GENETICS

The long and the short of it

Genes Dev. doi:10.1101/gad.1595107 (2007)

Short interfering RNAs (siRNAs) silence gene expression, regulating various cellular processes. Different types of naturally occurring siRNA exist, but the hallmark of these sequences is their short length of 20–31 nucleotides. Researchers now report that the model plant *Arabidopsis* also expresses long siRNAs (lsiRNAs) of 30–40 nucleotides.

Hailing Jin, from the University of California, Riverside, and her colleagues find that lsiRNAs share many features with other plant siRNAs, but differ in two aspects. Creation of lsiRNAs requires a unique set of proteins, and one lsiRNA seems to mediate the degradation of its target mRNA sequences by a mechanism that is unusual for plants. The lsiRNAs identified by the team are mainly induced in response to bacterial infection and under certain growth conditions.

ASTRONOMY

Galactic dust-busting

Astronom. J. **134,** 2385–2397 (2007)

Inside galaxies, stray dust blocks starlight and creates difficulties for astronomers. Most observations require a correction to compensate, but there have been relatively few measurements of dust in galaxies far from Earth.

Now Benne Holwerda of the Space Telescope Science Institute in Baltimore, Maryland, and his colleagues have used pairs of galaxies to gain a better understanding of far-away dust. Using the Sloan Digital Sky Survey, an archive of almost a quarter of the sky, the team selected 83 cases in which one galaxy was partially obscured by another (pictured, below). By comparing the exposed and obscured parts of the background galaxy, the team measured exactly how much light was absorbed by dust in the foreground galaxy.

The team looked at galaxies as far away as 2 billion light years, and is now working on extending the survey to even greater distances. The findings will aid a wide range of astronomical observations.

NASA/STSCI

CHEMISTRY

Special delivery

Nature Chem. Biol. doi:10.1038/nchembio.2007.56 (2007)

Salinosporamide A is a chlorinated natural product from a marine bacterium that is being tested in clinical trials for its cancer-beating properties. Bradley Moore, at the University of California, San Diego, and his colleagues have discovered an enzyme, SalL, that delivers chloride to a precursor of salinosporamide A by a unique enzymatic pathway.

Chlorine normally works its way into natural products by an oxidative mechanism. But in this case the researchers have identified a nucleophilic substitution that involves the breaking of a carbon–sulphur bond and the formation a carbon–chlorine bond. A biological methylating agent is highjacked by SalL to do this. Subsequent reactions of metabolite intermediates form salinosporamide A. The authors suggest that this enzyme opens up fresh possibilities for engineering metabolic pathways to create new chlorinated products.

NEUROBIOLOGY

Uncomfortably numb

Neuron **56,** 880–892 (2007)

During stressful situations, it pays to be able to cut out distractions. Now, researchers have found the mechanism that enables the stress hormone noradrenaline to block pain.

Pankaj Sah and his colleagues at the University of Queensland in Australia have found that in rats, noradrenaline prevents communication between a pain-sensing region of the brain called the parabrachial nucleus, and a portion of the central amygdala, a region that links emotion with sensory experience.

Axons from the parabrachial nucleus extend into the central amygdala. The researchers showed that noradrenaline acts on receptors in the parabrachial nucleus, leading to a reduction in the number of sites at which neurotransmitter is released into the central amygdala.

JOURNAL CLUB

Paul Mulvaney
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A nanoscientist says block co-polymers may unblock nanotechnology.

One of the great drivers of the nanotechnology revolution has been the dream of molecular assembly. Essentially, this means using molecular or chemical forces to self-assemble smart or functional structures that could be integrated into electronic or optical devices.

Thomas Russell and his colleagues have recently provided a superb example of the way the field may be heading (B. Kim *et al. Small* **3,** 1869–1872; 2007).They took a diblock polymer — one that self-assembles into micelles — known as poly(styrene-b-4-vinylpyridine) and forced it to form microdomains by tuning the micelle structure through solvent exchange. This led to hexagonally ordered templates with periods of about 45 nanometres.

They then transferred these polymer templates by reactive ion etching to aluminium surfaces and fabricated regular pores by anodic oxidation at 4° C. The resulting hexagonal, close-packed pores are just 12 nanometres across, with nearest-neighbour spacings that should be tunable over a range of about 10–50 nanometres. The ordering extends over an area several micrometres square.

Particularly elegant is the seamless combination of colloid chemistry with more conventional 'top-down' processing. These wet chemical methods should be cheaper and more scalable than more conventional cleanroom-based techniques. What is particularly exciting about this approach is that the diblock structure can be readily tuned to provide a range of surface topologies and so a wide variety of potential templates. These could drastically simplify the fabrication of periodic, sub-wavelength structures for plasmonics-based applications such as optical circuitry.

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