

Sciencewatch

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Bad news for artificial sweeteners

Sugar substitutes might affect bacteria in the gut in such a way as to exacerbate metabolic disorders. Eran Elinav of the Weizmann Institute of Science in Rehovot and colleagues have found that mice given water sweetened with saccharin develop glucose intolerance, whereas mice given water sweetened with glucose do not. However, glucose intolerance did not appear in mice that had their gut bacteria killed by antibiotics, while fecal transplants from glucose-intolerant mice induced the same



It seems that sugar might be best after all. (Image credit: Marazem/Dreamstime.com.)

intolerance in normal ones. This showed that the saccharin had made the mouse microbiome unhealthy, and the researchers obtained similar results with other artificial sweeteners, sucralose and aspartame.

In a small trial, seven healthy, fit humans

who did not use artificial sweeteners were given the maximum daily allowance of artificial sweeteners for a week. Four out of the seven developed glucose intolerance, with a corresponding shift in gut flora. It is interesting that the increase in the use of artificial sweeteners coincides with the increase in diabetes and obesity. Perhaps the best advice is to stick with sugar, just eat less.

● Further reading

J Suez *et al.* 2014 *Nature* **513** 290.

The origins of caffeine

Many people probably owe a significant part of their productivity to caffeine, from coffee, tea, or chocolate. So does this caffeine share a common origin? Victor Albert of the University of Buffalo in New York and colleagues sequenced the genome of robusta coffee, *Coffea canephora*, from which about a third of the world's coffee comes. They found that most of the genes unique to the plant are related to caffeine production, so a common caffeine-bearing ancestor to the three main sources appears unlikely. It seems that nature came up with caffeine at least twice.

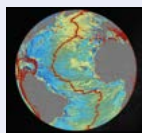
● Further reading

V A Albert *et al.* 2014 *Science* **345** 1181.

Possible origin for biomolecular chirality

One of the most striking features of living matter is that sugars all seem to be right-handed and amino acids left-handed. One resolution to the puzzle is the Vester-Ulbricht hypothesis, which is that chiral β -decay electrons might preferentially break down differently-handed molecules, although laboratory tests have been largely ambiguous or negative. Now, J M Dreiling and T J Gray of the University of Nebraska in Lincoln have demonstrated such a preferential dissociation of chiral molecules by chiral electrons. They used a 30% longitudinally polarized electron beam and bromocamphor – which comes in left- and right-handed forms – in the vapour phase. Looking at sub-electronvolt collisions, they find an energy-dependent asymmetry of about three parts in 10,000, giving support to one of the most promising theories of the origin of biomolecular chirality.

Gravity mapping the sea floor



Using radar altimetry data from two satellites – CryoSat-2 from the European Space Agency and Jason-1 from NASA and the French Centre

National d'Etudes Spatiales – David Sandwell of the Scripps Oceanographic Institute in La Jolla and colleagues have made the most detailed maps of the sea floor to date. Once effects of time-varying phenomena such as waves are removed, tiny changes in sea level reflect the gravitational tug of the mass below. The new maps show features rising less than about 2 km from the sea floor – the previous mapping limit – and have revealed more than 20,000 previously undiscovered seamounts 1.5–2 km high.

● Further reading

D T Sandwell *et al.* 2014 *Science* **346** 65.

Above: The gravity-based sea-floor map basin reveals new details on earthquakes (red dots), sea-floor spreading ridges, and faults. (Image credit: David Sandwell, Scripps Institution of Oceanography.)

● Further reading

J M Dreiling and T J Gray 2014 *Phys. Rev. Lett.* **113** 118103.

A condensed-matter Higgs

It is well known that superconductors display a mechanism similar to the Brout–Englert–Higgs mechanism in the Standard Model, and now a condensed-matter analogue of the Higgs boson itself has been found. Ryusuke Matsunaga of the University of

Tokyo and colleagues showed that strong terahertz light can produce oscillations in the superconducting order parameter in NbN at twice the frequency of the driving light. These oscillations, which correspond to a collective precession of Philip Anderson's pseudospins, are the analogue of the Standard Model Higgs boson. They are detected via a large third-harmonic signal, which is generated from a quadratic coupling between the Higgs mode and the exciting field. The work also points to nonlinear quantum optics in superconductors, and could help in understanding exotic superconductors.

● Further reading

R Matsunaga *et al.* 2014 *Science* **345** 1145.

News on neurons

Signal propagation in neurons has long been modelled as an electrochemical pulse, or “action potential”, according to the textbook Hodgkin–Huxley model. Now, Thomas Heimburg and colleagues at the Niels Bohr Institute in Copenhagen have shown that, contrary to the model's prediction of a refractory period following a pulse, two colliding pulses do not annihilate but rather pass through each other. This is the case both in myelinated nerves from earthworms and unmyelinated ones from lobsters, and the observations contradict claims of annihilation made in the 1940s but not reproduced since. The results are consistent with soliton propagation in which nerve pulses are electromechanical waves, with a mechanical component allowing propagation after collision.

● Further reading

A Gonzalez Perez *et al.* 2014 *Phys. Rev. X* **4** 031407.

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