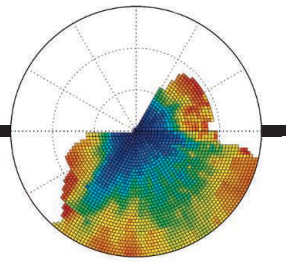
RESEARCH

RAVE produces a map of a Diffuse Interstellar Band
Kos et al. *p. 791*



IN *SCIENCE* JOURNALS

Edited by **Stella Hurtley**

A swarm of mini-robots on the move

ROBOTICS

Large-scale robotic self-assembly

When individuals swarm, they must somehow communicate to direct collective motion. Swarms of robots need to deal with outliers, such as robots that move more slowly than the rest. Rubenstein *et al.* created a large swarm of programmed robots that can form collaborations using only local information. The robots could communicate only with nearby members, within about three times their diameter. They were able to assemble into complex preprogrammed shapes. If the robots' formation hit snags when they bumped into one another or because of an outlier, additional algorithms guided them to rectify their collective movements. — MSL

Science, this issue p. 795

PLACE CELLS

Nerve cells displaying extra large spaces

Rats use brain cells called "place" cells to figure out where they are. Rich *et al.* used mazes or tracks many meters long—the size of rats' ranges in the wild— to investigate how rats represent a very large environment or extended experience in their brain. As novel environments became larger and larger, the rats' brains recruited new place cells. However, no matter how large the environment became, some cells always remained silent, perhaps as a reserve for other environments yet to be visited. — PRS

Science, this issue p. 814

INTERSTELLAR DUST

Can you spot a speck of space dust?

NASA's Stardust spacecraft has been collecting cosmic dust: Aerogel tiles and aluminum foil sat for nearly 200 days in the interstellar dust stream before returning to Earth. Citizen scientists identified most of the 71 tracks where particles were caught in the aerogel, and scanning electron microscopy revealed 25 craterlike features where particles punched through the foil. By performing trajectory and composition analysis, Westphal *et al.* report that seven of the particles may have an interstellar origin. These dust particles have surprisingly diverse mineral content and structure as compared with models of interstellar dust based on previous astronomical observations. — MMM

Science, this issue p. 786

CANCER

A potential target in a deadly brain cancer

A growth factor receptor called EGFR is often overactive in glioblastoma, a common and frequently lethal form of brain cancer. Kusne *et al.* found that the kinase aPKC was stimulated in glioblastoma cells not only by abnormally active EGFR but also in response to a cytokine called TNF-α released by immune cells that infiltrate the tumors. A drug that inhibited aPKC reduced tumor growth in a mouse model of glioblastoma, and glioblastoma patients with high aPKC levels had shorter survival times. Thus, two cancer-promoting pathways converge on aPKC, making it an attractive therapeutic target in glioblastoma. — WW

Sci. Signal. **7**, ra75 (2014).

PLANT SCIENCE

Strangleweed shares too much information

Because RNA normally functions within an individual cell, we

Parasitic dodder plant strangles its host

CREDITS: (CLOCKWISE FROM TOP) KOS *ET AL.*; CURTIS CLARK/WIKIMEDIA COMMONS; MICHAEL RUBENSTEIN/HARVARD UNIVERSITY WYSS INSTITUTE

Published by AAAS

generally think that we keep our RNAs to ourselves. Kim *et al.* now show that the parasitic dodder plant breaks that rule. When dodder attacks a host plant, it opens up a conduit through which messenger and perhaps other regulatory RNAs are exchanged between parasite and host. Because a single dodder plant can attack multiple hosts, such exchanges may underlie instances of genes transferring between species. — PJH

Science, this issue p. 808

CYSTIC FIBROSIS

A breathtaking tale of sticky mucus

Patients with cystic fibrosis have difficulty breathing because their airways are clogged with thick mucus. Does this mucus accumulate because there is a defect in the way it is produced? Or does it accumulate because of other disease features, such as dehydration or airway wall remodeling? Distinguishing between these possibilities is important for future drug development. In a study of piglets with cystic fibrosis, Hoegger *et al*. identify mucus production as the primary defect (see the Perspective by Wine). The airway glands of the piglets synthesized strands of mucus normally, but the strands were never released and stayed tethered to the gland ducts. — PAK

Science, this issue p. 818; see also p. 730

CELL THERAPY

A Swiss Army knife for treating sepsis

Sepsis is a complication of infection that kills ~7 million people a year, with no successful molecular therapy. But cells are more versatile than molecules: They make products and respond to their environments. Now, Fletcher *et al.* investigate whether cells are better equipped to battle this multifocal disease. One injection of anti-inflammatory cells derived from the lymph nodes dramatically increased survival in two mouse models of sepsis under conditions that mimic those in the clinic. These beneficial cells reduced the deadly "cytokine storm" associated with sepsis. — KL

Sci. Transl. Med. **6**, 249ra109 (2014).

