

CHEMISTRY

Micromotors detox chemical weapons

Synthetic micromotors might provide a faster, better way to decontaminate nerve agents.

Converting harmful organophosphate chemicals, such as sarin, into innocuous substances requires high concentrations of hydrogen peroxide and constant stirring over long periods. Such conditions are challenging when eliminating chemical-weapons stockpiles in remote or hostile locations.

Joseph Wang at the University of California, San Diego, and his team overcame these requirements using micromotors made of polymers tipped with platinum. These zip around the contaminated fluid, propelled by bubbles that are produced as platinum reacts with peroxide. In small-volume lab tests, this micromixing neutralized nerve agents at low peroxide concentrations and without external stirring.

Two out of three nerve agents tested with micromotors were almost completely detoxified within 40 minutes. The strategy could provide a general method to accelerate reactions, the authors say. *Angew. Chem. Int. Ed.* <http://doi.org/f2ndgr> (2013)



BOTANY

Two routes to huge blooms

The world's largest flowers develop in two distinct ways.

The plants *Rafflesia* and *Sapria* are two groups within the same family (*Rafflesia keithii* pictured). Their gigantic flowers look similar, smell like rotting meat and form large chambers to lure carrion flies as pollinators.

But when researchers led by Charles Davis of Harvard University in Cambridge, Massachusetts, examined gene-expression patterns and physical structures of developing

flowers, they found that the chambers of the two plant groups come from different tissues. This suggests that the groups evolved their most characteristic features independently.

The study might also help to explain how the flowers of some *Rafflesia* species can get as big as one metre across — the largest of all single blossoms — without collapsing. The flower chambers are derived from the petal whorl, which could provide structural reinforcement.

Proc. Natl Acad. Sci. USA <http://doi.org/pq9> (2013)

ZOOLOGY

Seasonal shift for reindeer eyes

As the seasons change, Arctic reindeer (*Rangifer tarandus*; pictured) alter the colours at the backs of their eyes.

In cats and some other mammals, a reflective surface called the tapetum lucidum reflects light through the retina a second time and improves sight in dim light. Glen Jeffery of University College London and his colleagues studied this structure in reindeer captured within two weeks of the

summer and winter solstices.

The tapetum lucidum changed from golden in summer to deep blue in winter. The winter colour seems to scatter more light across the retina. *Proc. R. Soc. B* 280, 20132451 (2013)

VISION

How bees see a steady landing

Lacking stereoscopic vision, bees have evolved another technique to ensure that they land safely.

Emily Baird of Lund

University in Sweden and her colleagues discovered that honeybees (*Apis mellifera ligustica*; pictured) alight safely by controlling the rate at which their landing zone expands in their field of vision. Keeping this 'optic flow' constant means that bees slow down as they near their targets.

Baird's team discovered this technique by studying bees as they landed on vertical discs with a rotating spiral pattern. Optical illusions that slowed down or sped up the apparent optic flow caused bees to change their flight speeds accordingly. Rather than landing, many bees would



either crash into the spiral or hover in front of it.

This simple method of adjusting speed for landings could be widespread among animals and might even be useful in flying robots in the future, the authors suggest. *Proc. Natl Acad. Sci. USA* <http://doi.org/psp> (2013)

GENETICS

More risk genes for Alzheimer's

The largest genetics study so far of late-onset Alzheimer's disease has identified 11 new genome regions that alter the risk of the disease.

A team of some 200 scientists in the International Genomics of Alzheimer's Project carried out meta-analyses of four separate genome-wide association studies, profiling 17,008 people with Alzheimer's and 37,154 people who did not have the disease. The researchers reproduced their findings by genotyping an independent group of 8,572 Alzheimer's cases and 11,312 controls.

Their results confirmed nine out of ten known Alzheimer's risk genes. Eleven newly identified regions may give more clues about the biology of the disease, for which there are still no effective treatments. *Nature Genet.* <http://doi.org/ppm> (2013)

PALAEOCLIMATOLOGY

Deep ocean is a heat sink

A long-term reconstruction of temperatures in the Pacific Ocean reveals how its heat content has changed since the last glacial era — findings that could augment climate models.

