Shaul Hurwitz of the US Geological Survey in Menlo Park, California, and his team propose that years with lots of rain (or snow) result in higher than usual pressures in the 200 °C-plus underground reservoirs that feed geysers, shortening eruption cycles. Conversely, after snowmelt in spring, cold water percolates into geyser conduits and lowers their temperature, lengthening eruption intervals. The work is based on data recorded between 1998 and 2006 by temperature sensors in geyser outflow channels.

GENETICS

The Mod Squad

Nature Genet. doi:10.1038/ng.154 (2008)

The sections of its DNA that a cell expresses — and thus the cell's characteristics — depend in part on chemical modifications to the histone proteins around which DNA is wound. A set of 17 such modifications is associated with a quarter of all promoters — gene-regulatory sites — in human immune cells, find Keji Zhao of the US National Institutes of Health in Bethesda, Maryland, and his colleagues.

They looked at the different combinations of chemical alterations that affect the expression of about 12,500 genes in $CD4^+$ T cells. One type of modification — acetylation — does not directly determine whether a gene is 'read', as had been suspected, but seems to prime the gene for activation.

PHYSIOLOGY

Environmental awareness

J. Gen. Physiol. **131,** 605–616 (2008)

Researchers at Stanford University in California report that proteins can alter the lipid environment around a transmembrane ion channel in a way that influences whether the channel is open or closed.

Miriam Goodman and her colleagues studied an ion channel involved in the nematode worm *Caenorhabditis elegans*'s sense of touch. The channel's core comprises the proteins MEC-4 and MEC-10. Around this core sit two other proteins, called MEC-2 and MEC-6, which are responsible for the observed effect.

MEC-2 is found on the inner side of cell membranes and seems to bind cholesterol. MEC-6 resides on the extracellular side of ion channels and contains a helical structure that may associate with various lipids. It is not clear whether MEC-2 directs the ion channel to regions in the membrane flush with cholesterol or whether it attracts cholesterol to the area around the pore.

CELL BIOLOGY

Motor control

Science **320,** 1636–1638 (2008)

A protein that allows the soil bacterium *Bacillus subtilis* to quickly halt its propeller-like propulsion and thus stick to a surface has been identified by Daniel Kearns of Indiana University in Bloomington and his colleagues. EpsE, the protein, seems to act like a clutch rather than a brake; it leaves the rotors that drive the bacterium's flagella unpowered but spinning freely rather than slowing them down.

The authors labelled *B. subtilis*'s EpsE with a fluorescent protein and revealed that EpsE is associated with flagellar motors. They then attached bacteria to a surface by a flagellum. The cells rotated passively even when they produced EpsE, which would have prevented them from swimming.

MICROFLUIDICS

Groove train

Nature Mater. doi:10.1038/nmat2208 (2008)

A network of grooves only a few millimetres long has been used to guide tiny structures around fluid-filled channels. These structures organize themselves into complex arrangements, as illustrated by the Greek temple pictured below.

SU EUN CHUNG *ET AL.*

More than 50 microstructures were slotted into the grooves. Water flow pushed them to the end of the lines, where they latched into place. Then exposure to ultraviolet light fused them together. The microstructures can carry living cells, among other things, suggesting an application in tissue assembly.

Sunghoon Kwon's team at Seoul National University in South Korea say that this improves on other methods of sub-200-micrometre robotic assembly, which are dearer and slower.

JOURNAL CLUB

Seth Lloyd
Massachusetts Institute of Technology, Cambridge.

A quantum mechanic considers how we might 'talk' to aliens.

So it finally happens. After hundreds of years of humans attempting to communicate with extraterrestrial beings, our descendants receive a message back. But it looks like utter gibberish. What to do? Earthlings might, for example, find some middle ground by sending the aliens a stream of circularly polarized photons to explain what we mean by left handedness. Or maybe the aliens would be able to decipher simple mathematical formulae, encoded in a binary alphabet, through which we could gradually build up a mutual understanding of mathematics, logic, and so forth?

That might work, but what if the replies are still nonsensical? Brendan Juba and Madhu Sudan recently supplied a mathematically precise answer to this question (B. Juba and M. Sudan *Symp. Theor. Comput.* 123–132; May 2008). Using the theory of interactive proofs, which shows how parties who possess different pieces of a theorem's proof can cooperate to construct a full proof, they show that as long as aliens are not completely indifferent to communications from Earth, we will quite quickly be able to ascertain whether or not they have knowledge that is useful to us.

The technique that Earthlings should use goes like this: Bob, the human, systematically encodes questions about a class of problems in a form that any computer can interpret. He then repeatedly sends the encoded questions to Alice, the alien, and carefully parses the apparent gobbledygook that she sends back. Juba and Sudan prove that if Alice knows the answers to Bob's questions (that is, were the questions asked in her own language), and actually answers some non-negligible fraction of those questions (again, in her own language), Bob can determine what she means.

So communicating with aliens is possible in principle, no matter how unpromising the task may seem. I find that reassuring.

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