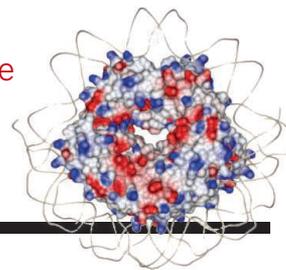


RESEARCH

Archaeal nucleosome-like structures elucidated

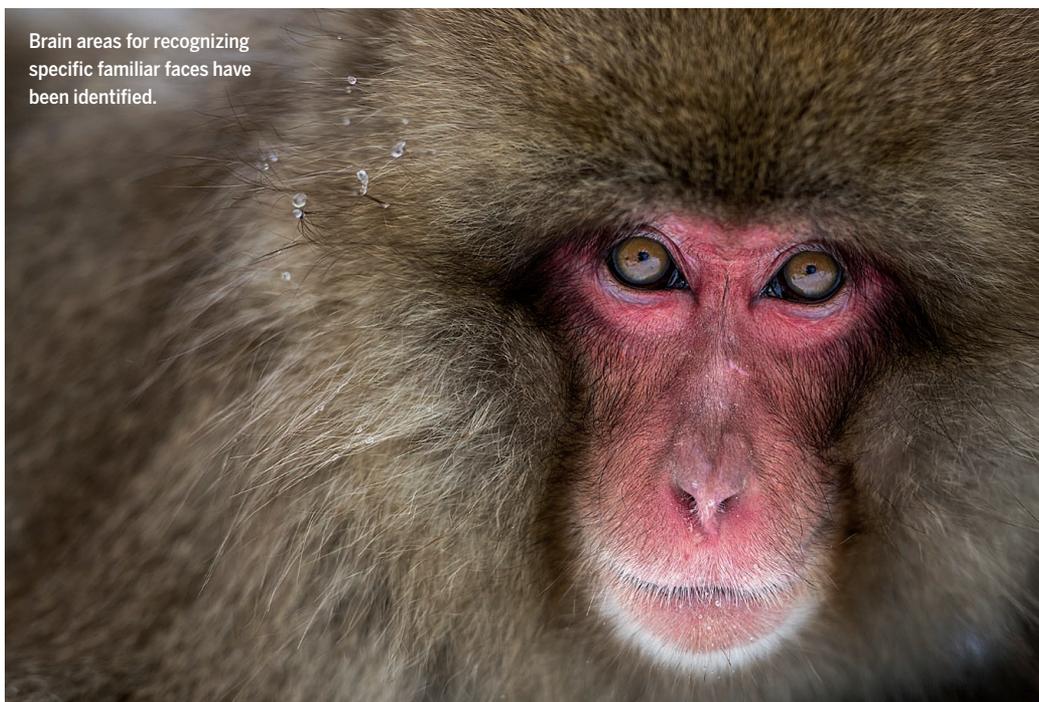
Mattiroli et al., p. 609



IN SCIENCE JOURNALS

Edited by Stella Hurtley

Brain areas for recognizing specific familiar faces have been identified.



NEUROSCIENCE

I've seen this face before

We have known for some time that there is a network of brain regions for face recognition. However, how and where face familiarity is encoded has been elusive for decades. Landi and Freiwald performed brain imaging in macaques and identified two areas specifically involved in recognizing familiar faces. These two areas showed a nonlinear response as blurred faces gradually became visible, rapidly becoming active when the faces of familiar monkeys became recognizable. —PRS

Science, this issue p. 591

ORGANIC CHEMISTRY

A charged approach to forming C–N bonds

Adjacent carbon-nitrogen bonds often appear in chemical compounds of pharmaceutical interest. Fu *et al.* developed a versatile method to form these bonds by pairing manganese catalysis with electrochemical azide oxidation in the presence

of olefins. A major advantage of the electrochemical approach is the tunable precision of its oxidizing power, which leaves other sensitive substituents such as alcohols and aldehydes intact. The reaction proceeded over several hours at room temperature, forming hydrogen at the counter electrode as a benign by-product. —JSY

Science, this issue p. 575

GEOPHYSICS

A coherent depth for continental plates

The thickness of the continental portion of Earth's cold and rigid surface plates is a source of debate. Tharimena *et al.* analyzed a specific type of seismic signal called SS precursors to provide a robust estimate of plate thickness under the

continents (see the Perspective by Savage). The values range from 130 to 190 km, which lines up well with the depth where diamonds are stable—an independent line of evidence for the depth of continents. —BG

Science, this issue p. 580; see also p. 549

CANCER

Rock-a-bye bone marrow

Chemotherapy saves the lives of many cancer patients. However, it is a difficult treatment that induces many major side effects, with one of the most common being myelosuppression—depletion of bone marrow cells. The consequences of myelosuppression include anemia, thrombocytopenia, and neutropenia, all of which can cause severe complications and delay subsequent courses of chemotherapy. Taylor *et al.* discovered that quizartinib, a tyrosine kinase inhibitor, can decrease the risk of myelosuppression during cancer treatment by transiently suppressing the proliferation of bone marrow progenitor cells. In mice with leukemia, cancer cells continued to proliferate during treatment, making them a target for chemotherapy even when the bone marrow was protected. —YN

Sci. Transl. Med. **9**, eaam8060 (2017).

