

Frogs utilize ultrasonic skills

Everyone is familiar with the audible chirps and croaks of various frogs, but one particular tree frog in China turns out to be quite adept at using sound for localization, as Jun-Xian Shen of the Chinese Academy of Sciences in Beijing and Albert Feng of the University of Illinois at Urbana-Champaign and colleagues have discovered. Moreover, the same species can also tune its ear to different frequencies.

Females of the concave-eared torrent frog (*Odorrana tormota*), which lives around noisy rivers at the Huangshan hot springs, make chirps in the range 7.2–9.8 kHz, with harmonics up into the ultrasonic region to let males know they are ovulating. Males can locate them with an astonishing precision of less than 1°; a feat of localization comparable to dolphins, barn owls, elephants and humans (Shen *et al.* 2008).

In related studies, with Marcos Gridi-Papp of the University of California, Los-Angeles, Feng and colleagues examined the eardrums of the same species to examine whether they actually vibrate at the ultrasonic frequencies. What they found surprised them: it turns out that the frogs can deselect their sensitivity



This remarkable frog, Odorrana tormota, can tune in to ultrasound and use it to locate mates with great precision. (Courtesy Albert Feng.)

to ultrasound. Further studies revealed that when the Eustachian tubes in the frog's ears are closed, their ears are sensitive to high frequencies, but when the tubes are open the eardrums respond to low-frequency sounds (Gridi-Papp *et al.* 2008).

Further reading

Jun-Xian Shen *et al.* 2008 *Nature* **453** 914.
Marcos Gridi-Papp *et al.* 2008 *PNAS* **105** 31 11014.

Measuring fine structure by eye

There are only a handful of parameters that are known that depend on fundamental constants, and not on the details of a material sample. Now, joining the list of quantities such as the resistivity quantum and magnetic flux quantum is the opacity of suspended graphene, the material that consists of a one-atom-thick layer of carbon. R R Nair of the University of Manchester and colleagues have discovered that graphene's opacity depends only on the fine structure constant, α . They found that graphene absorbs about $\pi\alpha$, or 2.3% of incident white light, a result of the material's electronic structure. This leads to the surprising realization that the fine structure constant can essentially be measured by eye.

Further reading

R R Nair *et al.* 2008 *Science* **320** 1308.

Incense proves to calm the nerves

Frankincense – an aromatic tree resin – turns out to be more than just something that smells nice when burned. Arieu Moussaieff at the Weizmann Institute in Israel and colleagues have shown that one of the components of the resin, incensole acetate, has antidepressant and anxiolytic effects in addition to activating an ion channel related to the sensation of warmth in the skin. The same ion channel is also present in the brain, but its role there is not yet understood. After more than 4000 years of use, frankincense is starting to give up some of its secrets, and it looks as though its use by so many ancient cultures was far from accidental.

Further reading

Arieu Moussaieff *et al.* 2008 *The FASEB Journal*
doi:10.1096/fj.07-101865.

Spins entangle in room-temperature diamond

Dreams of a quantum computer all require a means to control and maintain entangled bits for long periods of time, a feat that is often imagined to require cryogenic temperatures. Now P Neumann of the University of Stuttgart and colleagues have shown that entangled states of two and three spins of carbon-13 nuclei can be maintained in diamond.

The researchers find that they can control the entangled states through their coupling to an electron in a nitrogen vacancy (a spot in the crystal where a nitrogen atom displaces one of the carbons). All this is at room temperature and over millisecond time scales. The dreams of a quantum computer just possibly have come a little closer to one day becoming a reality.

Further reading

P Neumann *et al.* 2008 *Science* **320** 1326.

Is non-Gaussianity set to spell trouble for cosmic inflation?

Inflation – the idea that the universe underwent an early period of extremely rapid expansion – may be in trouble. Amit Yadav and Benjamin Wandelt at the University of Illinois at Urbana-Champaign looked at the local non-Gaussianity of the temperature anisotropy of the cosmic microwave background using data from the Wilkinson Microwave Anisotropy Probe.

They discovered a value between 50 and 80 for the parameter f_{NL} , which describes this non-Gaussianity, with a disagreement of some 2.5σ from the value between 0 and 1 that is expected in the simplest inflation models. Further data coming from the ESA's Planck satellite could make the result unambiguous and put significant pressure on inflationary models.

Further reading

A P S Yadav and B D Wandelt 2008 *Phys. Rev. Letts.* **100** 181301.