RNA NANOSTRUCTURES

The future of RNA origami writ large

Researchers have long fabricated intricate nanostructures from carefully linked DNA strands. Now they can use RNA made by gene expression, which avoids the costly strand synthesis and lengthy annealing steps necessary with DNA origami. Geary *et al.* used molecular modeling to extend the size of folded RNA origami structures (see the Perspective by Leontis and Westhof). The modeling revealed assembly patterns for linking single-stranded RNA into A-form helices. The authors created two-dimensional structures as large as 660 nucleotides on mica surfaces. — PDS

Science, this issue p. 799; see also p. 732

WATER ENGINEERING

Sourcing corrosive sewer sulfides

Sewer systems are corroding at an alarming rate, costing governments billions of dollars to replace. Differences among water treatment systems make it difficult to track down the source of corrosive sulfide responsible for this damage. Pikaar *et al.* performed an extensive industry survey and sampling campaign across Australia (see the Perspective by Rauch and Kleidorfer). Aluminum sulfate added as a coagulant during drinking water treatment was the primary culprit in corroding sewer systems. Modifying this common treatment strategy to include sulfate-free coagulants could dramatically reduce sewer corrosion across the globe. — NW

Science, this issue p. 812; see also p. 734

IN OTHER JOURNALS

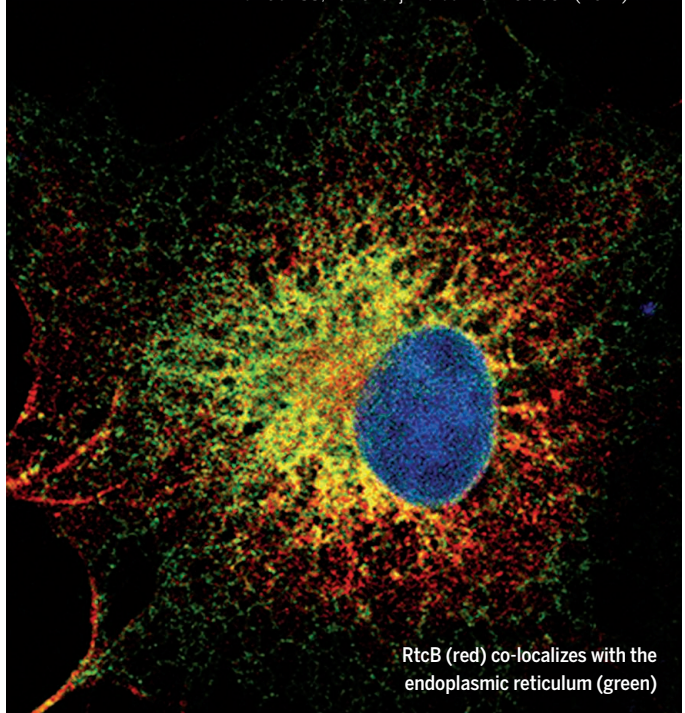
Edited by **Kristen Mueller** *and* **Jesse Smith**

UNFOLDED PROTEINS

Stitching mRNA back together again

Cells get rid of toxic, inappropriately folded proteins in a process called the unfolded protein response (UPR). The UPR occurs in the cell's endoplasmic reticulum, which folds and sorts proteins. It requires an unconventional type of RNA splicing: the removal of small pieces of genetic material called introns from messenger RNA (mRNA). But biologists weren't sure how the spliced mRNA got put back together. Lu *et al*. now report that the enzyme RtcB patches together the two halves of a spliced mRNA that codes for XBP1, an important regulator of the UPR. In the endoplasmic reticulum, RtcB bound another enzyme, IREα, which splices the intron out of the XBP1 mRNA. — GR

Mol. Cell **55**, 10.1016/j.molcel.2014.06.032 (2014).