BIOMATERIALS

Squid lenses beat spherical aberration

When light rays pass through a curved lens, greater refraction at the edges can distort the resulting image. This problem can be overcome if the

refractive index of the lens is varied according to the curvature. Cai *et al.* show that the lenses of squid eyes have an internal structure containing a set of globular proteins that form a gradient of colloidal particles to counter spherical aberration (see the Perspective by Madl). Thus, the evolutionary process has used the principles of patchy colloid theory to construct a self-assembling, complex optical device. —MSL

Science, this issue p. 564;
see also p. 546

FLOODING

Flooding along the river

Will a warming climate affect river floods? The prevailing sentiment is yes, but a consistent signal in flood magnitudes has not been found. Blöschl *et al.* analyzed the timing of river floods in Europe over the past 50 years and found clear patterns of changes in flood timing that can be ascribed to climate effects (see the Perspective by Slater and Wilby). These variations include earlier spring snowmelt floods in northeastern Europe, later winter floods around the North Sea and parts of the Mediterranean coast owing to delayed winter storms, and earlier winter floods in western Europe caused by earlier soil moisture maxima. —HJS

Science, this issue p. 588
see also p. 552

NEURAL EPIGENOMICS

Methylation and the single neuronal cell

The presence or absence of methylation on chromosomal DNA can drive or repress gene expression. Now, a comprehensive map of methylation variation in neuronal cell populations, including a between-species comparison, illustrates how epigenetic diversity plays important roles in neuronal development. Luo *et al.* examined how DNA methylation is both similar and different within neurons at the single-nucleus level in humans

and mice. They identified 16 mouse and 21 human neuronal clusters, with greater complexity of excitatory neurons in deep brain layers than in superficial layers. —LMZ

Science, this issue p. 600

RESEARCH IMPACT

Picking up a patent

What is the relationship between patents and scientific advances? Ahmadpoor and Jones devised a metric for the “distance” between patentable inventions and prior research to study this question. They analyzed the relationship between 4.8 million U.S. patents and 32 million research articles. Universities tended to cite their own research directly in their patents (in other words, a distance of 1), but the distance was greater for companies, suggesting that companies may rely on outsiders for their foundational research. The distance varied by discipline, with nanotechnology and computer science having the shortest distances between published research and patents. —BJ

Science, this issue p. 583

CRISPR BIOLOGY

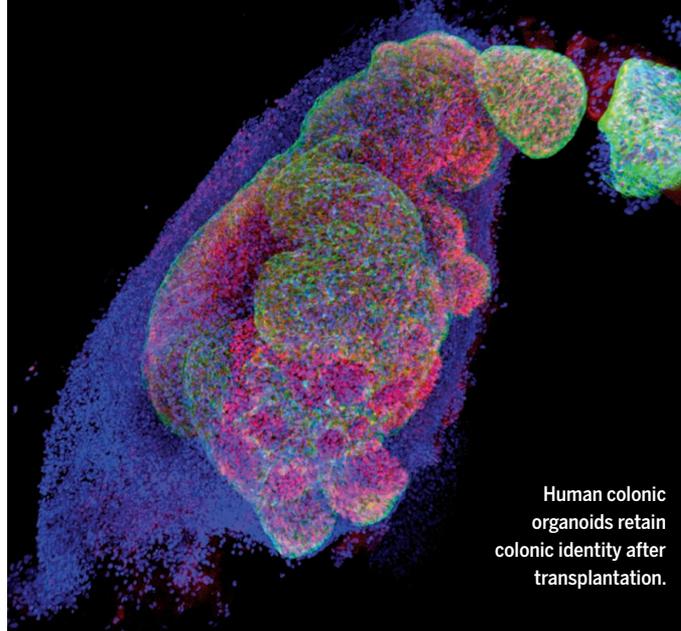
Bacterial defense amplification

Prokaryotic type III CRISPR systems use the effector complex and additional proteins such as Csm6 to destroy both the genome and the transcripts of invaders. However, how the effector complex and Csm6 coordinate CRISPR activity remains a mystery. Kazlauskienė *et al.* found that a cyclic oligonucleotide-based signaling pathway can regulate the defense response (see the Perspective by Amitai and Sorek). Upon target recognition, the Cas10 subunit of the effector complex synthesizes cyclic oligoadenylates, which act as second messengers to initiate and amplify the nuclease activity of Csm6. —SYM

Science, this issue p. 605;
see also p. 550

IN OTHER JOURNALS

Edited by **Caroline Ash**
and **Jesse Smith**



Human colonic organoids retain colonic identity after transplantation.

DEVELOPMENTAL BIOLOGY

The making of a distal gut

Organoid research is revolutionizing investigations into development and disease. Gut organoids have proved valuable in elucidating signaling pathways and structures. So far, most advances have focused on the small intestine. The distal gut has seen less progress because of the challenges of deriving organoids from cecum, colon, and rectum stem cells. Múnera *et al.* show that it is essential to have specific growth factors called BMP-HOX present to generate human colonic organoids. When transplanted, these organoids grow into tissues in mice that resemble the human colon. Insights into colitis, colon cancer, and irritable bowel syndrome should now be enabled through the use of these models of the distal human gut. —BAP

Cell Stem Cell **21**, 51 (2017).

