RESEARCH HIGHLIGHTS

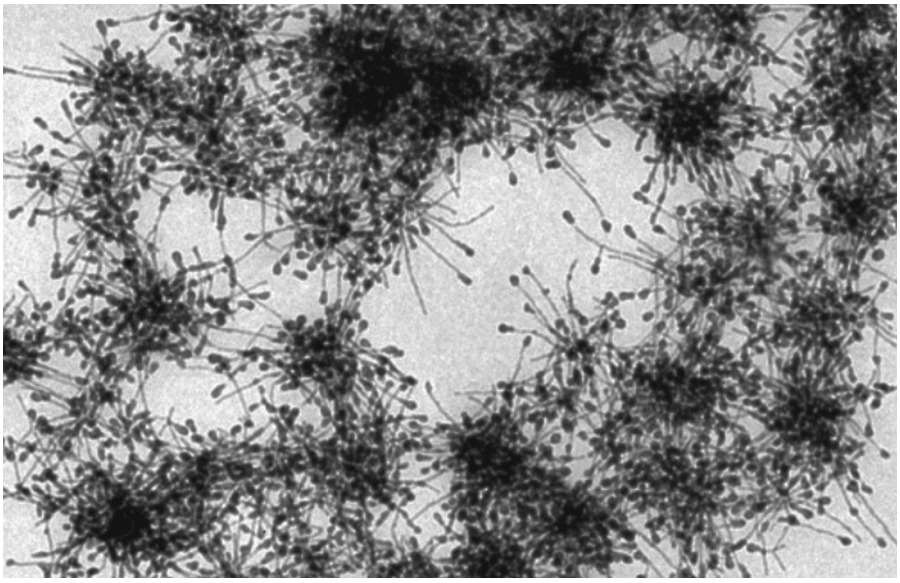
Gold webs

Adv. Mater. doi:10.1002/adma.200701518 (2008)

A duo in Germany has glued gold particles to an unusual nanoscale crystal cobweb, creating a structure that could lead to more efficient solar cells.

Yuriy Khalavka and Carsten Sönnichsen at the University of Mainz grew cadmium telluride crystals that branch into cobweb-like tangles of crystalline filaments. The material is a semiconductor, and organic compounds, such as those used in photovoltaics, can get inside the tangles. Thus, if these inorganic crystals were hooked up to other electronics, they could be used as scaffolding in new types of solar cell.

The researchers have created electrical contacts on the cadmium telluride tangles by bonding gold atoms to the crystals' tips (pictured). They now plan to measure the tangles' electrical properties using these gold leads.



Y. KHALAVKA

CHEMICAL BIOLOGY

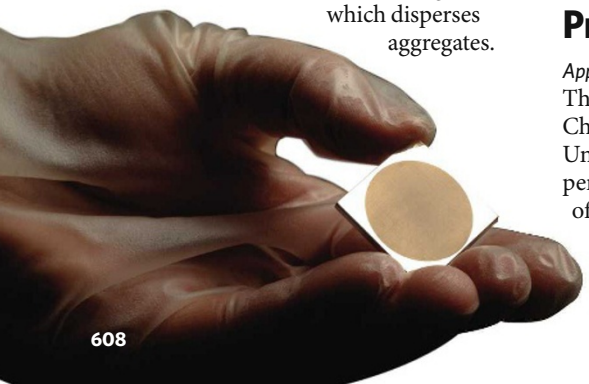
Aggravating aggregating

Nature Chem. Biol. doi:10.1038/nchembio.65 (2008)

Several early drug candidates that prevent the formation of protein fibre aggregates known as amyloids in the brain may act nonspecifically, making them unsuitable for treating disorders associated with amyloid accumulation such as Alzheimer's disease and prion diseases, researchers caution.

Many amyloid inhibitors are structurally similar to chemical aggregators, compounds that clump together in solution. Brian Shoichet of the University of California, San Francisco, and his colleagues proposed that amyloid inhibitors could function nonspecifically by sequestering individual proteins in such clumps, and therefore keeping them out of amyloids.

The researchers found that eight chemical aggregators inhibited polymerization of a yeast prion protein. Several of these compounds also prevented prion infection in live yeast cells. In addition, five known amyloid inhibitors were not able to function when they were prevented from clumping by the introduction of detergent, which disperses aggregates.



