at the National Institute of Standards and Technology in Boulder, Colorado.

Rather than using light, as in standard laser cooling methods, the researchers damp a small cantilever's vibrations through the electrical force between it and a nearby plate, which is connected to an electrical circuit that oscillates at radio frequencies. They reduced the cantilever's temperature from room temperature to 45 kelvin, but say that the method could in principle cool the device enough for quantum effects to show. This is predicted to happen when the object's thermal jitters are small. The technique might also improve the sensitivity of mechanical vibration and position sensors.

GENETICS

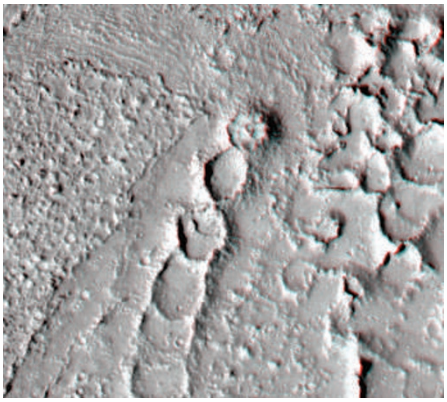
Dangerous repeats

Hum. Mol. Genet. **16,** 2326–2332 (2007)

A neurodegenerative disease called Fragile X-associated tremor and ataxia syndrome may be treatable by targeting abnormal RNA, research suggests.

The syndrome occurs in some people who have 60–200 copies of the nucleotide sequence CGG, which are transcribed into an RNA sequence that is thought to be toxic. Another disorder, called FRAXE, is caused by more than 200 repeats of the complementary sequence CCG.

Juan Botas and David Nelson of Baylor College of Medicine in Houston, Texas, and their colleagues, showed that expression of just one 90-copy CCG repeat in *Drosophila* eyes was enough to cause ocular deformities. However, flies that expressed both this sequence and a 90-copy CGG repeat had normal eyes. The researchers propose that the two RNA transcripts bind to each other, prompting their degradation. The effect depends on a protein, Argonaute-2, that is required for the process of RNA interference.



NASA/UNIV. ARIZONA/US GEOLOGICAL SURVEY

PLANETARY SCIENCE

Rivers of rock

Science **317,** 1709–1711 (2007)

The fluid that flowed most recently through Athabasca Valles, the youngest of the 'outflow channels' on the surface of Mars, was lava and not water, according to data from the Mars Reconnaissance Orbiter.

Windy Jaeger of the US Geological Survey, Flagstaff, Arizona, and her colleagues have identified features in photos taken by the orbiter's unprecedentedly acute HiRISE camera that they can only explain in terms of volcanic flow. The researchers also say that surface features interpreted in 2005 as dust-covered pack ice on a frozen sea are instead a pooled portion of this lava flow.

Those eager for evidence of water on Mars can take comfort in the fact that the distinctive ring-mound landforms (pictured left) spotted in these images were produced by outbursts of gas from below the lava flows. They presumably mark spots where ice or ground water in the rocks over which the lava flowed vaporized explosively.

MARINE BIOLOGY

Seaweed searches

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0704778104 (2007)

The lush kelp forests that characterize some cold ocean waters have now been discovered in tropical locales. The finding overturns the prevailing hypothesis that tropical waters are too warm and nutrient deficient to support the large seaweeds.

Michael Graham of Moss Landing Marine Laboratories in California, and his colleagues, used oceanographic data to model kelp habitats. The model accurately located known kelp forests, but also predicted more than 23,500 square kilometres of potential kelp habitat in deep tropical regions where upwelling brings in nutrients and clear waters allow sufficient light to penetrate. The researchers then searched the waters near the tropical Galapagos Archipelago and found several new kelp forests, as predicted.

These tropical kelp forests could provide unique biodiversity hotspots that may warrant inclusion in marine conservation programmes.

JOURNAL CLUB

David K. Campbell
Boston University, USA

A physicist highlights a three-in-one deal for nonlinear science

As a student of nonlinear phenomena, I am continually amazed by new examples of deterministic chaos, solitary waves and fractals.

A recent study (R. H. Goodman and R. Haberman *Phys. Rev. Lett.* **98,** 104103; 2007) gave me the rare pleasure of seeing all three of these fundamental manifestations of nonlinearity woven together.

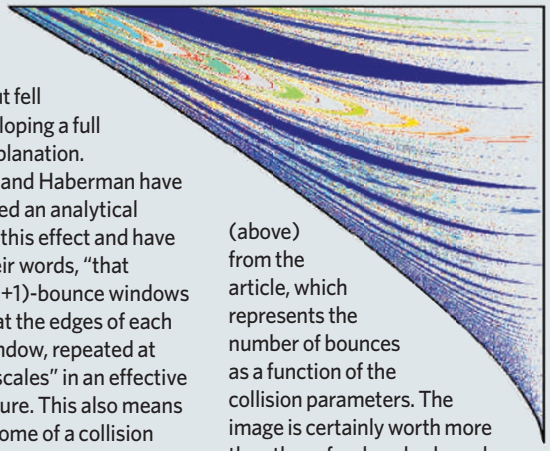
This paper addresses the collisions of solitary waves — localized nonlinear waves that propagate without changing shape and are found in systems ranging from solids to optical fibres.

In the 1980s, with several colleagues, I studied this problem numerically (see, for example, D. K. Campbell and M. Peyrard *Physica D* **18,** 47–53; 1986). We discovered a surprising 'bounce' phenomenon, in which solitary waves would collide, remain trapped for a number (n) of bounces and then escape to infinity. This behaviour occurred only when the waves had specific relative velocities on colliding; these bounce windows were interspersed with regions in which the waves repelled each other immediately.

We developed a heuristic explanation for this behaviour, consistent with the waves behaving like elastic particles that can be deformed, but fell short of developing a full analytical explanation.

Goodman and Haberman have now developed an analytical treatment of this effect and have shown, in their words, "that clusters of (n+1)-bounce windows accumulate at the edges of each n-bounce window, repeated at diminishing scales" in an effective fractal structure. This also means that the outcome of a collision is exquisitely sensitive to the initial velocity, a hallmark of deterministic chaos.

If all the above seems dry, take a look at the wonderful graphic



PHYS. REV. LETT.

(above) from the article, which represents the number of bounces as a function of the collision parameters. The image is certainly worth more than these few hundred words.

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