EARTHQUAKES

A new earthquake forecast for California

Earthquakes cannot be predicted, but rupture models can estimate the regional likelihood of an earthquake within a certain time window. Field *et al.* incorporate new data and fault-based information for the Third Uniform California Earthquake Rupture Forecast (UCERF3). The new model better accounts for potential multiple fault ruptures and provides self-consistent

forecasting windows from hours to more than a century. UCERF3 is an important development for operational forecasts that are vital for assessing the evolving seismic hazard in California. —BG
Seismol. Res. Lett.
10.1785/0220170045 (2017).

ECOLOGY

A benevolent invader?

Plant and animal species introduced into non-native localities by humans sometimes become invasive, often with damaging

ALSO IN SCIENCE JOURNALS

Edited by Stella Hurlley

MICROBIAL GENOMICS

Archaeal diversity and evolution

Archaea are prokaryotes that make up a third branch of the tree of life. Knowledge of archaeal biological diversity and their role in evolution has rapidly expanded in the past decade. Despite the discovery of previously unknown groups and lineages, few lineages have been well studied. Spang *et al.* review the diversity of Archaea and their genomes, metabolomes, and history, which clarifies the biology and placement of recently discovered archaeal lineages. —LMZ

Science, this issue p. 563

CHROMOSOME STRUCTURE

Origin of DNA compaction

As a repeating unit in eukaryotic chromatin, a nucleosome wraps DNA in superhelical turns around a histone octamer. Mattioli *et al.* present the crystal structure of an archaeal histone-DNA complex in which the histone-mediated DNA geometry is exactly the same as that in the nucleosome. Comparing features of archaeal and eukaryotic chromatin structures offers important insights into the evolution of eukaryotic nucleosomes. —SYM

Science, this issue p. 609

EDUCATION

High schoolers' interest in STEM is contagious

When asked what is influential in pointing students toward science, technology, engineering, and mathematics (STEM) careers, many would name science teachers and parents as obvious candidates. Hazari *et al.* offer evidence for another important group: classmates in high school science courses. They hypothesized that students who perceive that their classmates are highly interested in

the course material are themselves more likely to enter STEM careers, and this hypothesis was supported by information collected from a national survey. The effect remained strong after controlling for differences between students such as prior interest in STEM careers, family support for pursuing such a career, and academic achievement, and after controlling for differences in teaching quality. —REM

Sci. Adv. 10.1126/sciadv.1700046 (2017).

METABOLISM

Antiviral and anti-fatty liver

In myeloid cells, the Toll-like receptor signaling adaptor TRIF promotes inflammation to fight infection. Chen *et al.* found that TRIF also has a metabolic role in the liver. TRIF activation decreased the levels of SCD1, a key lipogenic enzyme. TRIF activation reduced lipid accumulation in hepatocytes exposed to palmitic acid, a saturated fatty acid that is abundant in high-fat diets and in the livers of mice with diet-induced obesity. Because the hepatitis C virus co-opts host lipogenesis to ensure its replication, this TRIF-dependent pathway may restrict viral infection of hepatocytes. —WW

Sci. Signal. 10, eaal3336 (2017).

NEUROSCIENCE

Neural mechanisms for hallucinations

Pairing a stimulus in one modality (vision) with a stimulus in another (sound) can lead to task-induced hallucinations in healthy individuals. After many trials, people eventually report perceiving a nonexistent stimulus contingent on the presence of the previously paired stimulus. Powers *et al.* investigated how different groups of

volunteers and patients respond to this conditioning paradigm. They used behavior, neuroimaging, and computational modeling to dissect the effect of perceptual priors versus sensory evidence on such induced hallucinations. People who are more prone to hear voices were more susceptible to the induced auditory hallucinations. The network of brain regions that was active during the conditioned hallucinations resembled the network observed during clinical symptom capture in individuals who hallucinate while in a brain scanner. —PRS

Science, this issue p. 596

MICROBIOTA

Healthy guts exclude oxygen

Normally, the lumen of the colon lacks oxygen. Fastidiously anaerobic butyrate-producing bacteria thrive in the colon; by ablating these organisms, antibiotic treatment removes butyrate. Byndloss *et al.* discovered that loss of butyrate deranges metabolic signaling in gut cells (see the Perspective by Cani). This induces nitric oxidase to generate nitrate in the lumen and disables β -oxidation in epithelial cells that would otherwise mop up stray oxygen before it enters the colon. Simultaneously, regulatory T cells retreat, and inflammation is unchecked, which contributes yet more oxygen species to the colon. Then, facultative aerobic pathogens, such as *Escherichia coli* and *Salmonella enterica*, can take advantage of the altered environment and outgrow any antibiotic-crippled and benign anaerobes. —CA

Science, this issue p. 570; see also p. 548