TOOLS IN BRIEF

STEM CELLS

Rat haploid embryonic stem cells

The study of gene function in diploid organisms such as the rat is impeded by the fact that each gene exists as two copies. Li *et al.* report the derivation of androgenetic haploid embryonic stem cells (ESCs) from the Dark Agouti rat. They remove the maternal pronucleus after fertilization, mature the embryos *in vivo* to the blastocyst stage and derive ESCs from harvested embryos under established conditions. Periodic FACS permits stable maintenance of haploid cells in culture over many passages. Haploid rat ESCs display many markers of pluripotency, including contribution to all germ layers and to the germ line in chimeras, although differentiation results in diploidization as has been seen for mouse. The cells remain haploid upon mutagenesis by random or targeted methods and will contribute to the study of gene function in this model organism.

Li, W. *et al. Cell Stem Cell* doi:10.1016/j.stem.2013.11.016 (19 December 2013).

MICROBIOLOGY

Peptidoglycan visualized, at last

Most bacterial species' cell walls contain peptidoglycan, a polymer essential for maintaining cell shape. Enzymes responsible for peptidoglycan synthesis are therefore important antibiotic targets. Though Chlamydiales bacteria contain genes for peptidoglycan synthesis and are susceptible to antipeptidoglycan antibiotics, to date, peptidoglycan has not been detected in any Chlamydial species. Liechti *et al.* report a metabolic labeling method that has now brought this decades-long debate about the 'Chlamydial anomaly' to rest. They took advantage of the tolerance of bacteria to accept alkyne- and azide-functionalized analogs of D-alanine-D-alanine dipeptides, which are incorporated into the growing peptidoglycan chain by the enzyme MurF. These bioorthogonal, reactive handles allow fluorescent probes to be attached via a click-chemistry reaction, allowing peptidoglycan to be visualized. The labeling method will facilitate a broad range of peptidoglycan studies in *Chlamydia* and in many other bacteria.

Liechti, G.W. *et al. Nature* doi:10.1038/nature12892 (11 December 2013).

MOLECULAR ENGINEERING

More channels under the spotlight

Optogenetic approaches rely on the expression of heterologous light-sensitive ion channels or pumps in cells, enabling the use of light to selectively control cells. Optopharmacological approaches, in contrast, rely on the expression of engineered versions of endogenous receptors or channels that are tagged with a tethered photoswitchable ligand. This strategy has been used to generate light-sensitive versions of glutamate, GABA and nicotinic receptors by fusing a photoisomerizable azobenzene derivative to a molecule that acts as a competitive or noncompetitive ligand to the receptor. Lemoine *et al.* report an engineered, photoactivatable version of the ATP-activated P2X channel by adding the azobenzene to the transmembrane region of the protein. This tool lends control over P2X signaling in cells and offers a new strategy for rendering engineered channels susceptible to light.

Lemoine, D. *et al. Proc. Natl. Acad. Sci. USA* **110**, 20813–20818 (2013).

SENSORS AND PROBES

Flexible and minimally invasive nanowires

An ideal sensor for recording bioelectrical signals in cells would be minimally invasive and easy to manipulate. Nanowire probes such as the kinked silicon nanowire field-effect transistor (nanoFET) are much smaller than the commonly used patch-clamp micropipette tips and can be reused. But these and similar nanoprobes are typically fixed to a solid support, which makes it cumbersome or nearly impossible to target a cell of interest. Qing *et al.* use lithographic patterning to fabricate the nanoscale probe end that contains the electrical-sensing nanoFET and couple it to the larger probe body using a special mechanical assembly process. The resulting probe is freestanding and can be manipulated in three dimensions, thereby broadening the range of biological scenarios that can be probed.

Qing, Q. *et al. Nat. Nanotechnol.* doi:10.1038/nnano.2013.273 (15 December 2013).