The nanomaterials could only stick to clumps of bacterial cells — aggregates too large for ciliates to gobble. However, ciliates took up quantum dots directly from the media, retaining the biotinylated dots for more than twice as long as the carboxylated ones. Rotifers, which eat ciliates, thus consumed quantum dots, but emptied the dots from their guts fast enough to avoid accumulating them.

NEUROSCIENCE

Wide awake

Nature Neurosci. doi:10.1038/nn.2140 (2008)

When it comes to neuronal activity, researchers often assume that what holds for anaesthetized subjects holds for those that are fully awake. This simple inference is misguided, Jason Kerr of the Max Planck Institute for Biological Cybernetics, in Tübingen, Germany, and his colleagues have found.

They recorded how pairs of neurons behave in unmedicated rats and how they behave in the same rats when dosed with ketamine. The neuron pairs that generated the strongest correlations in their discharges before the animals were anaesthetized were not those that were most strongly correlated when the rats were drugged.

This means that care must be exercised when extrapolating measurements of firing patterns across populations of brain cells in the anaesthetized to the wakeful.

MOLECULAR BIOLOGY

Shaping up

Science **320,** 1471–1475 (2008)

How does ubiquitin, a regulatory protein that labels other proteins for destruction, bind to so many different structures? By shuffling between arrangements until it finds the best option, according to Bert de Groot of the Max Planck Institute for Biophysical Chemistry in Göttingen, Germany, and his team.

Forty six of the arrangements were already known from X-ray crystallography of ubiquitin recognition complexes. The researchers followed ubiquitin's structure over pico- to microseconds in various solutions and from many angles, showing that all these conformations are likely to be adopted in living cells.

This work adds to evidence that many confirmations of the same protein often exist in dynamic equilibrium before a binding partner comes along, a model that is at odds with the 'induced fit' hypothesis.

ENVIRONMENTAL MONITORING

Arsenic detectives

Proc. Natl Acad. Sci. USA doi: 10.1073/pnas.0710477105 (2008)

Dissolved arsenic was discovered in the groundwater of the Bengal Basin of Bangladesh and India more than twenty years ago. With deeper wells, safe drinking water might be provided for more than 90% of this region, according to an analysis by Holly Michael and Clifford Voss of the US Geological Survey (USGS) in Reston, Virginia.

The release of arsenic into the basin's groundwater is mainly caused by reduction of iron oxyhydroxides, which tends to take place near the surface. Most wells in the area pump from the contaminated zone, even though the polluted groundwater rarely reaches deeper than 100 metres.

J. HOLMES/PANOS

The USGS model of groundwater flows in the basin suggests that water taken from depths of 150 metres or more will not, in most areas, be tainted by arsenic for a millennium.

MOLECULAR BIOLOGY

Cancer's instigators

Cell 133, 994–1005 (2008)

Some primary tumours stimulate the spread of cancer by releasing a protein called osteopontin, studies in mice suggest.

Robert Weinberg of the Whitehead Institute for Biomedical Research in Cambridge, Massachusetts, and his colleagues implanted tissue from vigorously growing human breast tumours into mice. They then injected tumour cells that normally grow slowly. The fast-growing tumours spurred the enlargement of the 'responder' tumours via osteopontin, which has been previously linked to poor prognosis in several human cancers. Blocking osteopontin's action may yield useful cancer treatments.

JOURNAL CLUB

John P. Quinn
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A microbiologist learns that all marine creatures must suffer for the greed of a few.

Phosphate is an essential nutrient for all forms of life. Demand for it tends to outstrip supply to such an extent that it limits the overall productivity of many ecosystems, including vast tracts of the seas. I study the curious strategies by which creatures obtain sufficient phosphate for life as they know it.

Some microorganisms, for instance, keep a phosphate store for when times are hard. They scavenge for the nutrient in their surroundings with high-affinity uptake systems and then produce polyphosphate, an insoluble polymer that packs hundreds of phosphate subunits into a single strand. Strands of polyphosphate then form intracellular granules that can be broken down by cellular enzymes when they are needed.

This kind of 'luxury' uptake was recently the focus of a study by Ellery Ingall of the Georgia Institute of Technology in Atlanta and his colleagues. Diatoms — unicellular, silica-walled algae — accumulate phosphate during summer blooms to levels far beyond their immediate needs. Indeed, polyphosphate produced by plankton accounted for 7–11% of the total phosphate in the surface waters of Effingham Inlet, a fjord on Vancouver Island, Canada (J. Diaz *et al. Science* **320,** 652–655; 2008).

This self-indulgent behaviour seems to have far-reaching consequences. Decaying plankton eventually sink to the ocean floor, where they spill unused polyphosphate onto the sediment surface. Notably, Ingall and his team found that soluble phosphate was not released at this point. Instead, polyphosphate molecules seeded the precipitation of minerals called apatites, a process that took only a few years. So diatom greed may ultimately lower the ceiling on marine productivity by locking away the oceans' most hard-to-come-by nutrient. That is important as well as curious.

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