Anatomy

Elbow room for top predators

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Large mammalian carnivores are often thought of as adopting one of two hunting styles: chasing down their prey, or overpowering them in an ambush. But does an animal's anatomy reveal which strategy it has adopted? It seems that it does — the forelimbs give the game away.

Ki Andersson measured the dimensions of forelimb joints (the equivalent of our elbow) in a range of mammal meat-eaters. Those that chase their prey in sustained pursuits, such as wolves and hyenas, have narrow forelimb joints that offer stability for running but restrict other movement. In contrast, species such as bears and the biggest big cats, which ambush and grapple prey, have wider elbow joints that give them dexterous paws.

These patterns are shaped by strong natural selection, Andersson argues. Cheetahs, perhaps the most noted exponent of the chase, have narrow joints indicative of their style, despite being closely related to other cats that wield their paws with the help of bulkier elbows.

Andersson has also studied the elbows of fossil mammals related to badgers and otters, and concludes that the technique could yield insights into the lifestyles of extinct species. For example, the African *Ekorus ekakeran* seems to have been a chaser, whereas *Megalictis ferox*, from North America, probably used an ambush strategy. **Michael Hopkin**

Ceramics

A mark of imperfection

Chem. Mater. **16,** 3641–3646 (2004)

Japanese pottery from Bizen, decorated in the Hidasuki style (pictured), is made from yellowish clay streaked with fiery patterns in shades of red. No glaze is used; the clay vessel is simply bundled up in rice straw during firing in the kiln, and the straw somehow imparts the bright coloration.

The technique was discovered by chance more than 1,000 years ago, and is considered to imbue the stoneware with the quality of *wabi-sabi*: an earthy, impermanent and incomplete beauty. The colour is known to be caused by iron in the clay, which reacts with alkaline material in the straw. Yoshihiro Kusano *et al.* have now deciphered the microscopic chemistry of this process.

Clay from Bizen typically contains 2–3% by weight of iron oxide, and when heated, this combines with the aluminosilicate clay to form the pale mineral mullite, doped with iron. But potassium in rice straw induces instead the formation of corundum (aluminium oxide) crystals, on which smaller haematite particles stick like barnacles. This seems to be the colorant of the Hidasuki pattern; the precise hue depends on the size of the haematite crystals. **Philip Ball**

Chemistry

Temperature-sensing trees

J. Am. Chem. Soc. doi:10.1021/ja047755g (2004)

Dendrimers are the 'spreading chestnut trees' of the molecular world. These spherical molecules branch out from a central core, ending in a cluster of atomic twigs.

Yasuhiro Haba *et al.* now report a temperature-sensitive dendrimer, made by hanging an isobutyramide chemical group from the end of each twig. These dendrimers are extremely soluble in phosphate-buffered water at room temperature. But as soon as the temperature rises above a critical temperature, the dendrimers quickly fall out of solution and the mixture becomes milky.

Interestingly, the authors find that increasing the number of branching points in the dendrimer lowers its critical temperature significantly: a dendrimer with five generations of branching becomes insoluble above 42 °C, but one with only three branching generations has a critical temperature of around 75 °C.

It had seemed that large differences in the molecular weight of a dendrimer only altered this critical temperature by a few degrees. Haba *et al.* believe that the effect they see might be caused by the marked increase in the density of the isobutyramide groups at the edges of the larger dendrimer. **Mark Peplow**

Physics

Levitating femtodroplets

Appl. Phys. Lett. doi:10.1063/1.1781735 (2004). Video footage at ftp://ftp.aip.org/epaps/appl_phys_lett/E-APPLAB-85-040432/

Shrinking a laboratory to the size of a silicon chip is a promising way to automate rapid chemical analyses of tiny amounts of material. Conventional microfluidic devices can move microlitre quantities of liquids around, but surface contact can slow down the samples or even degrade them.

I. F. Lyuksyutov *et al.* describe a diamagnetic levitation system that can process droplets that are a billion times smaller — femtodroplets. The tiny droplets can be positioned with 300-nm accuracy and merged with each other; solid particles can be precisely rotated and assembled into chains.

The system uses two oppositely magnetized neodymium–iron–boron permanent magnets that confine droplets in the space between them, while magnetic or electric fields from electrodes in the base are used to push the droplets back and forth. By trapping droplets between magnets, the authors effectively create miniature beakers for contained chemical reactions, and have tested their system with, for example, droplets containing single red blood cells and alcohol solutions. **Mark Peplow**

Cancer

Hedgehog targeted

Cancer Cell **6,** 229–240 (2004)

Medulloblastomas are malignant brain tumours that occur in children. Existing treatments, which involve surgery, chemotherapy and radiation, can cause unacceptable side effects, so the hunt is on for an effective, non-toxic alternative. Justyna T. Romer *et al.* now report studies of one potential alternative in mice.

The authors' study used mice that had been genetically altered to develop medulloblastomas. They treated the animals with a small molecule that inhibits a particular cell signalling pathway — that involving the Sonic Hedgehog protein. When the drug was given at low doses, tumour cells proliferated less frequently and began to die off. Higher doses completely eradicated the tumours within two weeks, and helped the animals to stay tumour-free for longer periods than mice that were not treated with the drug.

Romer *et al.* hope that this or similar molecules will prove useful in treating medulloblastomas and other cancers in which the Sonic Hedgehog pathway has gone awry. But ultimately, they caution, many compounds, targeting many cell-growth pathways, may be needed. **Helen Pilcher**