having the spins either in the protective singlet configuration, or as a triplet that can be transformed into observable signal when needed.

There has been related work using very similar transformations in systems of slightly inequivalent spins[8,10], but the demonstration by Feng *et al.*[1] that there is a natural handle on chemically equivalent spins suggests a general way of exploring long-lived spin states in a whole range of molecules. These molecules can be chosen so that they have interesting properties for specific applications, be they in the context of metabolic processes or for studies of other processes that are slower than T_1. Moreover, the technique explored by Feng *et al.* involves manipulating spin systems using coherent radiofrequency pulses — something NMR spectroscopists are traditionally very good at. In short, Feng and colleagues give us a powerful hammer, and there should be no shortage of nails to be hit. ❐

Andreas Trabesinger has been both researcher in the field of NMR and an editor at Nature Physics. *Now he provides science-communication services through his company Reinschrift.*
e-mail: trabesinger@gmail.com

References

1. Feng, Y., Davis, R. M. & Warren, W. S. *Nature Phys.* **8**, 831–837 (2012).
2. Bowers, C. R. & Weitekamp, D. P. *J. Am. Chem. Soc.* **109**, 5541–5542 (1987).
3. Navon, G. *et al. Science* **271**, 1848–1851 (1996).
4. Hall, D. A. *et al. Science* **276**, 930–932 (1997).
5. Golman, K., in't Zandt, R. & Thaning, M. *Proc. Natl Acad. Sci. USA* **103**, 11270–11275 (2006).
6. Carravetta, M. & Levitt, M. H. *J. Am. Chem. Soc.* **126**, 6228–6229 (2004).
7. Carravetta, M., Johannessen, O. G. & Levitt, M. H. *Phys. Rev. Lett.* **92**, 153003 (2004).
8. Pileio, G., Carravetta, M. & Levitt, M. H. *Proc. Natl Acad. Sci. USA* **107**, 17135–17139 (2010).
9. Warren, W. S., Jenista, E., Branca, R. T. & Chen, X. *Science* **323**, 1711–1714 (2009).
10. Tayler, M. C. D. & Levitt, M. H. *Phys. Chem. Chem. Phys.* **13**, 5556–5560 (2011).

QUANTUM MECHANICAL RESONATORS

Rising above the noise

Tiny mechanical oscillators have enabled us to directly see quantum effects. They are limited, however, by the fact that they must be physically attached to something: this link to the environment can be a source of thermal noise that destroys the delicate quantum states. A scheme for separating a resonator from its surroundings by levitating it is now independently put forward by two teams of researchers (O. Romero-Isart *et al. Phys. Rev. Lett.* **109,** 147205; 2012 and M. Cirio *et al. Phys. Rev. Lett.* **109,** 147206; 2012).

Schrödinger's famous cat is a hypothetical example of a quantum effect at an everyday macroscopic scale. In reality though, quantum mechanics is normally confined to the world of the atomically small. Recently, however, microscale resonators that are large enough to be seen with the naked eye have entered the quantum regime. A quantum oscillator still vibrates even in its lowest-energy state; so-called zero-point motion. The difficulty in creating a resonator in this quantum state is removing any other causes of motion — thermal vibrations, in particular. Dilution refrigerators and clever optical techniques can reduce the effective temperature down to below 100 mK. But heat can still leak in via whatever anchors the oscillator to the rest of the world. One approach that has been put forward is to suspend the resonator in mid air using the radiation pressure exerted by a laser beam. But photons too can increase the temperature. Oriol Romero-Isart and Mauro Cirio and their respective co-workers instead consider levitating oscillators in a static magnetic field.

© HEMERA/THINKSTOCK

Romero-Isart *et al.* theoretically investigated a superconducting micrometre-sized sphere, made of lead for example. The resonator considered by Cirio *et al.* comprised a nickel–zinc microsphere suspended above three orthogonal superconducting rings. Both teams placed a loop of superconducting wire known as a flux qubit near their resonator: the magnetic flux passing through the qubit depends strongly on the position of the resonator. The researchers were able to show how this resonator–qubit magnetic coupling could be used to cool the motion of the resonator to near the quantum ground state.

These highly isolated resonators could be the ideal system for investigating quantum mechanics at a mesoscopic scale. They could also be the basis for new designs of ultrasensitive detectors.

DAVID GEVAUX