

SOCIAL BEHAVIOR

From faithfulness to spatial memory

Natural selection shapes traits to be as adaptive as possible for a given environment. Okhovat *et al.* show that such varying selection also shapes variation in social behavior and the brain (see the Perspective by Robinson). Variation in male fidelity among monogamous prairie voles reflects differences in the expression, regulation, and epigenetic status of a vasopressin receptor that functions in spatial memory. Thus, the trade-offs males face between fidelity and infidelity may promote heritable variation that is important for spatial memory and maintain variation in their levels of fidelity. — SNV

Science, this issue p. 1371; see also p. 1310

CANCER

Growing blood vessels in gliomas

Aggressive gliomas have a high density of abnormal blood vessels that enables tumor growth and damages the brain. Zhang *et al.* analyzed patient data and correlated increased levels of a secreted factor called pleiotrophin with more aggressive grades of glioma and decreased survival. When implanted in mice, glioma cells that released pleiotrophin formed larger tumors with more blood vessels. Mice developed smaller gliomas and survived longer when treated with inhibitors of ALK, a receptor for pleiotrophin. — WW

Sci. Signal. **8**, ra125 (2015).

GEOPHYSICS

A mysterious mid-mantle slowdown

The viscosity of Earth's deep interior plays a key role in mediating plate tectonics. Rudolph *et al.* combined several geophysical data sets to model the viscosity of the mantle. Mantle viscosity abruptly increases below 1000 km. The increase could explain

the stalling of subducting slabs and the deflections of hot upwelling plumes around this depth. Although the viscosity increase explains some recent unexpected observations, the origin of the jump itself remains a mystery. — BG

Science, this issue p. 1349

SUPERCONDUCTIVITY

Locking the spins in a superconductor

In Cooper pairs—pairs of electrons responsible for the exotic properties of superconductors—the two electrons' spins typically point in opposite directions. A strong-enough external magnetic field will destroy superconductivity by making the spins point in the same direction. Lu *et al.* observed a two-dimensional superconducting state in the material MoS₂ that was surprisingly immune to a magnetic field applied in the plane of the sample (see the Perspective by Suderow). The band structure of MoS₂ and its spin-orbit coupling conspired to create an effective magnetic field that reinforced the electron pairing, with spins aligned perpendicular to the sample. — JS

Science, this issue p. 1353; see also p. 1316

COGNITIVE SCIENCE

Handwritten characters drawn by a model

Not only do children learn effortlessly, they do so quickly and with a remarkable ability to use what they have learned as the raw material for creating new stuff. Lake *et al.* describe a computational model that learns in a similar fashion and does so better than current deep learning algorithms. The model classifies, parses, and recreates handwritten characters, and can generate new letters of the alphabet that look "right" as judged by Turing-like tests of the model's output in comparison to what real humans produce. — GJC

Science, this issue p. 1332

IN OTHER JOURNALS

Edited by Kristen Mueller and Jesse Smith



Planting marsh grasses in a clumped, rather than dispersed, pattern can improve outcomes when restoring wetlands

RESTORATION ECOLOGY

Planting to enhance positive interactions

Rising sea levels and human development threaten coastal ecosystems worldwide. Efforts to protect and restore these environments include a range of physical and biological measures, including reestablishing vegetation to stabilize the habitat and restore ecosystem function. Silliman *et al.* report the results of experiments in coastal wetlands in Florida and the Netherlands, showing that the simple pattern of planting (clumped versus dispersed) marsh grasses influences the success of restoration. Compared to a dispersed pattern of planting, planting marsh grasses in a clumped pattern enhanced their survival, biomass, and density. Clumped plants interacted positively; for instance, they reduced their anoxia stress, and neighboring roots shared oxygen more readily, effectively producing a more oxygen-rich microenvironment than isolated individual plants can achieve. — AMS

Proc. Natl. Acad. Sci. U.S.A. **112**, 14297 (2015).

