Detour ahead

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Would you mind sharing a taxi with a stranger? Probably not, as you'd get to split the fare. But what if it required a detour — the stranger getting in or out at a point not on your route? You'd probably consider the extra time involved.

Apart from the individual financial gains, taxi-sharing reduces air pollution and traffic congestion, which are problems affecting cities worldwide. Paolo Santi and colleagues have now quantified the advantages and feasibility of car-pooling using a networks approach.

The authors investigated the dataset of all 172 million taxi rides made in New York City during 2011. They developed algorithms for reworking this spatiotemporal trip map based on the maximum total number of shared trips or the minimal total combined trip time. They found that if a passenger can tolerate up to just a two minute delay, the average percentage of trips that can be shared by two is close to 100%.

Santi *et al.* found similarly promising results in a scenario involving 'e-hailing', in which a customer hails a cab from a smartphone app and waits for up to one minute for a shared taxi. The outlook was even positive in cases with lower trip density or passengers who were reluctant to share. *BV*

Break the ice

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Geometrical frustration emerges when it is impossible to arrange a set of particles in a way that minimizes their pairwise interactions. Engineering such systems artificially provides the ultimate probe of these exotic frustrated ice-like states. In this respect, superconductors make great model systems — their vortices (magnetic flux quanta) act as the particles, and non-superconducting islands are used to define the underlying geometry.

One limitation of this approach is that any modification requires the fabrication of a new device. But Juan Trastoy and colleagues have now devised a way to circumvent this problem, by etching defects close enough together to overcome the potential barrier between them. This effectively allows temperature to control the energy landscape, offering a means of modifying ice formation in real time.

The team were able to show that for various island arrangements, the vortices formed frustrated states, which were then thawed by increasing the temperature. The analogy with regular ice could hardly be more apt. *FL*

Shine a light

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Controlling the behaviour of magnetic systems without resorting to the use of applied magnetic fields offers tantalizing prospects for data memory and storage technologies. Optical manipulation is one way to achieve low-power, rapid control of the magnetization, but the catch is that up until very recently, this was only possible with a limited selection of materials containing rare-earth elements and characterized by antiferromagnetic exchange interactions.

Charles-Henri Lambert and colleagues have now generalized this concept to thin ferromagnetic structures. In one fell swoop, the authors dramatically expanded the range of possible systems suitable for optomagnetic switching, and showed that antiferromagnetic interactions are not a key ingredient for this phenomenon, as previously thought.

The optical switching depends on the helicity of the circularly polarized laser beam impinging on the magnet, and is demonstrated on ferromagnetic systems such as Co films, as well as Co/Pt and Co/Ni multilayers, provided they are thin enough. This is thought to be a consequence of the small demagnetization energy due to dipolar interactions, which would otherwise be overwhelming in the bulk limit. Optical control of ferromagnetic bits may be feasible after all. *AT*

Drive for a spin

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Current-driven domain motion is a powerful method for manipulating magnetic structures. Unlike bulk systems, heterostructures consisting of an ultrathin magnetic layer with a neighbouring heavy metal can host domain walls that are capable of moving against the flow of electrons. Jacob Torrejon and colleagues have now shown that the texture of the domain wall can be tuned, allowing the current-driven motion to be controlled.

In this type of heterostructure, the Dzyaloshinskii–Moriya interaction promotes chiral Néel-type domains. Such domain formation has important consequences for current-induced motion, as the domains can be driven by spin Hall torques generated by the heavy metal. Torrejon *et al.* showed that the strength and direction of the Dzyaloshinskii–Moriya interaction could be altered by modifying the heavy-metal layer. It wasn't quite as easy as changing the underlying material, but the authors' study suggests that nitrogen doping would have a similar fine-tuning effect.

Although the authors attributed their finding to electronegativity, the underlying physics for such tuning is far from clear. But leaving this stone unturned doesn't detract from the immediate practical implications of this impressive control over domain dynamics. *LF*

Two-star show

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Around half of the stars in the sky are thought to come in pairs — orbiting around one another. But what of stars with exoplanets? Are binary stars just as likely to play host to planets as those that go it alone? The answer is yes, according to a survey of exoplanet host stars undertaken by Elliott Horch and co-workers.

The team used speckle imaging to observe more than 600 Kepler Objects of Interest, picking up nearly 50 probable pairs. Their model suggests that this indicates that 40–50% of the stars with exoplanets may be binaries. However, the study can't yet determine which star is the one being orbited. And the Kepler space telescope has even found exoplanets that orbit star pairs sitting very close together.

The idea that a planet like ours might boast a pair of Suns is an appealing kind of science fiction — an inspiration to countless films and comic books. And for such a planet, night might be its own science fiction. *AK*

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