RESEARCH HIGHLIGHTS

Selections from the scientific literature

MATERIALS

Diodes printed in three dimensions

Researchers have created a light-emitting diode (LED) by three-dimensional (3D) printing of five different materials — expanding the number and type of material that can be printed in this way.

This technique involves depositing materials layer by layer until a 3D object is formed. Michael McAlpine and his colleagues at Princeton University in New Jersey used the technology to print a millimetre-sized LED based on quantum dots — nanoscale crystals that emit light.

They seamlessly printed an organic polymer and an indium and gallium metal for the electrodes; a silver metallic interconnect; a layer of quantum dots; and a conductive plastic layer. The entire device was printed onto a curved contact lens.

Other devices, including solar cells and transistors, could be made in this way, the researchers say.

Nano Lett. **http://dx.doi.org/10.1021/nl5033292 (2014)**

IMAGINECHINA/CORBIS

GEOLOGY

Earthquake risk for North China city

Tianjin (pictured), a Chinese city of 11 million people not far from Beijing, lies atop a seismic fault that could be overdue for a large earthquake.

An Yin of the University of California in Los Angeles and his colleagues analysed modern and historical records of earthquakes in northern China. Mapping their locations revealed a 160-kilometre-long fault segment running through Tianjin, roughly 100 kilometres southeast of Beijing. This area has not experienced a major tremor for about 8,400 years, and the authors estimate that a quake of roughly magnitude 7.5 is either overdue or will strike in the next 2,000 to 3,000 years.

Given the region's complex fault structure, however, other factors could explain the lack of major earthquakes, such as multiple smaller quakes releasing energy from the fault.

Geology **http://doi.org/w8j (2014)**

ZOOLOGY

Termite eggs ward off sperm

Ageing termite queens produce new queens asexually by laying eggs without any openings that normally allow sperm to pass through.

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In termite colonies, queens can reproduce both asexually to generate new queens and sexually to produce other colony members. Toshihisa Yashiro and Kenji Matsuura at Kyoto University in Japan analysed eggs collected from field colonies of the termite *Reticulitermes speratus* (**pictured**). They found that in the eggs that had no openings for sperm, the embryos developed without any genetic contribution from the male. Eggs from older queens tended to have few or no openings compared with eggs from younger queens.

This is a rare example of a female animal controlling the fertilization of her eggs even when males are present, the authors say.

Proc. Natl Acad. Sci. USA **http://doi.org/w87 (2014)**

CHEMISTRY

Rapid synthesis a thousand times

A robotic system that can carry out and analyse 1,536 chemical reactions in less than a day could help to accelerate drug discovery.

Tim Cernak and Spencer Dreher at pharmaceutical company Merck in Massachusetts and New Jersey and their colleagues used the system to couple a model substrate with 16 other molecules, in combination with 16 different palladium catalysts and 6 basic reagents. Each of these unique mixtures was dissolved in 1 microlitre of solvent, automatically dispensed into a separate chamber on a 1,536-well plate, and its products were analysed to determine optimum reaction conditions.

The researchers also coupled pairs of more-complex, drug-like substrates, and easily scaled up successful reactions by 1,000 times or more. This high-throughput approach could rapidly assess synthetic routes to a wide range of drug candidates without wasting precious starting materials.

Science **http://doi.org/w9d (2014)**