Work by Peter Hänggi of the University of Augsburg in Germany and his collaborators contradicts those early calculations. The group's one-dimensional models of particles in a gas show that the same temperature will be observed regardless of the observer's speed. The team admits, however, that this may not be true of two- or three-dimensional gases, and believes that further study is needed.

CLIMATE CHANGE

Irreducible sensitivity

Science **318,** 629–632; 582–583 (2007)

Decades of intensive work on climate change have done little to narrow the range of uncertainty over Earth's climate sensitivity — the amount of global warming to be expected under carbon dioxide levels twice those of the pre-industrial world, which the Intergovernmental Panel on Climate Change puts at between 2 °C and 4.5 °C. Nor can a substantially better estimate be expected in the future, according to Gerard Roe and Marcia Baker of the University of Washington in Seattle.

Their mathematical analysis stresses that normally distributed uncertainties in the feedbacks associated with climate processes make ruling out a long tail of high sensitivities unrealistic. In an accompanying Perspective, Myles Allen and David Frame at the University of Oxford, UK, argue that this is not a problem for setting policy, because the concentrations of carbon dioxide associated with specific warmings can be much better constrained.

CHEMISTRY

Clicking without copper

Proc. Natl Acad. Sci. USA **104,** 16793–16797 (2007)

Proteins can be quite easily labelled for studies in living cells, but other types of molecule are trickier to track. One possibility is to use a two-step technique: first get the cell's own machinery to add a chemical 'socket' to the molecule of interest, then add a trackable reagent that fits easily into that socket. 'Click' chemistry — so named for the ease of assembly — might be helpful for this second step, but normally depends on toxic copper compounds.

Now Carolyn Bertozzi and her colleagues at the University of California, Berkeley, report using a cyclooctyne onto which fluorine atoms have been added to carry out the same sort of click reaction without the need of copper. Their system can be used to track sugar molecules in and on living cells for minutes or for days.

PLANETARY SCIENCE

Identical twins

Astrophys J. **669,** L89–L92 (2007)

Astronomers have identified a star that is in many ways indistinguishable from the Sun.

Peruvian astronomers Jorge Meléndez of the Australian National University, and Iván Ramírez at the McDonald Observatory of the University of Texas in Austin report that the parameters of HIP 56948, one of four 'solar twins' they have been studying, are exactly the same as the Sun's, within the constraints of observational accuracy. Unlike previous solar twins, this star — which resides 200

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light years away in the constellation of Draco — shares the Sun's low lithium content. In addition, HIP 56948, like the Sun, has no accompanying 'hot Jupiter' in close orbit.

Such solar twins are useful for various calibrations, the authors say; they are also of potential interest to researchers involved in the search for extraterrestrial intelligence.

CHEMICAL PHYSICS

Nano steams ahead

Phys. Rev. Lett. doi:10.1103/PhysRevLett.99.178103 (2007)

Nanoparticles may exhibit chemotaxis — directed motion along a gradient of chemical concentration previously seen at the microscale only for living cells.

Ayusman Sen, Darrell Velegol and their colleagues at Pennsylvania State University have shown previously that nanorods made with platinum at one end and gold at the other move through a solution of hydrogen peroxide, owing to the catalytic production of oxygen gas. Now they report that in a peroxide gradient the rods — 370 nm wide and 2 μm long — move 'uphill' towards the fuel source, because the increase in speed at higher peroxide concentrations biases their movement. This offers a simple way to power and guide nanoscale objects.

JOURNAL CLUB

James E. Ferrell
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A systems biologist encourages modelling by the millions.

In a typical modelling study, we write down equations, solve them, and see whether they account for known data. If they do, we claim to understand some bit of biology. One huge caveat is that many other models might have matched the data just as well.

Researchers from Peking University in Beijing and the University of California, San Francisco, have devised a satisfying way of dealing with this problem (W. Ma *et al. Mol. Syst. Biol.* **2,** 70; 2006).

Their starting point was epithelial patterning in the fruitfly *Drosophila*. During embryogenesis, a system known as the 'segment polarity network' generates repeating stripes of gene expression. The stripes are initially fuzzy and later become sharp. Ma *et al.* set out to see what simple gene circuits were best suited to this sharpening process.

They formulated differential-equation models for about 14 million ways of connecting two or three segmentation genes, then randomly chose 100 sets of parameters that defined the strength of the interactions for each gene. They then carried out computations for each combination to determine which of them converted fuzzy stripes into sharp ones.

Many topologies worked for at least one parameter set. But only a fraction worked for more than one or two. Interestingly, the most robust topologies were all variations on the same design — each had three sub-circuits, one 'stripe generator' motif and two bistable 'response sharpeners'. These findings give hope that complex networks may be decomposed into modular sub-circuits with understandable functions.

Comprehensively examining millions of models is a lot of work, but is not impossible. And, as Ma *et al.* show, it can yield important insight that could not have been derived from studies of one or two.

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