UNIV. ROCHESTER

PALAEOBIOLOGY

Deep-sea damage

Proc. Natl. Acad. Sci. USA doi:10.1073/pnas.0705486105 (2008)

Populations of small crustaceans called ostracodes living deep in the ocean collapsed after major climatic events during the past 20,000 years, according to Moriaki Yasuhara of the US Geological Survey in Reston, Virginia, and his colleagues.

Climate and deep-ocean circulation are known to be linked, but whether climate change could seriously affect deep-sea ecosystems has been a matter of debate. The authors measured the diversity of ostracode fossils in a deep-sea sediment core from the northwestern Atlantic Ocean. They found that ostracode species richness has regularly plunged to as little as half its normal level following abrupt alterations in Earth's climate.

The findings do not prove that deep-sea ecosystems are destined for damage in the face of anthropogenic global warming, but they posit the likelihood of it happening.

METALLURGY

Pretty on the outside

Appl. Phys. Lett. doi:10.1063/1.2834902 (2008)

The alchemists would be green with envy. Chunlei Guo and Anatoliy Vorobyev of the University of Rochester in New York can permanently change the surface colour of metals such as aluminium, which is normally silver-coloured, to gold (pictured, left) — and to grey and black. Their trick is to etch the metals' surfaces with pits of different lengths and create other tiny shapes using a powerful laser. These tune the surfaces to absorb particular wavelengths of light, and reflect only the desired colour — or almost no light in the case of black.

At the moment, the process takes four hours to cover a few square centimetres of metal. But with some improvements to speed up the method, blackened metals could prove useful parts of stealth aircraft, colourful metals may replace filters in telescopes and, for the romantic goth, gold wedding bands could be turned black, says Guo.

GENOMICS

Inner differences

Nature Genet. doi:10.10.1038/ng.78 (2008)

A group at the Pasteur Institute in Paris has identified regions of the human genome that probably contribute to differences in appearance, disease susceptibility and other physical traits among four human populations.

Pygmies are small and Massai are tall, northern European adults are good at digesting milk and west Africans have a decent chance of resisting malaria. But the genetic data allowing us to pick apart where natural selection has chipped away at the genome and created such differences only became available with the publication of the HapMap.

Lluís Quintana-Murci and his colleagues analysed more than 2.8 million single-base changes in the genomes of Han Chinese, Japanese, northwestern Europeans and Nigerian Yoruba. The genetic differences

associated with each of these ethnic groups should suggest candidate genes for medical conditions that burden some populations more than others, the authors conclude.

LINGUISTICS

Lingua frantic

Science **319,** 588 (2008)

If all language evolved at the same stately pace, then the number of words that differ between any two languages would be easily calculated by multiplying this constant by how long ago the two tongues parted ways. But Mark Pagel at the University of Reading, UK, and his colleagues have found that branches heavy with linguistic divorces evolve faster, suggesting that 'punctuational bursts' of language change occur just after splits happen. The authors calculate that the rapid change during these bursts accounts for 10–33% of the differences between languages.

Pagel and his team suggest two possible reasons for such bursts: founder events in which the idiosyncrasies of a small number of language 'originators' permanently colour the language, or the desire of recently separated groups to establish distinct identities.

ZOOLOGY

High pitch

Proc. R. Soc. B doi:10.1098/rspb.2007.1619 (2008)

The male Anna's hummingbird (*Calypte anna*, pictured right) has an impressive trick that seems to be for wooing the opposite sex: it swoops down in a graceful dive accompanied by a loud chirp as high as the top note on a piano. Oddly, this sound is produced not vocally, but by the bird's tail feathers, Christopher James Clark and Teresa Feo report.

The mechanism, say the researchers from the Museum of Vertebrate Zoology at the University of California, Berkeley, is similar to a flag making a flapping sound in the wind. But according to their high-speed video analysis, the speed of the dive is so rapid, and the flapping frequency of the bird's tail feathers so high and so finely tuned, as to make a single clear note ring out.

