology. Kashima et al. performed a high-throughput drug screen that used the hyperactive locomotion of a fly model of this disease as a behavioral marker. Inhibitors of LIMK1, a kinase involved in the pathogenesis of the disease, ameliorated the neurological and behavioral phenotypes in the fly model and also reduced hyperactivity in a mouse disease model. This method may aid in future drug development for fragile X syndrome, for which there are few treatment options at present. —LKF


POLYMER SCIENCE

When polymers behave like metals

Diblock copolymers, in which two dissimilar chains are chemically linked, can show a rich array of morphologies. These are usually attained by slow cooling to give the chains time to find their thermodynamically preferred arrangements. Rather than using slow cooling, Kim et al. rapidly quenched their materials from the disordered state and then annealed at low to moderate temperatures (see the Perspective by Stein). Different processing routes drove assembly into a variety of low-dimensional phases more typical of metal alloys. —MSL

Science, this issue p. 520; see also p. 487

ZIKA VIRUS

LAMP shines a light on Zika virus

Rapid and simple assays to detect infectious agents are key to tracking emerging epidemics. Chotiwan et al. describe a loop-mediated amplification (LAMP) assay that detects Zika virus RNA in human biofluids such as serum and semen, as well as in mosquitoes, the insect vector that transmits the disease. The assay successfully distinguished the Asian-lineage Zika virus, which is associated with the current outbreak in the Americas, from the African-lineage Zika virus. This approach should enable tracking of the Asian-lineage strain as it moves into new geographical locations. —OMS


IN OTHER JOURNALS

Edited by Caroline Ash and Jesse Smith

Notch signaling influences cell fate during mammalian eye development.

RPE cranks it up a Notch

Notch signaling within and between cells is involved in many processes, including cell fate specification. In the retina, high levels of Notch during retinal progenitor cell (RPC) division promote RPC renewal, whereas low levels promote postmitotic neuron differentiation. Ha et al. found that retinal pigment epithelium (RPE), a neighboring tissue to the neural retina, influences asymmetric division by localizing Notch components to the apical side of the adjacent dividing RPC. This positioning required an E3 ubiquitin protein ligase, Mib1, which boosts levels of Notch in one sister cell, but not the other. Hence, a neighboring tissue influenced cell-fate specification through Notch signaling, which could also happen in other neural tissues. —MKE


CELL BIOLOGY

Not making the right contacts

The microtubule-severing enzyme spastin is mutated in the inherited neural disease, or axonopathy, called hereditary spastic paraplegia (HSP). The endoplasmic reticulum (ER) within cells, including neurons, plays a role in defining the position and timing of endosomal tubule fission. Allison et al. identified a role for spastin at ER-endosome contact sites during endosomal tubule fission. Failure of this process caused problems in lysosomal enzyme trafficking. Lysosomal abnormalities developed in primary cortical neurons from a spastin-HSP mouse model,
Wet, soft, squishy, and tunable

Hydrogels are highly cross-linked polymer networks that are heavily swollen with water. Hydrogels have been used as dynamic, tunable, degradable materials for growing cells and tissues. Zhang and Khademhosseini review the advances in making hydrogels with improved mechanical strength and greater flexibility for use in a wide range of applications. —MSL  

Science, this issue p. 500

DNA METHYLATION

Inducing DNA methylation where it wasn’t

The specific order of DNA’s purines and pyrimidines encodes proteins, but chemically modified bases are important in regulating gene expression. In mammals, most cytosines are methylated when present in the CpG dinucleotide; however, stretches of mammalian DNA containing a high frequency of the CG sequence, termed CpG islands (CGIs), are typically unmethylated. The mechanism by which methylation of CGIs is blocked is unclear. Takahashi et al. interrupted CpG-rich sequences by targeted insertion of CpG-free DNA into CGIs in human pluripotent stem cells, which induced stable, heritable methylation. Some disorders result from improper methylation; this work provides an epigenome-editing tool to develop model systems for understanding CGI methylation in development and disease. It may also enable therapeutic strategies to correct aberrant imprinting diseases. —BAP  

Science, this issue p. 503

OCEAN ACIDIFICATION

Reconciling pH and future productivity

The differential effects of reduced seawater pH and increased carbon dioxide on marine phytoplankton productivity have not been resolved. Hong et al. found that previous experimentation did not account for variable metal concentrations or for ammonia contamination. After controlling for these variables, experimentation, protein expression analysis, and field data showed that low pH, coupled with the low ambient iron availability in the open ocean, inhibits nitrogen fixation, whereas elevated CO₂ is fertilizing. Overall, the deleterious effects of decreased pH trump the beneficial effects of increased CO₂. Thus, it seems that in a future, more acidic ocean, phytoplankton productivity is likely to be suppressed. —CA  

Science, this issue p. 527

ECOLOGICAL PROCESSES

Climate extremes stress ecosystems

Climate shocks, such as warming bursts or rapid freeze-thaw cycles, stress ecological systems, often adversely affecting carbon and nutrient cycling. Mooshammer et al. exposed soil microbial communities to such shocks to uncover the mechanisms underpinning stress responses. Changes in microbial composition and their enzyme chemistry are the likely causes for observed alterations in C, N, and P biogeochemistry. These findings may improve our ability to predict the environmental consequences of ever worsening climate variability. —SN  


COMPLEMENT

Inter-innate cooperation

The different branches of the immune system work together like a well-oiled machine, but how this coordination occurs is not fully understood. Narni-Mancinelli et al. found one such mechanism: cross-talk between the alternative complement pathway and natural killer (NK) and innate lymphoid cells (ILCs). They report that complement factor P (CFP), a positive regulator of the alternative complement pathway, binds Nkp46, which is expressed on subsets of NK cells and ILCs. Patients lacking CFP are more susceptible to Neisseria meningitidis infection, and, in mice, this CFP protection was dependent on Nkp46 and group 1 ILCs. Thus, ILCs and the alternative complement pathway cooperate to fight off bacterial infection. —ACC  


NEURODEVELOPMENT

Self-organization for sensory brushes

Sensory hairs on the back of a fruit fly are lined up in neat rows. The orderliness of this arrangement has encouraged models based on organized specification of the hairs. Corson et al. now show that development is both less precise and more effective than that. They used mathematical modeling to recapitulate genetic effects as the developing epidermis becomes organized into enough rows and single lines of hairs. Their work suggests that the sensory field develops through self-organizing patterning that can adjust to the size of the epidermis. —PJH  

Science, this issue p. 501

POSITIVES AND NEGATIVES OF METHYLATED CpG

When the DNA bases cytosine and guanine are next to each other, a methyl group is generally added to the pyrimidine, generating a mCpG dinucleotide. This modification alters DNA structure but can also affect function by inhibiting transcription factor (TF) binding. Yin et al. systematically analyzed the effect of CpG methylation on the binding of 542 human TFs (see the Perspective by Hughes and Lambert). In addition to inhibiting binding of some TFs, they found that mCpGs can promote binding of others, particularly TFs involved in development, such as homeodomain proteins. —BAP  

Science, this issue p. 502; see also p. 489