RANDOM SAMPLES

edited by JOCELYN KAISER

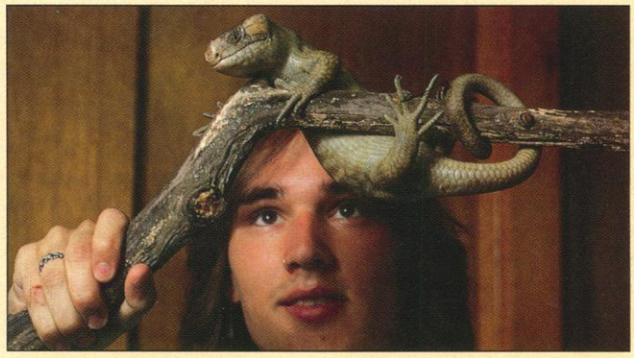
Atoms Have the Coolest Time

A second may be the length of time it takes you to say "one thousand one." It is also, by international agreement, the time it takes cesium atoms to resonate 9,192,631,770 times in a microwave field. To measure that resonance—the basis of atomic clocks—as accurately as possible, researchers have to make the atoms hold still, which means cooling them. And as of now, the coolest atoms anywhere are in the custody of a group at the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland, which has chilled cesium atoms to just 700 nanokelvin (billionths of a degree above absolute zero).

The feat required some way to put the brakes on atoms that, at room temperature, race around at speeds of several thousand kilometers an hour. The group, led by physicist William Phillips of NIST, began with a cloud of cesium atoms slowed by conventional means. They then enlisted a cooling technique pioneered at the Ecole Normale Supérieure in Paris, which relies on four converging beams of laser light.

At the intersection of the beams, the light waves interfere, canceling each other out in some spots and reinforcing in others. The result is a honeycomb of bright and dark regions. The photons pelting the atoms from all sides tend to push them into the bright spots of this "optical lattice," trapping them and cooling them to about a millionth of a kelvin.

But then the NIST group turned down the intensity of the beams, making the energy wells created by the bright spots wider and shallower. The trapped atoms slowed even more, to a temperature of 700 nanokelvin. The group is already planning to put those sluggish atoms to work in an atomic clock. But they're not alone, team member Steven Rolston notes: "Almost every standards lab is working on a frequency standard based on laser-cooled atoms." Call it a race for time.



SHARRON BENNETT/CORNELL UNIVERSITY

Lounge lizard. Skink rests on a tree branch.

Strange Tail of the Skink

The Solomon Islands skink, a South Pacific lizard, anchors itself in tree tops by corkscrewing its tail around branches. Such acrobatics make the average monkey's tail appear, well, all thumbs. Now Kevin Zippel, a former undergraduate at Cornell University, has discovered the skink's talents are the product of an unparalleled anatomy.

The skink tail, Zippel reported at a July meeting of the Society for the Study of Amphibians and Reptiles, consists of a series of cone-shaped muscles stacked one on top of the other. The stacked muscles are attached to an outer sheath of spirally wound collagen fibers. This design allows the tail to bend in any direction, and for one part to stay rigid while another part flexes. "The particular fiber winding angle of the collagen fibers is exactly the right one for a system that has to change shape," says biomechanics expert Steven Wainwright of Duke University.

Until Zippel's finding, prehensile, or grasping, organs had been thought to come in two basic designs. One is the elephant-trunk model, in which muscles, firmly encased in connective tissue but lacking bones, push and pull, creating pressure changes that bend the organ. The other model is the monkey-tail or articulated linkage model in which muscles flex a series of bones.

The skink's tail is different. Cornell's John Bertram, Zippel's adviser, notes that it "appears to come halfway between the muscular organization of the elephant's trunk and [that of] the shark's body," which also is made up of a series of conical muscles. "Robotics engineers should check it out," suggests Zippel.

Dante Rescued From Inferno

Like a stranded mountain climber, the robot that made headlines exploring the steaming crater of an Alaskan volcano earlier this month slipped on its climb out and had to be rescued by helicopter last week.

After days of dodging falling boulders, the 1-ton machine named Dante was almost halfway up the crater wall when trouble hit. "Dante had walked on its own out of the worst terrain," says John Bares, Carnegie Mellon University roboticist and the mission's manager. "But it just got unlucky."

Dante's ill luck began when it tried to back out of a muddy gully. The slippery ground beneath gave way, and the spider-like robot tipped over on its side, unable to move—even though its navigational systems and video cameras were still working. Although the robot already had accomplished its scientific goals—to explore the crater and sample gases from belching vents—the team wanted it back for use on future missions.

The rescue, however, was far from flawless. One helicopter tried to hoist the robot by its communications tether, which then snapped, sending Dante rolling down the slope. For a while, researchers considered abandoning the machine. But a few days later, on 13 August, Bares and a national guardsman were able to put a sling around Dante, which a helicopter used to lift out the damaged robot. Dante is now on its way back to Pittsburgh—with seven of its eight legs broken. Next time, says Bares, they'll put rigging points on its underside.

Russian Scientist Takes Gripe to Court

Russian researchers are fast learning the ways of the West. A graduate student in Moscow's Institute of Sociology adopted a very Western means of complaint last month when professors failed his doctoral thesis: He sued them.

Sergei Belanovski's thesis, entitled "The methods and technique of the focused interview," explored an interviewing method developed by U.S. sociologist Robert Merton. Professors Olga Maslova and Tamara Dridze decided that Belanovski's thesis was "too emotional and, in fact, retells Robert Merton's works." Belanovski's interviews were of some value, they said, but there was insufficient new material to grant him a degree.

Belanovski felt he had been mistreated, but rather than pursue his grievance within the Russian Academy of Sciences, which manages the institute, he decided to seek compensation in the courts for the Russian equivalent of slander. He sued Maslova for 20,000 rubles and Dridze for 50,000—a total of around $35.

The attorney representing the two professors claimed that the issue was purely a scientific matter and should never have been brought to court. As the hearing neared completion last month, Belanovski declared that he was unwell and the case was adjourned until 16 September. With inflation expected to reach 10% next month, Belanovski should avoid further delays in his case or his compensation may be measured in pennies.