

STRUCTURAL BIOLOGY

Building a gate to the nucleus

Nuclear pore complexes form a gateway between the cytoplasm and the nucleus (see the Perspective by Ullman and Powers). Stuwe *et al.* combined structural, biochemical, and functional analyses to elucidate the architecture of a six-protein complex that makes up the inner ring of the fungal nuclear pore. This includes a central trimeric complex homologous to the Nup62 complex found in metazoans that is incorporated into the nuclear pore inner-ring complex. Chug *et al.* report the structure of the metazoan trimeric Nup62 complex. Neither study supports a model in which the pore can dilate and constrict. Instead they suggest a rigid pore in which flexible domains called FG repeats fill the channel and form a barrier that can be traversed by receptors that carry cargos across. — VV

Science, this issue pp. 56 and 106; see also p. 33

PLANETARY SCIENCE

An exoplanet extracted from the bright

Direct imaging of Jupiter-like exoplanets around young stars provides a glimpse into how our solar system formed. The brightness of young stars requires the use of next-generation devices such as the Gemini Planet Imager (GPI). Using the GPI, Macintosh *et al.* discovered a Jupiter-like planet orbiting a young star, 51 Eridani (see the Perspective by Mawet). The planet, 51 Eri b, has a methane signature and is probably the smallest exoplanet that has been directly imaged. These findings open the door to understanding solar system origins and herald the dawn of a new era in next-generation planetary imaging. — BG

Science, this issue p. 64; see also p. 39

GENOME EDITING

Improving gene editing in human T cells

Gene editing holds promise for correcting human disease, but has been hampered by low efficiencies. To address this, Sather *et al.* devised a more effective way to disrupt and replace the CCR5 locus in human T cells, a procedure known to improve HIV clearance. Serotype 6 of an adeno-associated viral vector worked particularly well for the delivery of nucleases and repair templates to primary human T cells, achieving efficient gene editing rates and little toxicity. The nuclease they used (megaTAL) generated homology-directed repair (rather than nonhomologous end-joining repair) and so could both delete and replace the target locus. When inserted into the locus, chimeric antigen receptors and an HIV fusion inhibitor ameliorated HIV infection in mice. — KLK

Sci. Transl. Med. **7**, 307ra156 (2015).

POLYMER CHEMISTRY

Transient polymer links are better

Very long polymer molecules elongate in shearing flows. This ordering of the chains lowers the viscosity of small-molecule solvents. The chains also reduce the dangers of misting during explosive spreading of the solvents. However, the long polymer chains degrade during normal fuel handling and clog pumping equipment. Wei *et al.* used telechelic polymers—short chains with reactive end groups—to form extremely long chains in organic solvents (see the Perspective by Jaffe and Allam). These reformable polymers offer the potential for better fuel safety without the drawbacks of covalently bonded long-chain polymers. — MSL

Science, this issue p. 72; see also p. 32

IN OTHER JOURNALS

Edited by Sacha Vignieri and Jesse Smith



Genes recruited during “pregnancy” in male seahorses are homologous to those used by females across taxa

REPRODUCTIVE EVOLUTION

Like mother, like father

Live birth has evolved repeatedly across the major taxonomic groups, but in the vast majority it is the female that does the brooding. The most developed case of gender reversal in brooding occurs among seahorses. In some seahorse species, males not only incubate the eggs internally but develop a pouch structure that is strikingly similar to a uterus in terms of form and function. Whittington *et al.* produced a detailed transcriptome of the genes up-regulated during pregnancy in male *Hippocampus abdominalis* and found that those involved in embryo growth and support functions, such as nutrient transport and waste removal, were generally homologous to those seen in pregnant female mammals and reptiles. Thus, it seems that the pregnancy pathway is much the same whether fish or mammal, female or male. — SNV

Mol. Biol. Evol. **10.1093/molbev/msv177** (2015).

SUPERCONDUCTION

Building a nanowire superconducting qubit

A major ingredient of a superconducting qubit is a Josephson junction, typically containing an insulator that acts as a bridge (“weak link”) between two superconductors. Larsen *et al.* and de Lange *et al.* fabricated superconducting qubits that,

instead of an insulator, used a semiconducting nanowire as the weak link. Both groups used InAs nanowires, in one case enclosed in a shell of superconducting Al and in the other contacted by superconducting NbTiN. The researchers controlled the frequency of the qubit—a complex operation in the conventional setup—by simply modulating the carrier