RtcB (red) co-localizes with the endoplasmic reticulum (green)

AGING

A sweet decline for the aging fly brain

Our livers and muscles store glucose as glycogen, a branched polysaccharide. Glycogen is a major energy reserve, but it may play a more sinister role in the aging brain. Along with other components, glycogen forms aggregates in the brains of aging mice, humans, and flies that correlate with a decline in neuron function. To better understand this, Sinadinos *et al*. experimented with fruit flies. They used RNA interference to inhibit the flies' production of glycogen synthase, the enzyme that makes glycogen from glucose. Then the researchers measured how fast the flies could climb. As the flies aged, their neurons functioned better than those of controls. Treated male flies—but not females—lived longer. — LBR

Aging Cell 10.1111/acel.12254 (2014).

ALSO IN *SCIENCE* JOURNALS

Edited by **Stella Hurtley**

IN UTERO EFFECTS

The nutritional sins of the mother...

Prenatal exposures of a mother can affect the health of her offspring, but how? Radford *et al.* found that the male progeny of undernourished pregnant mice had altered DNA chemistry in their sperm. In addition, the offspring displayed compromised metabolic health. The specific affected genes not only lost DNA methylation but also lacked the normal sperm DNA packaging factors (protamines) and instead were enriched in nucleosomes. Thus, when subjected to a suboptimal prenatal environment, offspring feel the effects of the maternal assault. — BAP

Science, this issue p. 785

INTERSTELLAR DUST

Clues to a mystery with RAVE results

An unknown interloper systematically picks off light from galactic sources, snatching at specific wavelengths ranging from the ultraviolet to the infrared. The cause of what astronomers term diffuse interstellar bands (DIBs) still evades identification. Kos *et al.* combined nearly 500,000 stellar spectra from the RAVE survey to make a telling map that may clue us in further. This pseudo–three-dimensional map shows the distribution of the carrier that absorbs light at 862 nm, and it closely follows a separate map of interstellar dust, but with a significantly larger scale height in the Galactic plane. Though this is only one DIB of many, this analysis sets a path for the future study of others. — MMM

Science, this issue p. 791

PHOTOSYNTHESIS

Setting the stage for release of oxygen

Plants transform water into the oxygen we breathe using a protein-bound cluster of four manganese (Mn) ions and a calcium ion. Cox *et al.* now establish the precise electronic structure in that cluster immediately before formation of the O-O bond (see the Perspective by Britt and Oyala). Using the technique of electron paramagnetic resonance spectroscopy, they confirm a hypothesis that all four Mn ions are octahedrally coordinated and in the 4+ oxidation state. Such clues to the efficiency of the photosynthetic process, so essential to life on Earth, may also facilitate the development of artificial water-splitting catalysts. — JSY

Science, this issue p. 804; see also p. 736

CELL REPROGRAMMING

Factor in oocyte assists reprogramming

Unfertilized eggs contain components that can dedifferentiate other cells that have gone down the path toward a specific cell fate. Gonzalez-Muñoz *et al.* show that the protein-folding factor ASF1A facilitates this reprogramming event and it acts at a particular phase of germ cell division termed metaphase II. ASF1A helps turn differentiated cells such as human adult dermal fibroblasts into undifferentiated pluripotent stem cells. — BAP

Science, this issue p. 826

TRANSDIFFERENTIATION

Epigenetics direct transdifferentiation

To make an entire animal, many and varied cell types form and interact. Some of these differentiated cells take a U-turn and can de-differentiate or transdifferentiate to another cell fate. Although relatively rare in nature, Zuryn *et al.* followed such a program in the tiny roundworm *Caenorhabditis elegans,* where a rectal cell–to–motor neuron conversion is seen. Transcription factors with conserved roles in cell plasticity and terminal fate selection partner up with specific histone-modifying enzymes in discrete steps to specify separate sequential phases of cell identity. — BAP

Science, this issue p. 826

SYNTHETIC BIOLOGY

Toward an "artificial cell" on a chip

Cell-free systems that reconstitute biochemical pathways have been critical for unraveling the inner workings of the cell. Karzbrun *et al.* created a highly miniaturized cell-free system on a silicon chip. A series of tiny linked compartments were fabricated on the chip, in which DNA-driven reactions occurred, with materials flowing into and diffusing between the compartments. The system recreated oscillating protein expression patterns and protein gradients, and provides a stepping stone to creating "artificial cells" on a chip. — GR

Science, this issue p. 829

PHOTO: CREDIT GOES HERE AS SHOWN; CREDIT GOES HERE AS SHOWN