Chemistry

Green fuels pick up the pace

Green Chem. **6,** doi:10.1039/b404883k (2004)

Biodiesel is an alternative fuel derived from fatty acids in vegetable oils or animal fats. Because it contains almost no sulphur, it burns more cleanly than conventional diesel. However, the chemical reaction that breaks down the fatty acids into fuel relies on an aqueous alkali catalyst such as sodium hydroxide, making the product difficult to separate from the reaction mixture.

Robert S. Watkins *et al.* now unveil a solid catalyst for this reaction that works just as well as a conventional catalyst, yet allows much easier separation of products. Their experiments used starting materials that contain shorter carbon chains than those found in vegetable oils, as a simpler model system for screening potential catalysts.

The authors achieved a 100% yield of the product using a calcium oxide catalyst loaded with 1.23% (by weight) lithium nitrate. The catalyst could be easily filtered from the reaction mixture, and recycled with minimal loss of activity. This could open up the possibility of synthesizing biodiesel as a continuous process, rather than in batches. **Mark Peplow**

Plant biology

Stretching a point

Plant Physiol. doi:10.1104/pp.104.041483 (2004)

The growth of a pollen tube from a pollen grain depends on fluxes of metal ions. In particular, a calcium gradient, with highest concentrations in the tip, is needed to sustain tube elongation. Rajiv Dutta and Kenneth R. Robinson have studied events in the Easter lily, *Lilium longiflorum*, and have identified an ion channel that is responsible for calcium influx into the growing tube, and which is activated by stretching of the cell membrane.

The lily pollen tube grows in cycles of elongation every 40 to 60 seconds, accompanied by oscillations in the concentrations of various ions. Using electrophysiological measurements, Dutta and Robinson detected a spontaneously active potassium channel in the membrane of pollen grains, as well as potassium and calcium channels that were activated when the membrane was stretched by the measuring pipette. Only stretch-activated calcium channels were detected in pollen-tube tips. Blockade of this channel inhibited tube growth.

The increase in intracellular calcium occurs slightly after the elongation phase of pollen-tube growth, in line with the idea that a stretch-activated channel is involved. This process would also position calcium influx at the point of maximum elongation, providing a feedback loop that could account for the growth oscillations seen in lilies. It remains to be seen how potassium enters the tip. **Christopher Surridge**

Earthquakes

Shock reconstruction

J. Geophys. Res. B **109,** doi:10.1029/2003JB002523 (2004)

On 29 June 1170, a powerful earthquake shook the Middle East, developing along a 1,000-km fault that runs from southern Turkey to the Red Sea. Arabic documents of the time record the impact of the quake, but the sources are relatively few and they differ in their assignment of the earthquake's epicentre.

Emanuela Guidoboni and colleagues have delved into contemporary accounts in

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other languages to build a more complete picture of the event. The timing of the quake between the second and third Crusades (1147–49 and 1189–92) meant that there were people of many nationalities in the region. Among the accounts in Latin are those of William of Tyre (pictured), who wrote of the city of Tripoli being reduced to an "untidy pile of stones"; and of Amalric the First, King of Jerusalem, who informed the King of France by letter that "nearly all the castles and cities situated between Tripoli and Antioch" were destroyed. Michael the Syrian — writing in Syriac, an ancient dialect of Aramaic — records that the northern city of Aleppo was worst hit.

Guidoboni *et al.* used the new data to reconstruct the probable epicentre of the earthquake, in western Syria. They estimate that the quake's magnitude was 7.7, assuming it was a single event: the account by William of Tyre suggests that the region might have been hit twice. **Alison Wright**

Diagnostics

Cool amplification of DNA

EMBO Rep. doi:10.1038/sj.embor.7400200 (2004)

Many diagnostic tests depend on the amplification of a particular DNA sequence for further assays, the main method used being the polymerase chain reaction (PCR). Because the enzyme that copies DNA needs a single-stranded template to make the second strand, the duplex DNA that is generated must be separated by a brief high-temperature pulse in every cycle of amplification. A drawback of this process is that the thermal cycling equipment is both expensive and energy-demanding.

Myriam Vincent *et al.* describe a method for DNA amplification, called helicase-dependent amplification, that doesn't require high temperatures. In their protocol, duplex DNA is separated into single strands by a helicase — a protein that travels along DNA, breaking the bonds between strands. By adding a helicase to a PCR-like reaction, the amplification process can be conducted at constant, lower temperature.

Like PCR, Vincent and colleagues' method can amplify DNA sequences a million-fold. Moreover, the authors suggest how the technique may be improved, making helicase-dependent amplification a potential alternative to standard PCR, particularly where use of a thermocycler is not possible. **Angela K. Eggleston**

Nanotechnology

Nanotube diodes

Appl. Phys. Lett. **85,** 145–147 (2004)

Diodes are fundamental components of modern electronics. In the most common type of diode, two different kinds of semiconductor material are joined together — one with an excess of electrons and the other with an excess of positively charged 'holes' for the electrons to fall into. This ensures that current can only flow in one direction through the device.

J. U. Lee *et al.* have made diodes from single-walled carbon nanotubes that measure 0.5–3 nm across and operate efficiently at room temperature. Most semiconductors need a smattering of extra chemical elements to change the number of electrons or holes inside them, but with nanotubes the same effect can be achieved through 'electrostatic doping' — that is, using an external electric field to change the properties of two different parts of the same nanotube. Even better, this means that the field can easily be reversed, changing the preferred direction of current flow.

Lee *et al.* suggest that their nanotube diodes could also function as light-emitting diodes at infrared wavelengths, and could therefore be useful in the development of nanoscale optoelectronic devices. **Mark Peplow**