Artist's conception of a gamma-ray burst

ASTRONOMY

GRBs not fatal for life in early universe

A nearby gamma-ray burst (GRB) could hugely damage Earth's atmosphere, triggering a mass extinction. GRBs were more common in the early universe, so they might have prevented the early emergence of complex life. Li and Zhang have tested this idea by calculating how often planets would be struck by a dangerously close GRB. Examining how this changes over time, and between different galaxy types, they show that reasonably safe locations existed even when the universe was a third of its current age. Intriguingly, the most likely safe location is in the outskirts of a massive blue galaxy—just where we find Earth. — KTS

Astrophys. J. 810, 41 (2015).

concentration of the nanowire with gate voltage. The new architecture may lead to more-scalable quantum computers and address fundamental issues such as the quantum statistics of Majorana fermions. — JS

Phys. Rev. Lett. **115**, 127001; 127002 (2015).

WATER SPLITTING

A close look at the catalyst interface

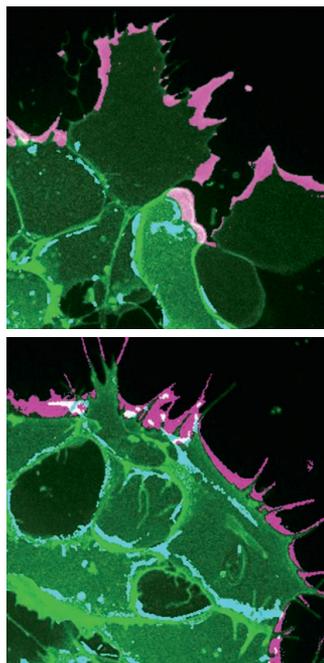
The light-driven splitting of water into hydrogen and oxygen is a widely studied approach toward storing solar energy for use at night and on cloudy days. Hill *et al.* constructed cells in which *n*-doped silicon absorbed the light and a cobalt catalyst on top helped accelerate the oxygen-generating half of the reaction. Their goal was to study how the catalyst/silicon interface influenced the cell's photovoltage. By probing the system in both solution and solid-state environments, they discerned a crucial contribution from an SiO_x oxide layer between the silicon and cobalt. Noncontinuous cobalt coverage also contributed to an enhanced photovoltage. The results could help guide optimization of this and similar device designs. — JSY

Nat. Mater. 10.1038/nmat4408 (2015).

NEURAL CREST

Oh, what places they'll go

Neural crest cells originate from the neuroepithelium, but end up scattered throughout the body, serving as progenitors of a variety of cell types ranging from pigment to bone. Scarpa *et al.* asked how such initially well-behaved cells become individualistic pioneers. The key



Migrating neural crest cells reach for new substrates (magenta) as their cell-cell holds (cyan) decrease

is a switch in the collection of molecules that the cell uses to hold on to its environment. With this switch, the neural crest cell's ability to hold on to neighboring neural crest cells weakens at the same time as its ability to hold on to other substrates strengthens. The shifted balance of power tears apart neighboring cells and favors pathways to new territory. As for adolescents' yearning to leave home, the pull of the horizon weakens anchors at the birthplace. — PJH

Dev. Cell **34**, 421 (2015).

MICROBIOME

The most wanted and most fastidious

Cataloging of the human microbiota is continuing apace, but our functional knowledge of the key organisms is woeful. Ó Cuív *et al.* have exploited bacterial sex, or conjugation, to isolate and genetically manipulate a broad range of the functionally important Firmicute bacteria from mixed human fecal cultures. The recombinant pEHR5 vectors are stably maintained and can be used to fluorescently label some of the *Clostridium*-group bacteria, which are poorly understood organisms, despite several species being earmarked as desirable for a healthy gut

community. This technique will allow the integration of metagenomics with bacterial genetics and paves the way to discovering what these organisms do and where in the gut they do it. — CA

Sci. Rep. 10.1038/srep13282 (2015).

ANTIBIOTICS

Triple threat

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a worldwide threat to human health, because it is resistant to a large class of β -lactams (penicillins) and to second-generation penicillins, including methicillin. However, Gonzales *et al.* report that combining different classes and generations of these drugs could be effective in fighting MRSA. A 1:1:1 mix of three compounds—a β -lactam, a carbapenem, and a β -lactamase inhibitor—synergistically targeted bacterial cell wall synthesis and was bactericidal against 73 different clinical isolates of MRSA. The drug combination prevented MRSA from acquiring resistance to the mix and cleared infection in a mouse model of lethal MRSA. The finding opens the prospect of using already—clinically approved drugs to treat multidrug resistant infections. — LC

Nat. Chem. Biol. 10.1038/nchembio.1911 (2015).

Science

Like mother, like father

Sacha Vignieri

Science **350** (6256), 53.

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