CELL BIOLOGY

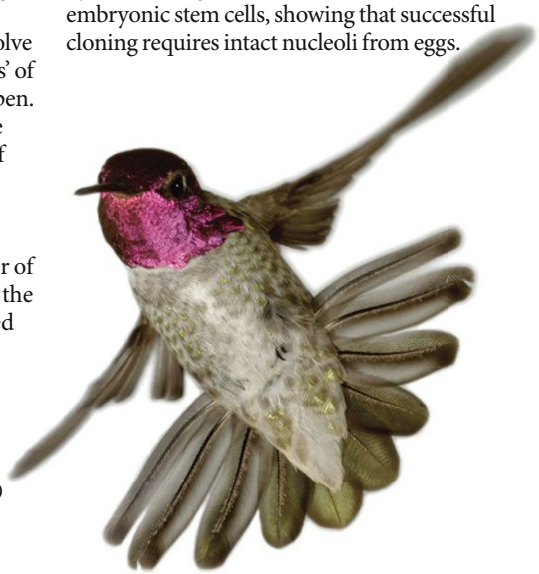
Another gift from Mum

Science **319,** 613–616 (2008)

Pig and mouse embryos require nucleoli provided by the egg to survive early development, researchers in Europe and Japan have discovered. Nucleoli are spherical organelles that make parts for cellular protein factories called ribosomes, and are found inside the nuclei of most organisms other than bacteria and archaea, which lack a true nucleus. They vanish during sperm maturation, but whether the sperm's genetic information might allow their synthesis later in the embryo was unknown.

Sugako Ogushi at Kobe University in Japan and her collaborators removed nucleoli from unfertilized oocytes using microsurgery. All the embryos formed from these enucleolated eggs stopped developing after only a few cell divisions.

Proper development could be restored by reinjecting nucleoli from other eggs but not by transferring nuclei from either somatic or embryonic stem cells, showing that successful cloning requires intact nucleoli from eggs.



C. CLARK/A. VARMA

BIOCHEMISTRY

Paired pairs

J. Phys. Chem. B **112,** 1060–1064 (2008)

Two strips of double-stranded DNA can stick together in a manner that depends on the sequences of their bases, Geoff Baldwin of Imperial College London and his colleagues have found.

That a single DNA strand can stick to a double helix by hydrogen bonding was already known, but the idea that two double helices pair up according to their sequences is new. Baldwin and his co-workers fluorescently tagged two DNA duplexes of the same length and nucleotide composition, but with different sequences, and found that the two types of molecule paired up, like with like, in liquid-crystalline aggregates when mixed together in an electrolyte.

Subtle, sequence-dependent differences in the space between the 'screw threads' of the duplexes may affect how the coils fit together, and thus the electrostatic interactions between them. The effect may explain some mysterious features of DNA recombination in cells.

JOURNAL CLUB

Gerald Crabtree
Howard Hughes Medical Institute, Stanford University School of Medicine, California

A developmental biologist muses on the magic of the egg.

Many biologists, myself included, grew up watching frogs' eggs hatch into tadpoles at the warm surfaces of summer ponds. The yearly cycle provided a leisurely period of thought about basic biology. But few of us guessed how central to current biological and financial interests the egg would become. These days, an enucleated egg's ability to reprogramme the nucleus of a somatic cell — first demonstrated in frogs' eggs in 1958 — promises an era in which organs could be picked up like junkyard parts.

What magic does the egg possess that allows it to reset the nucleus to a basal, or 'pluripotent', state from which all cells can be generated? The three famous transcription factors — Oct4, Sox2 and Klf4 — that are required to transform a skin cell into a pluripotent cell provide some insight. But do these recapitulate a pattern used by the egg during development, or induce reprogramming by an alternative pathway?

John Gurdon and his colleagues at the Gurdon Institute in Cambridge, UK, have purified the proteins that bind to the regulatory sequences of the *Oct4* gene in frogs' eggs (M. J. Koziol *et al. Curr. Biol.* **17,** 801–807; 2007). The group chose *Oct4* because its regulatory regions have been clearly defined. They found that the initiation of *Oct4* expression involved, in addition to likely candidates, some unexpected proteins.

If, as many scientists think is the case, the re-establishment of pluripotency involves short-circuiting egg development, this suggests to me that the magic that allows the egg to reset a nucleus into a pluripotent state may lie in these unexpected proteins — as well as Oct4, Sox2 and Klf4. There is so much more to learn from watching frogs' eggs grow up.

Discuss this paper at **http://blogs.nature.com/nature/journalclub**