

PHYSICS UPDATE

These items, with supplementary material, first appeared at www.physicstoday.org.

ENIGMATIC COSMIC SOURCE PUMPS OUT MULTIPLE RADIO BURSTS

In 2007 Duncan Lorimer and colleagues scoured archival data from a 2000–01 survey of the Magellanic Clouds and discovered an energetic radio pulse of less than 5 ms duration. Since that discovery, about 20 more so-called fast radio bursts (FRBs) have been reported. One of them, identified in 2014, has now been

shown to have a property that sets it apart from all its brethren: It bursts repeatedly. Laura Spitler of the Max Planck Institute for Radio Astronomy and company spotted the source, named FRB121102 (because its first burst was on 2 November 2012), in data taken with the Arecibo Observatory's William E. Gordon Telescope, pictured here. In May and June 2015, the Gordon telescope pointed to the location of FRB121102 for follow-up observations. Spitler and colleagues discovered 10 additional bursts, whose separations ranged from 23 s to 572 s.

Astronomers are puzzling over the nature of FRB emitters. Before the Spitler and company finding, FRBs appeared to be one-time occurrences whose proposed causes have included the



merging of neutron stars and the collapse of a neutron star to a black hole. But those cataclysms are incompatible with a repeating source such as FRB121102. Instead, the researchers suggest, the repeating bursts could be rare, energetic pulses from an extragalactic neutron

star. Possibly, many or all FRBs are repeaters whose multiple pulses have escaped detection. Or the lesson of FRB121102 may be that FRBs come in at least two types, as do now-familiar gamma-ray bursts and supernovae. (L. G. Spitler et al., *Nature* **531**, 202, 2016. Photo courtesy of the NAIC–Arecibo Observatory, a facility of NSF.)

—SKB

SKYRMIONS GO FOR A RIDE

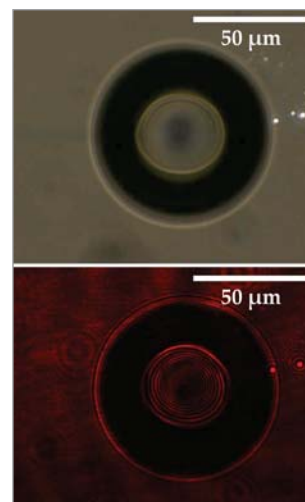
Some physicists have high hopes that tiny vortices of magnetization called magnetic skyrmions will change the way we store data on computers. But there aren't many materials that support those swirls of magnetism, and the ones that do require cryogenic temperatures. Now a research team led by Geoffrey Beach of MIT and Mathias Kläui of the University of Mainz in Germany has created and manipulated room-temperature skyrmions at the interface between metallic thin films. Using a technique for fabricating read and write heads for hard drives, the scientists sandwiched a thin sheet of cobalt or cobalt-iron-boron between two layers of nonmagnetic material, such as platinum or tantalum. Then they applied magnetic field pulses that caused the magnetic moments of interfacial atoms to twist and form skyrmions that were about 100 nm in diameter. The physicists next built a nanosized track and used pulses of current to push and pull the

magnetic swirls at speeds exceeding 100 m/s. The track demonstration is significant because it is modeled after the workings of a proposed data storage device called racetrack memory. Physicists envision skyrmions as robust data carriers—the state of a bit would be determined by the presence or absence of a skyrmion—that are smaller and could be manipulated far more quickly than the magnetic domains in traditional hard drives. The next step toward that goal is generating skyrmions that don't require a bulky or energy-sapping external magnet to maintain stability. (S. Woo et al., *Nat. Mater.*, in press, doi:10.1038/nmat4593.) —AG

BOILING WATER ONE BUBBLE AT A TIME

The first step in boiling water is the formation of bubbles at the bottom of the pan. Those bubbles grow and leave the heated surface within a few milliseconds, which makes it difficult to study their formation in real time.

Now Shalabh Maroo of Syracuse University and his colleagues have found a way to make the bubbles stick around longer. They took a container filled with room-temperature water and used a focused laser beam to locally heat a spot at the bottom of the container. A vapor bubble that forms on the spot can be held in place for hours by setting the laser power so that evaporation at the bubble's base is balanced by condensation at its cooler parts. Thanks to that stability, the researchers could study at leisure how bubbles on a heated surface behave in different situations, including presence or absence of dissolved air, the use of hydrophilic or hydrophobic surface material, and increases in laser power. The figure shows a bubble, viewed from below, on a silicon dioxide surface in degassed water; the set-up is illuminated with light from a halogen lamp (upper) and a helium–neon laser (lower). Interference fringes revealed a thin liquid microlayer at the bubble's base. In water with dissolved air, the bubbles steadily grew larger even at constant laser power due to the continuous release of air into the bubbles. Maroo and his colleagues measured the air release rate and thus the liquid evaporation rate in the microlayer. The results should help researchers better understand the dynamics of bubble growth during boiling. (A. Zou et al., *Sci. Rep.* **6**, 20240, 2016.) —SC



TREES BREAK AT A NEARLY CONSTANT WIND SPEED

What's the maximum load a piece of wood can sustain before breaking? The question has a star-studded history, with contributions from Leonardo da Vinci, Galileo Galilei, the Bernoulli family, and Leonhard Euler, among others. The topic is one of practical importance, with applications in shipbuilding and curve fitting as well as in architecture and engineering. Christophe Clanet and colleagues at École Polytechnique in Palaiseau, France, and ESPCI Paris Tech have now looked at its implications for the ability of live trees to withstand wind. Examining data from the storm Klaus that hit southwest Europe in 2009, the team observed significant overlap between the areas of strongest wind and the areas of most broken trees. Where local wind speeds topped roughly 42 m/s, fewer than half the trees survived, whether soft-