METHODS IN BRIEF

CHEMISTRY

DNA nanostructures built from bricks

The relatively new field of DNA nanotechnology has grown rapidly with the development of methods for constructing structures and devices from DNA strands. Ke *et al.* describe a new method to construct ever more complex three-dimensional structures by stacking together combinations of 'DNA bricks' composed of 32-nucleotide single-stranded DNA molecules with four 8-nucleotide binding domains. In a single annealing reaction, a three-dimensional structure can be self-assembled from hundreds of DNA bricks, aided by a software tool for structure design. Akin to building a toy house using LEGO blocks, the approach is highly modular; Ke *et al.* reported the self-assembly of 102 distinct structures, which included intricate tunnels and cavities, by selecting subsets of appropriate DNA bricks from a master collection.

Ke, Y. *et al. Science* **338**, 1177–1183 (2012).

STEM CELLS

Differentiating stem cells *in vivo*

In vivo engraftment of stem cell–derived cells into damaged or diseased tissue has many challenges. For one, if pluripotent stem cells are introduced in numbers large enough for tissue regeneration, there is a high risk of teratomas in an immunodeficient mouse (a standard research model for studying engraftment). Levi *et al.* show that teratoma formation can be minimized by transplanting the cells into an engineered niche that promotes efficient differentiation. Pluripotent cells are implanted in a hydroxyapatite-coated poly-L-lactic acid scaffold that releases bone morphogenic protein 2. The implants achieve rapid and efficient repair of a calvarial defect with a very low incidence of teratomas (they are seen in 2 of 42 mice) after injection of 1 million human pluripotent cells.

Levi, B. *et al. Proc. Natl. Acad. Sci. USA* **109**, 20379–20384 (2012).

MASS SPECTROMETRY

Soft ionization with vacuum alone

For proteins to be analyzed by mass spectrometry (MS), they must first be ionized. Electrospray ionization (ESI) produces multiple charged ions from proteins in solution that can be analyzed on high-accuracy mass spectrometers. Matrix-assisted laser desorption/ionization (MALDI) MS permits molecular imaging of solid biological materials. But both methods have drawbacks: MALDI needs high voltage, which limits the size of protein complexes one can look at, and ESI requires that proteins be in solution. Inutan and Trimpin now take the best of both methods and show that soft ionization can be achieved directly by exposing solid biological material in a matrix to vacuum. The researchers applied this 'matrix-assisted ionization vacuum' method to fragile molecules and large molecular complexes.

Inutan, E.D. & Trimpin, S. *Mol. Cell. Proteomics* published online (13 December 2012).

NANOBIOTECHNOLOGY

An earthworm QD factory

One of the more creative and interesting ways to make designer molecules and materials is via living organisms in place of traditional test tubes in the chemistry laboratory. Bacteria and yeast have been previously manipulated to biosynthesize semiconductor quantum dots (QDs), which are widely used for biological imaging applications. Stürzenbaum *et al.* now have conscripted the earthworm *Lumbricus rubellus* to make QDs. Earthworms have an intrinsic metal detoxification system that can be harnessed to make QDs: normal worms exposed to $CdCl_2$ and Na_2TeO_3 in soil for 11 days produced CdTe QDs in their guts. These earthworm-produced QDs had luminescent characteristics similar to those of synthetic QDs, were water soluble and could be used for live-cell imaging applications.

Stürzenbaum, S.R. *et al. Nat. Nanotechnol.* **8**, 57–60 (2013).