GEOPHYSICS

Setting the table for an old plate

New pictures of Earth's interior reveal an ancient tectonic plate sinking toward the bottom of the mantle. Simmons *et al.* find the structure in seismic tomography images under the data-limited region of the Indian Ocean. Complete subduction of the plate occurred more than 100 million years ago. This observation suggests that old plates can hang around in the mantle longer than previously thought. It also provides a new piece of information for reconstructing plate motions and landmass locations in the distant past. — BG

Geophys. Rev. Lett.
10.1002/2015GL066237 (2015).

BEHAVIOR

Empathy is for the birds

Many species empathize with one other by state matching, a process whereby an individual shifts its physiological state to match another's. Increasing evidence suggests that empathy occurs across mammals, but whether other vertebrates empathize is unclear. Birds are prime candidates for state matching, given their extensive parental care, pair bonding, and sociality. Perez *et al.* now show that in highly monogamous zebra finches, females match their state of stress (as measured by glucocorticoids) to that



Monogamous zebra finches empathize through song

of their male mate, as perceived only through changes in his call. No match appeared when females listened to the calls of unknown males, which suggests that the close bond facilitates empathy. — SNV

Horm. Behav. 10.1016/j.yhbeh.2015.09.002 (2015).

AGING

A circadian secret to a long life

Dietary restriction (reduced nutrient intake without malnutrition) increases life span in multiple species, including fruit flies, but how this occurs is largely unknown. Katewa *et al.* now find that in flies, changes in the expression of genes that regulate the circadian clock underlie the life-extending effect of dietary restriction. Dietary restriction increased the amplitude of daily cycles of clock gene expression in tissues such as the fly head and body. In flies with mutated clock genes, dietary restriction failed to increase longevity. Moreover, genetically increasing the periodicity of circadian gene expression also extended the life span of flies. Further analysis indicated that circadian gene expression contributes to changes in metabolism that mediate the effects of dietary restriction on life span. — LBR

Cell Metab. 10.1016/j.cmet.2015.10.014 (2015)

CATALYSIS

Upgrading ethanol without adding hydrogen

An issue with ethanol—usage mandates for gasoline is the “blend wall”: Many vehicles can only use up to 10 to 15% ethanol. In order to use more ethanol as a fuel, it must be converted to hydrocarbons that blend into gasoline, but existing processes have suffered from the need to add hydrogen or produce a high fraction of undesirable small hydrocarbons. Narula *et al.* report the conversion of ethanol to larger



Catalytic conversion to hydrocarbons allows more ethanol to be used in automobile fuel

hydrocarbons suitable for use in gasoline, as well as diesel and jet fuels, with a ZSM-5 zeolite containing indium and vanadium. A hydrocarbon pool mechanism appears to operate without dehydration steps. — PDS

Sci. Rep. 10.1038/srep16039 (2015).

NEPHROLOGY

A circulating harbinger of kidney disease

Chronic kidney disease affects 600 million people worldwide. Initially asymptomatic, the disease often follows a progressive course that can lead to heart disease and kidney failure. An easily measured biomarker that identifies people at high risk of developing kidney disease would allow doctors to intervene earlier so that patients' disease progresses at a slower rate. Toward that end, Hayek *et al.* examined the predictive capacity of suPAR, a protein previously linked to a certain type of kidney disease. They serially monitored plasma levels of suPAR in a large group of patients, many with normal kidney function at the study's start, and found that elevated levels of the protein correlated with a

decline in kidney function and with new-onset chronic kidney disease. — PAK

N. Engl. J. Med. **373**, 1916 (2015).

PHYSICS

Studying magnetism in an atomic chain

When we think of magnets, solid materials generally come to mind, but researchers can also study magnetism by placing individual atoms in an egg-crate-like potential created by lasers: an optical lattice. This approach, however, requires extraordinarily low temperatures. To circumvent that requirement, Murmann *et al.* studied a string of three or four fermionic ${}^6\text{Li}$ atoms in an elongated optical trap. In this one-dimensional system, no lattice was needed because the atoms, tuned to interact strongly, spontaneously formed an ordered chain. The researchers first placed three atoms in a particular spin configuration and then tilted the trap to let the outermost atom tunnel out. The spin state of the tunneling atom revealed that the atoms were initially in an antiferromagnetic state. — JS

Phys. Rev. Lett. **115**, 215301 (2015).