Yair Rosenthal at Rutgers University in New Brunswick, New Jersey, and his colleagues analysed sediment cores in Indonesia's Makassar Strait, and used the mineral composition of tiny sea creatures' shells to calculate past water temperatures.

This showed that, at depths of 500–900 metres, temperatures in the Pacific Ocean were typically higher over the past several thousand years than at present. Over millennia, the waters have undergone prolonged cooling and temperatures are now increasing faster than at any time in the past 10,000 years.

The results support other studies suggesting that the ocean is currently taking up more heat, temporarily slowing the rise in average global air temperatures. *Science* 342, 617–621 (2013)

ASTRONOMY

Explosions in the young Universe

The biggest ever thermonuclear blasts happened in the early Universe, when primordial gas clumps collapsed and created the seeds of supermassive black holes.

Arising even before many stars and galaxies had time to form, the origins of big black holes have been a puzzle. Daniel Whalen of Los Alamos National Laboratory in New Mexico and his colleagues used computer simulations to reveal how gas in early galaxies could have cooled rapidly, forming stars that then exploded. The stars quickly collapsed back on themselves, generating turbulence that caused nearby gas clumps to form baby black holes.

In related work, the same team ran other analyses predicting whether light from those supernova blasts would be visible to upcoming space missions. The James Webb Space Telescope, due

COMMUNITY CHOICE

The most viewed papers in science

NEUROSCIENCE

Cells grow in sleeping brains



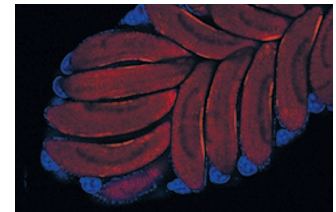
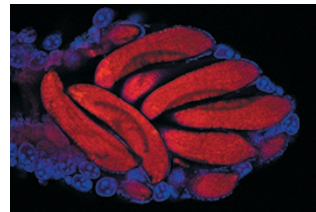
Sleep seems to wake up a type of brain cell that maintains healthy neuron signalling.

Chiara Cirelli and her colleagues at the University of Wisconsin-Madison analysed support cells called oligodendrocytes that wrap around neurons and protect them with a specialized sheath that helps their signals to travel faster.

They collected oligodendrocytes and their precursor cells from mice after the animals had experienced a few hours of sleep or wakefulness and then profiled the expression of newly transcribed genes. Genes that were most active during wakefulness were involved in cell differentiation and death. By contrast, genes that were expressed during sleep promoted cell growth and the production of protective sheaths.

Further experiments showed that the rate of growth of oligodendrocyte precursor cells doubles during sleep, and that cell production increased when mice spent more time in the stage of sleep associated with dreaming.

J. Neurosci. 33, 14288–14300 (2013)



for launch in 2018, should be able to detect these stellar explosions, the authors find. *Astrophys. J.* 777, 99; 110 (2013)

ENTOMOLOGY

Male mosquito boosts egg-making

Male mosquitos deliver more than sperm when they copulate with females: they also provide a hormone that spurs egg development.

A team led by Flaminia Catteruccia at the Harvard School of Public Health in Boston, Massachusetts, studied the malaria-spreading mosquito *Anopheles gambiae*, focusing on a protein that is more abundant in females after mating. Tests using mosquito ovaries showed that this protein helps to direct nutrients into developing eggs (pictured,

red shapes): when the protein was silenced, fewer eggs were produced (left) than when it was expressed (right).

Further work showed that a molecule in male mating secretions binds to this female protein and boosts its expression, which in turn increases egg production.

This is the first demonstration in insects of an interaction between a male hormone and a female protein that changes female reproductive success, the authors say. Interfering with it, perhaps by creating males that lack the hormone, might help to control populations of disease-carrying mosquitoes. *PLoS Biol.* 11, e1001695 (2013)

NATURE.COM

For the latest research published by Nature visit: www.nature.com/latestresearch