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Physics news on the Internet (based on electronic preprints)

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1. Microlocomotive

M Porto of Tel Aviv University in Israel and his colleagues proposed a theoretical model of a moving microscopic (nanometre-sized) device they dubbed 'locomotive'. In its simplest version, this is a system of three balls connected sequentially by two variable-length springs, possibly light-sensitive molecules that can change their shape when absorbing light. When one illuminates them by a narrow light beam so as to alternately increase and decrease their length, the strings could move the balls along a corrugated surface. Motion in two perpendicular directions is achieved by adding more balls and strings to the system. While no prototype is yet available, the device holds a promise of great possibilities in medicine and in the design of mechanical microdevices.

Source: http://www.nature.com/

2. Right- and left handed molecules

Many molecules come in two varieties, one the mirror image of the other. While these 'right-' and 'left-handed' varieties are equally abundant in the non-organic world, amino acids that form the basis of proteins are always left-handed for some yet unknown reason (see *Usp. Fiz. Nauk* **166** 873 (1996) [*Phys. Usp.* **39** 819 (1996)] for more details). True, an excess of one variety over the other may be created by shining circularly polarized light on chemically reacting substances, but polarized light is too rare in nature to be a factor in biological evolution. Now G Rikken and E Raupach of the Grenoble High Magnetic Field Laboratory in France have found a new way is which a 'right-' versus 'left-hand' asymmetry may appear. Exposing a complex unstable chrome compound to the combined action of an ordinary unpolarized light beam and a magnetic field of the same direction, they saw the molecules of one variety to dominate in the solution. The result is the same if polarized light is used, and if the magnetic field is reversed, the other variety builds up. If the light beam is perpendicular to the field, no asymmetry is observed. Some believe it is this effect which is behind the right to left-hand asymmetry in living organisms.

Source: *Nature* **405** 932 (2000)
http://www.nature.com/

3. Soft dipole resonance in He-6

Many nuclei with extra neutrons (isotopes) may be treated as made up of the main nucleus plus a system of additional neutrons; such nuclei are normally nonspherical and their deformability makes then susceptible to vibrational excitation. In Li-6, for example, it has been predicted that the three protons oscillate together opposite to the three neutrons, and in He-6 the coupled system of two protons and two neutrons (α particle) oscillates opposite to the two remaining neutrons. The reason this 'soft dipole resonance' has thus far evaded experimental detection is that in a real nucleus different vibrational modes are coupled with each other as well as with the rotational and other degrees of freedom. Now physicists in Japan have for the first time discovered the resonance in He-6 nuclei formed in a Li-6 target struck by a beam of Li-7.

Source: *Physics News Update*, Number 492
http://www.hep.net/documents/newsletters/pnu/pnu.html#RECENT

4. Spin liquid

The so-called resonance valence bonds between spins predicted by P W Anderson back in 1973 have been discovered by a Britain – US – Polish collaboration in a neutron-scattering study of Cs_2CuCl_4 in a strong magnetic field at low temperature — conditions, under which this material behaves as a two-dimensional antiferromagnet and its properties are determined by the interaction of quasiparticles known as spinons. As a result of the resonance effect, a strong increase in neutron scattering intensity is observed. Also, large ground-state quantum oscillations are noted as also is the stabilizing effect of an additional magnetic field directed along a crystal lattice plane.

Source: http://xxx.lanl.gov/abs/cond-mat/0007172

5. A brown dwarf flare

Brown dwarfs are a special class of stars, intermediate between normal stars and planets, whose small mass prevents stable fusion reactions in their cores. Because of the gravitational energy released due to the slow compression process in brown dwarfs, they are rather dim objects. Chandra X-ray Observatory now has produced strong evidence for the presence of a magnetic field in brown dwarfs by detecting a sudden X-ray flare from a brown dwarf LP 944-20 located 16 light years from Earth. The flare, with emitted energy about a million times that of Jupiter flares, faded away over the next two hours and was presumably due to processes occurring in the magnetized turbulent gas near the object's surface.

Source: http://chandra.nasa.gov

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