The researchers identified a glucose derivative that binds to an active pocket of GNBP2 and disarms it. This molecule, D-δ-gluconolactone, caused termites to succumb to subsequent infection with the fungus *Metarhizium anisopliae* as well as opportunistic infections in lab tests.

QUANTUM MECHANICS

Do the wave–particle

Nature Phys. doi:10.1038/nphys1278 (2009)

In the whacky world of quantum mechanics, particles can act as waves and waves as particles. Physicists wondered whether this duality might also be true for a form of collective motion known as a 'surface plasmon polariton', which arises when light excites electrons on a metallic surface.

Among other quantum properties, plasmon polaritons seem to have wave–particle behaviour. Fedor Jelezko and Jörg Wrachtrup at the University of Stuttgart in Germany and their colleagues looked at plasma polaritons on the surface of a silver nanowire and found that they interfered with themselves — a telltale signature of wave–particle duality. The authors say the work will prove useful, particularly in the development of quantum networks.

CHEMISTRY

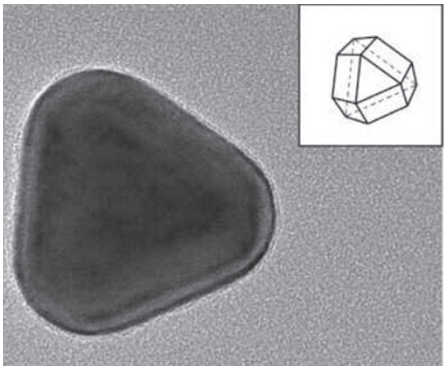
Don't be square

Angew. Chem. Int. Edn **48,** 4824–4827 (2009)

Tiny silver crystals, which among other things are useful as catalysts and in biomedical imaging, like to form as cubes. But to allow better control of their properties, these crystals need to be coaxed into different shapes.

Younan Xia at Washington University in St Louis and his colleagues made silver nanocubes with a conventional reaction using silver nitrate solution, but then quickly added a small, additional amount of this solution. Three of the cubes' faces were augmented with extra silver atoms, creating a crystal that is half octahedron and half truncated cube (pictured below). With slower addition of silver nitrate, the growing cubes remained cubic.

The authors suggest that the exotic crystal shapes could prove useful for an imaging technique called surface-enhanced Raman spectroscopy. Sharp tips, such as the points of an octahedron, help to focus the electric field.



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PLANT BIOLOGY

Seeding expression

Science **324,** 1447–1451; 1451–1454 (2009)

The distribution of methyl groups attached to DNA is thought to be the main route by which genes are 'imprinted', or expressed differently depending on the parent from which they are inherited. Two teams reveal that, in the plant *Arabidopsis thaliana*, extensive DNA demethylation occurs in the seed endosperm — the tissue that provides nutrients for the developing embryo — and show how it underlies imprinting.

Steven Henikoff and his colleagues at the Fred Hutchinson Cancer Research Center in Seattle, Washington, used gene-expression and endosperm-demethylation patterns to predict five new imprinted genes. And Robert Fischer, Daniel Zilberman and their colleagues at the University of California, Berkeley, found that extensive hypermethylation in the embryo accompanies endosperm gene demethylation.

The authors suggest that demethylation in the endosperm and production of small RNA molecules helps to silence disruptive transposable elements — short DNA sequences that can copy and insert themselves throughout the genome — in the embryo.

GENE REGULATION

Just-in-time activation

Genes Dev. doi:10.1101/gad.1787109 (2009)

DNA winds around bundles of proteins called histones to make nucleosomes. The histone H2A.Z — a variant of H2A — was thought to prepare genes for activation and then exit the scene once this had occurred. But Luc Gaudreau of the University of Sherbrooke in Canada and his co-workers now show that it is recruited only to the promoter regions of certain genes — those regulated by oestrogen receptor alpha — at around the time of induction. Moreover, recruitment recurs in a cyclical manner, boosting gene expression.

By identifying proteins that bind to specific DNA sequences, the researchers studied the timing of H2A.Z recruitment to a gene promoter after cells were exposed to oestradiol. Compared with H2A, H2A.Z triggers a shift in nucleosome position and stabilizes the binding of other proteins that promote gene expression.

JOURNAL CLUB

Wolf-Dietrich Hardt
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An infection biologist points out an outstanding issue in mucosal immunology.

The gut immune system can distinguish between harmless commensal microorganisms and dangerous pathogens, and attenuates its response to the former to avoid dangerous chronic inflammation. The mechanisms that maintain this hyporesponsiveness are just beginning to be unravelled.

Dendritic cells, the key organizers of appropriate immune responses, actively sample commensal microbes. In organs other than the gut, this would trigger a strong immune response, and the responsiveness of intestinal dendritic cells to microbes is thought to be thwarted by anti-inflammatory molecules released by gut cells. But the situation could be much more complex: hyporesponsiveness might be restricted to certain 'microbe-associated molecular patterns' (MAMPs), such as lipopolysaccharides, large molecules attached to the outer membrane of many bacteria.

Linda Klavinskis of Kings College London and her team have analysed the MAMP-responsiveness of dendritic cells migrating from gut tissue to local lymph nodes. Surprisingly, these cells do respond to harmless *Bacillus* spores and most MAMPs — but not lipopolysaccharides (V. Cerovic *et al. J. Immunol.* **182,** 2405–2415; 2009). Does this suggest that hyporesponsiveness of intestinal dendritic cells is transient? The maintenance of hyporesponsiveness in the gut mucosa, patterns of MAMP-hyporesponsiveness, and localization and timing of MAMP responses will be important topics for future research.

Unfortunately, unactivated dendritic cells are hard to isolate from the gut mucosa. *In situ* analysis of dendritic-cell responses to gut microbes in intact tissue holds much promise. Technical advances in multicolour two-photon microscopy, fluorescently tagged microbes, and transgenic mice expressing cell-type and response-specific fluorescent reporter proteins will be instrumental in this key area of biology.

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