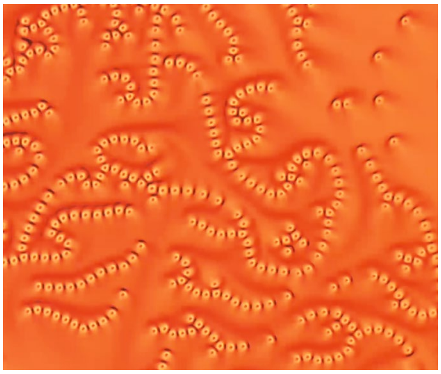
ACTIVE MATTER

Skyrmion school

Nat. Commun. **10**, 4744 (2019)



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Schools of fish can move in an organized manner because each fish tries to match its movements to its neighbours. As fish don't necessarily lend themselves to controlled parameter studies, it is fortunate that the same collective effects that make a school of fish swim as one can also arise in synthetic systems. These make attractive experimental test beds of schooling dynamics — especially if they use readily available technology. Hayley Sohn and colleagues have now shown that skyrmions in liquid crystals can display collective effects similar to a school of fish.

In their experiments, the skyrmions — stable topological structures — were formed in the director field of the liquid crystal. An oscillating electric field applied to the crystal cell broke the symmetry of the system and allowed the skyrmions to move of their own accord. The skyrmions interacted elastically with their neighbours, which led to collective effects — such as re-assembly or formation of chains and clusters. *ED*

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UNCONVENTIONAL SUPERCONDUCTIVITY

Triplet no more

Nature **574**, 72–75 (2019)

For two decades, strontium ruthenate has been the leading candidate for a solid-state realization of chiral p-wave superconductivity. This is important because this form of superconductivity has an unusual triplet order parameter and is predicted to host Majorana fermions. Now, Andrej Pustogow and co-workers have ruled out this interpretation by conducting careful nuclear magnetic resonance experiments.

This technique is sensitive to the symmetry of the order parameter via the change in the Knight shift upon entering the superconducting state. The authors found a substantial reduction at the critical temperature, indicative of a decrease in the magnetization and therefore an absence of the spin polarization that would be expected for a triplet state. This demonstrates that the superconductivity in strontium ruthenate is likely of singlet character.

There are still many exotic options for what exactly that state might be. These results mark a new stage in our understanding of both triplet superconductivity and strontium ruthenate. *DA*

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NUCLEAR PHYSICS

Of all shapes

Phys. Rev. Lett. **123**, 142502 (2019)

Nuclei come in various shapes — from spheres to deformed ellipsoids, which can coexist, so that a nucleus with a spherical ground state may possess a deformed excited state, or vice versa. Shape coexistence is mostly observed for nuclei with proton or neutron numbers that almost fill up a nuclear shell, such as in cadmium-110 with 48 protons.

Now, Paul Garrett and colleagues have reported spectroscopic studies of the structure of the stable cadmium-110 and cadmium-112 isotopes combined with beyond-mean-field calculations. The results suggested that at least three different shapes coexist in these nuclei. In contrast to the prevalent view that low-energy excitations in cadmium nuclei are caused by vibrations around a spherical nucleus, the authors found that these excitations are deformed states, which do not possess vibrational wave functions. If confirmed, this result would challenge our understanding of nuclear structure because deformation might already appear at closed shells. *SR*

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BIOMECHANICS

Fall forward

J. R. Soc. Interface **16**, 20190292 (2019)

Consider for a moment how something as innate to us as running or jumping actually works. The complexity of such seemingly simple tasks still keeps those who engineer robots or wearable devices busy. Taylor Dick and co-workers have now investigated the mechanics of our capacity to stand upright when encountering changing terrain or — put more simply — when falling into a hole.

The team had people hop on a platform and used motion capture to record the coordinated kinetics and kinematics of their lower-limb joints when the platform was suddenly pulled from under their feet. Calculations of the mechanical work and power at each joint showed that we are able to recover from short falls — up to 10 cm — with minimal changes to our legs' mechanics as the ankles absorb the shock. Fall higher, however, and the hopping mechanics change to redistribute the shock to the higher joints — knees and hips — possibly to prevent damage to our smaller distal muscles. *FL*

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TOPOLOGICAL PHOTONICS

Reconfigurable routing

Science **365**, 1163–1166 (2019)

A signal sent across a chip doesn't arrive at its full strength because of losses. On optical chips these come mainly from defects, but the scattering-free optical modes propagating along an interface between two topologically different regions may solve this problem. Photonic topological properties are defined by the physical structure, making such waveguides rigid — like traces on a circuit board. Han Zhao and colleagues were able to steer topological modes along optically reconfigurable paths.

The team exploited the interplay of topological and non-Hermitian symmetries, where new topological states emerge for a specific contrast between gain and loss in the system. By optically pumping some regions of a microring lattice patterned onto an InGaAsP-based multiple quantum well, they generated an overlay structure of optical gain and intrinsic material loss in such a way that a topological mode was created on the boundary between the two regions, whose shape can be flexibly controlled by patterning the illumination. *NM*

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