SOFT MATTER

Droplet duster

Soft Matter http://doi.org/5dn (2015)

A droplet brought in contact with a hot-enough plate will develop an insulating vapour layer at the bottom, slowing down further evaporation and making the droplet seem to levitate. This phenomenon — the Leidenfrost effect — is familiar to cooks who sprinkle water on a pan to gauge its temperature.

Cher Lin Tan and colleagues have now demonstrated how this effect might be employed to remove dust and other particles from heated ceramic or metallic surfaces. The physical mechanism is reminiscent of that seen in the self-cleaning ability of highly water-repellent lotus leaves: water droplets rolling along the surface collect and hold dirt particles.

The authors experimented with various types of particles, surfaces and liquids. They found that the temperature-induced lotus-leaf effect is more efficient for water than for ethanol droplets, and that surface roughness doesn't really matter. By adding iron filings to the droplets, they were able to simply magnetically extract the dirt pellet that forms when the liquid within a dirty drop has evaporated. The process may find an application in the mint industry for cleaning coins and recycling precious-metal muck. *BV*

QUANTUM GRAVITY

Draw the line

Nature Commun. **6,** 7503 (2015)

Uniting gravity and quantum mechanics is an ongoing struggle. Experimentally, it involves chasing after the tiniest effects on the most extreme scales. Gravity is suspected of messing with quantum mechanics by introducing small modifications to the commutator relations, but we do not yet have any proof that that is indeed the case. Still, modified commutators could potentially be revealed in low-energy mechanical oscillators, which makes them a good place to look for clues.

Mateusz Bawaj and colleagues analysed several micro- and nano-oscillators to explore the bounds on modifications to the commutator relations between their position and momentum operators. They used oscillators with high quality-factors and low background noise with different geometries and masses distributed around the Planck mass, including a 33 mg double-paddle oscillator, a 20 μg silicon wheel oscillator and a 20 ng membrane. Bawaj *et al.* lowered the known limits by several orders of magnitude, but we have yet to catch gravity red handed. *IG*

TOPOLOGICAL SUPERCONDUCTIVITY

Edging closer

Nature Nanotech. http://doi.org/5dp (2015)

There are three types of fermions in condensed-matter systems: Dirac, Weyl and Majorana. Whereas Dirac fermions are now commonplace thanks to graphene, and experimental evidence for Weyl fermions is growing stronger, Majorana fermions currently remain as elusive as Ettore Majorana himself. Topological superconductors are predicted to host these quasiparticles, but experimentally realizing topological superconductivity is not trivial. Vlad Pribiag and colleagues may have provided a suitable two-dimensional system for this exotic state.

Using superconducting quantum interference, the authors provide evidence for superconductivity in the edge modes of a semiconductor quantum-well heterostructure. The authors were able to electrically tune from bulk to edge-mode superconductivity, but as the edge-mode regime is only observable when the bulk is highly resistive, they associate this with a two-dimensional topological phase.

Topological superconductivity in such edge states would not only give access to Majorana fermions, but also provide a platform for realizing localized Majorana modes. And as these modes would obey non-Abelian statistics and have topological characteristics, they are the highly sought-after building blocks for a fault-tolerant quantum computer. *LF*

X-RAY IMAGING

Miniature meltdown

Proc. Natl Acad. Sci. USA **112,** 7444–7448 (2015)

When you want to understand a process, sometimes there's no better way than observing it directly. Of course, if it's the laser-induced melting of a nanoparticle you're interested in, simply looking is far from straightforward. But Jesse Clark and colleagues have now managed to do exactly that — imaging the reversible melting of a single gold nanocrystal on picosecond timescales using an X-ray free electron laser.

Theory, molecular dynamics simulations and experiments on nanoparticle ensembles have together succeeded in providing us with a picture of what nanoparticle melting might look like. The common wisdom on the strength of these findings holds that isolated regions on the surface of the nanoparticle melt first. Measurements from previous pump–probe experiments suggest that this process might initiate at melting temperatures as low as 70% of that of the bulk.

By probing a single nanoparticle, the team was able to obtain images of the melting transition with unprecedented temporal resolution, and confirm that the partial melting process is indeed non-homogeneous — and also fully reversible. *AK*

SUPERNOVAE

Lone star states

Astrophys. J (in the press); preprint at http://arxiv.org/abs/1505.03407 (2015)

NASA, 2002

A single star without a host galaxy is virtually invisible to us until it explodes in a supernova. Then it becomes a probe for the vast empty spaces between galaxy clusters. But ascertaining that there is no host poses a technical challenge. Indeed, Melissa Graham and co-workers observed that a suspected lone star (detected by the Canada–France–Hawaii Telescope) is actually part of a faint dwarf galaxy or globular cluster, thanks to the resolution of the Hubble Space Telescope (pictured). It may be the first instance of a type 1a supernova in such a small galaxy. Usually, supernovae are found in galaxies comprising hundreds of billions of stars.

In the same study, two other stars (plus one additional probable case) were confirmed as being true intracluster stars that have been stripped from their host galaxies. However, the loners are unable to escape the gravitational potential of their former hosts. Detections of such hostless stars are often serendipitous discoveries, but they are useful for estimating the amount of unseen baryonic mass in galaxy clusters and for studying the structure of the Universe. *MC*

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