

Sciencewatch

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Tsunamis: why the first wave is not the tallest

Tsunamis usually consist of multiple waves and it has long been a puzzle why the first wave is often not the tallest or most damaging. Now, Frederic Dias of University College in Dublin and colleagues have found the answer in a resonance effect.

As the first wave crashes on the shore, the water level behind it drops, resulting in a stored potential energy analogous to a compressed spring. If the second wave arrives at the right time it can pick up the energy of the rebounding water to give a larger and more powerful second wave. Subsequent waves can be even more powerful, which explains the puzzle.

In simulations of a perfectly smooth



beach the researchers found enormous amplifications in strength, up to a factor of 60. More realistic simulations of the tsunami that struck the Mentawai Islands in October last year showed smaller yet still large enhancements. Predictions of where such enhancements are expected to be large in size could improve how people are warned when future tsunamis hit.

● Further reading

T S Stefanakis 2011 *Phys. Rev. Letts.* **107** 124502.

The first wave of the "tsunami monster" is not necessarily the most damaging. (Image credit: Andart/dreamstime.com.)

Memory that stays cool

A new nonvolatile memory device could use 99% less energy than current FLASH technology and lead to laptops that do not heat up your lap. Saptarshi Das and Joerg Appenzeller of Purdue University in Indiana have demonstrated a proof-of-concept of a new ferroelectric transistor random-access memory, or FeTRAM.

Earlier ferroelectric RAM devices destructively read out bits stored in a capacitor. By contrast, the new device stores bits in a memory transistor – the capacitor being replaced by a transistor with an organic ferroelectric, which can be read out nondestructively. Unlike earlier attempts of this kind, the device is compatible with current CMOS technology. Some cool memory could be coming soon.

● Further reading

S Das and J Appenzeller 2011 *Nano Letts.* **11** 4003.

Weird particles in graphene

Graphene – a single layer of carbon atoms from graphite – has displayed a variety of unusual properties, including having effectively massless charged quasiparticles. Igor Zaliznyak of Brookhaven National Laboratory and colleagues have recently shown that if three layers are properly stacked, massive $I=3$ chiral quasiparticles appear, with the novel property that their masses depend on energy going to infinity as the energy level decreases.

In the normal world of particle physics such particles would be unstable against

The origin of lager

Beer drinkers may have Argentina to thank for the lager that they have drunk, even if it is German. José Paulo Sampaio of the Universidade Nova de Lisboa in Caparica, Portugal, and colleagues were researching the genetics of yeast when they came to the surprising conclusion that the cold-resistant yeast that makes lager – first brewed in the 15th century – must originate from beech trees in Patagonia. The yeast is not indigenous to Europe, Japan or North America, and how it travelled to Europe is not clear. It could possibly have come on wood that was used to make a barrel. Whatever route, however, it seems to have been an amazing, but happy, accident.

● Further reading

D Libkind *et al.* 2011 *PNAS* **108** 14539.

decay, but chirality protects these from doing so. They could be the basis for completely novel electronic and spintronic devices.

● Further reading

X L Zhang *et al.* 2011 *Nature Physics* doi:10.1038/nphys2104

An antiviral with potent potential

Viral illnesses are notoriously difficult to treat, but now a new approach could hold the promise of cures for almost all of them. The trick is in noticing that nearly all viruses generate double strands of RNA with more

than 30 base pairs – something healthy mammalian cells do not. The immune system has an enzyme called protein kinase R (PKR) that blocks them, but many viruses have ways round it.

Todd Rider of the Massachusetts Institute of Technology in Lexington and colleagues bonded PKR to a protein that triggers cell suicide, or apoptosis. The result, called DRACO (for “double-stranded RNA activated capsase oligomerizer”) makes a cell die as soon as the viral RNA is produced. The researchers showed it to be effective against rhinovirus, which causes the common cold, as well as the H1N1 virus. While clearly dangerous if too many cells are infected, this appears to be a novel approach to treating a range of viral infections.

● Further reading

T H Rider *et al.* 2011 *PLoS ONE* **6**(7): e22572.

Magnetic cloaking

Invisibility cloaking has been a hot topic in recent years and now a related twist is the development of a magnetic cloak. Alvaro Sanchez and colleagues at the Universitat Autònoma de Barcelona have shown how an “antimagnet” made using superconductors and isotropic magnetic materials can conceal the magnetic response of a volume from the outside. Such devices could be useful, for example in allowing magnetic resonance imaging of people with pacemakers or cochlear implants.

● Further reading

A Sanchez *et al.* 2011 *New J. Phys.* **13** 093034.