RESEARCH HIGHLIGHTS

Smothered by a swarm

Naturwissenschaften doi:10.1007/s00114-009-0575-0 (2009)

Honeybees don't just kill hornets with heat — they gas them, too. The giant hornet (*Vespa mandarinia japonica*) is a ferocious predator of the Japanese honeybee (*Apis cerana japonica*). The bees fight back by smothering the invader inside a ball formed by their swarming bodies, killing the hornet in minutes. It was thought that the temperature inside the ball — which can rise to around 46 °C — killed the hornet while sparing the more heat-tolerant bees.

Michio Sugahara and Fumio Sakamoto of Kyoto Gakuen University, Japan, found that outside a bee ball, hornets survive such temperatures. Their heat tolerance falls, however, as carbon dioxide levels rise. The air in a bee ball contains about 3.7% CO_2, and in this atmosphere the temperature is lethal to the hornet.

PALAEOCLIMATOLOGY

Tropical ice

Geophys. Res. Lett. doi:10.1029/2009GL037643 (2009)

Ice cores can reveal historical information about climate and vegetation through trapped aerosols such as dust, soot and complex molecules.

Matthew Makou of Ohio State University in Columbus and a team of fellow ice enthusiasts looked at compounds derived from tropical plants that were blown to high altitudes, where they became trapped in ice. The researchers tried out relatively new methods — stir-bar sorptive extraction and thermal desorption — that allowed useful information to be extracted from such compounds without the need for many kilograms of ice.

The authors suggest that the methods will be useful in reconstructing past characteristics of tropical areas, such as forest-fire occurrence, vegetation cover and aridity.

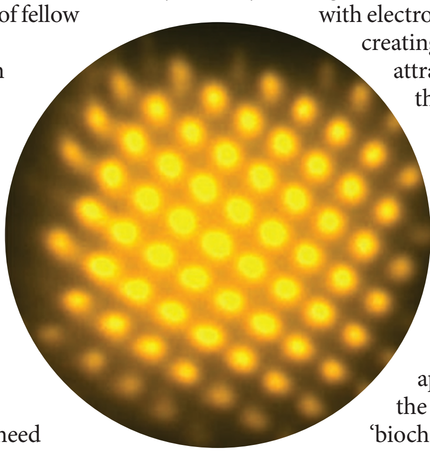
NANOTECHNOLOGY

Penned in protein

Angew. Chem. Int. Ed. doi:10.1002/anie.200900950 (2009)

Etching precise protein patterns on a substrate is important both for medical diagnostics and for fundamental studies. Until now, this has usually been done by first creating protein-attracting regions and then filling in the rest of the surface with protein-repellent molecules.

Michael Zharnikov of the University of Heidelberg in Germany and his coworkers have now developed a technique that 'writes' protein patterns on to a substrate more easily. They do this by depositing an ethylene glycol layer on a gold surface and then zapping it with electron-beam lithography, creating hydrophobic areas that attract proteins only where the electron beam was focused (pictured left; yellow dots represent adsorbed protein). If the adsorbed proteins carry specific binding sites, additional proteins can then be attached as a secondary patterning motif. The approach could lead to the creation of sophisticated 'biochips'.



CHEMICAL BIOLOGY

A glowing report

Nature Chem. Bio. doi:10.1038/nchembio.190 (2009)

Michael Tsang and colleagues at the University of Pittsburgh, Pennsylvania, wanted to find small-molecule modulators of the fibroblast growth factor (FGF) pathway, which is central to embryonic development. They screened chemicals in zebrafish that had been engineered to glow when FGF was active. One chemical known as BCI supercharged the glow, indicating it was boosting FGF activity.

Further study revealed that BCI blocks the activity of dual-specificity phosphatase 6 (Dusp6), an FGF feedback regulator, thereby stopping it from impairing FGF and resulting in the extra glow. Compared with untreated zebrafish embryos, BCI-treated embryos had more cardiac progenitor cells — which eventually give rise to the heart — but fewer of the cells that go on to line blood vessels and form blood cells. The results, say Tsang's team, demonstrate the utility of zebrafish in chemical screens *in vivo*.

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EVOLUTION

Nice guys finish last

Behav. Ecol. Sociobiol. doi:10.1007/s00265-009-0814-6 (2009)

Selfish individuals can profit from the altruism of others in their group, and can even exploit a group's resources so much that the resources become exhausted — an event known as the tragedy of the commons.

Omar Eldakar, of the University of Arizona in Tucson, and his colleagues have now shown experimentally that aggressive mating in water striders (*Aquarius remigis*) can result in one such tragedy. Harassment of female water striders by males has previously been shown to drive away females, diminishing the mating success of all males in a group.

The team built pools and manipulated the number of aggressive and nonaggressive males in each. They found that hyperaggressive males had greater mating success than those which were not aggressive within mixed pools. But as the number of hyperaggressive insects increased, the mating success of both types decreased.