THE IMAGE BANK/GETTY IMAGES

CELL BIOLOGY

Pore relation

Genes Dev. **19,** 1188–1198 (2005)

A controversial theory suggesting that genes relocate to the periphery of the nucleus when they are transcribed is supported by studies in yeast cells. A team led by Pamela Silver at Harvard Medical School tracked the location of the many genes whose expression is enhanced when yeast cells are exposed to a mating pheromone. The researchers show that most of the activated genes cluster around nuclear pores — openings through which molecules pass between the nucleus and cytoplasm. They also use high-resolution mapping to investigate how the chromosome hosting the genes changes its spatial orientation to put the genes in place.

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

NANOTECHNOLOGY

Into the groove

Nano Lett. doi:1021/nl050405n (2005)

Nanoscale ice sculptures could provide templates for making transistors and miniature machines, suggests a team at Harvard University. The researchers used electron-beam lithography to carve grooves through a 20-nanometre-thick layer of ice on a silicon wafer, and then applied a coating of chromium. A rinse in isopropyl alcohol removed the icy template and its metal overlayer, leaving strips of chromium less than 20 nanometres wide.

Unlike the polymer mask materials used to pattern silicon today, ice doesn't need spinning or baking on to the substrate. And it can be removed by sublimation, eliminating the need for solvents, although this process leaves stray chromium flakes.

VVG/SPL

CANCER

Healing hijacked

Cell **121,** 335–348 (2005)

The body's wound-healing process is subverted by breast-cancer tumours to help them grow and build a network of blood vessels, according to a study led by Robert Weinberg of the Whitehead Institute in Cambridge, Massachusetts.

Tumours are already known to contain fibroblasts — cells usually found only in inflamed or regenerating tissue that help build connective tissue. The team found that in invasive breast tumours, these fibroblasts make a protein called SDF-1 that encourages cancerous cells (pictured left) to grow. The protein also summons cells to generate the blood vessels that tumours need.

HYDRODYNAMICS

Skipping stones

Phys. Rev. Lett. **94,** 174501 (2005)

Stones, as many time-wasters know, skim across water when thrown the right way. But how to get the most bounces? Experiments reported in *Nature* (**427,** 29; 2004) last year showed that a flat stone should be tilted at 20° to the water's surface for optimal skipping. Now, Shin-ichiro Nagahiro and Yoshinori Hayakawa of Tohuku University in Japan back up this finding with theory. They model the impact of a stone on water using smoothed particle hydrodynamics, and calculate the angle where the velocity required for an onward bounce is minimized. Happily, for the peaceful coexistence of theorists and experimentalists at the waterside, they find it is always around 20°.

CHEMISTRY

Complex proteins

J. Am. Chem. Soc. doi: 10.1021/ja050304r (2005)

The functions of some proteins involved in cell signalling and the immune response are altered when small molecules, such as lipids and carbohydrates, are attached to an amino-acid side chain. Obtaining large amounts of these modified proteins for study has proved difficult because bacteria cannot make them.

A possible solution, offered by chemists from the University of Illinois in Urbana, involves an artificial amino acid containing aziridine, a three-membered ring. Thiols, the sulphur equivalent of alcohols, selectively react with this ring, forming a new bond. So far, the team has attached small thiol-containing molecules to peptides, but other methods may extend the technique's scope to longer proteins.

JOURNAL CLUB

Peter Dayan
University College London, UK

The director of UCL's Gatsby Computational Neuroscience Unit recommends some gainful reading.

Who of us lacking an anorak could admire an article with 60 equations and 15 instances of "piecewise linear"? But skip this paper — in the press at the *International Journal of Bifurcation and Chaos* — and you'll miss an important, if obscure, treat. It addresses a venerable question, which has long troubled me, in the neuroscience and psychology of decision-making: the role of neuromodulators.

Neuromodulators are an important class of transmitter. From a biophysical perspective, they seem to regulate general properties such as the excitability or 'gain' of their target neurons. Thus, many see them merely as widespread irrigants (or irritants, as our less charitable colleagues would have it).

But behavioural neuroscience studies suggest that neuro-modulators can play a key role at specific times in decision-making tasks. The transmitters regulate competition between populations of neurons that represent choices. This allows a subject to integrate noisy sensory information with past experience about rewards to make almost optimal decisions.

Previous attempts to reconcile the general function with the specific were a bit too heuristic to convince me. I buried my head in the sand or muttered jeremiads — complaining that the necessary tests were impossible.

However, this paper squares the biophysics with the behaviour. The researchers use a model to show that changing the gain of neurons is precisely the right thing to do to achieve optimal decisions. Along the way, they link classical and modern suggestions about the mechanisms of decision-making, an area under intense behavioural and electrophysiological scrutiny.

So buy your anorak, and let this theory reign.

www.math.nyu.edu/~ebrown/papers/simple_networks.pdf