TOOLS IN BRIEF

MOLECULAR BIOLOGY

A tag for activated neurons

Behaviors are controlled by the activation of discrete populations of neurons in the brain. To understand this process better, it is necessary to define the molecular identity of those functional populations of neurons. In recently activated neurons, the ribosomal protein S6 gets phosphorylated, so Knight *et al*. decided to use this as a tag. The researchers exposed mice to different types of stimuli and then immunoprecipitated phosphorylated ribosomes from the brain homogenates to profile the associated messenger RNAs. By comparing the abundance of each transcript in the phospho-S6 immunoprecipitate to its abundance in the tissue as a whole, they obtained lists of genes uniquely expressed by populations of neurons that responded to specific stimuli. The molecular identification of activated cells may also serve to identify new markers that define these subpopulations of interest.

Knight Z.A. *et al. Cell* **151**, 1126–1137 (2012).

LAB-ON-A-CHIP

Enriching metastatic cells

A flexible cytoskeleton is a good attribute for a stem cell, but it means bad news for a mature cell. As cells differentiate they become stiffer, and if a cell regains the ability to change shape easily, it also gains metastatic potential. Zhang *et al.* used this increase in flexibility to separate metastatic from nonmetastatic cells. As cells navigate a maze of microbarriers in a microfluidic chip, stiff cells get stuck, whereas flexible cells make it through and are collected at the end of the maze. The researchers ran metastatic and nonmetastatic breast cancer cells through their chip to prove the principle and then used the device to enrich for flexible cells in a heterogeneous population of breast cancer cells. The deformable cells overexpress genes related to cell motility and metastasis and show anchorage-independent growth.

Zhang, W. *et al. Proc. Natl. Acad. Sci. USA* **109**, 18707–18712 (2012).

SENSORS AND PROBES

BRET-FRET nanoparticles

Imaging *in vivo* is complicated by tissue autofluorescence and light scattering; there is much interest in near-infrared (NIR) probes to reduce these effects. Xiong *et al*. report polymer nanoparticles that incorporate two steps of energy transfer for *in vivo* imaging with a signal-to-noise ratio an order of magnitude higher than that of standard fluorescence imaging. A variant of luciferase is the bioluminescence resonance energy transfer (BRET) donor, the nanoparticle itself is the BRET acceptor and fluorescence resonance energy transfer (FRET) donor, and an NIR dye is the FRET acceptor. The resulting particles are coated with poly(ethylene glycol) for increased solubility and can be conjugated with tumor-targeting peptides. The particles self-illuminate upon application of the luciferase substrate coelenterazine, and they do not contain potentially toxic metals. Using these particles, Xiong *et al.* imaged the lymphatic system and tumors as small as 2–3 millimeters in the mouse.

Xiong, L. *et al. Nat. Commun.* **3**, 1193 (2012).

NEUROSCIENCE

A model of human behavior

Simulating how our brains work using super-powerful computers is becoming more and more popular. In further improvement of these models, the guiding theme has been to incorporate the largest possible number of neurons, but relatively little attention has been put on reproducing functionality and behavior. Work by Eliasmith *et al*. attempts to fill this gap by simulating a variety of complex human behaviors. The model is called Semantic Pointer Architecture Unified Network (or 'Spaun'), and it is based on the activity of 2.5 million simulated neurons that are organized into subsystems resembling different human brain areas and their wiring. When the researchers present Spaun with stimuli, it responds via a physically modeled arm. Spaun can perform diverse tasks involving simple perception to complex cognition, and it may serve to study important aspects of human brain function.

Eliasmith, C. *et al. Science* **338**, 1202–1205 (2012).

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