with speed larger than $\mathbf{v}_d$. This picture is now beautifully confirmed by the observation of different Doppler shifts for the two helical components of the spin grating. The value of q_0 extracted from these measurements agrees with the value obtained from the amplitude measurements, confirming the consistency of the analysis.

Where do these experiments leave us with regard to the spin transistor[2]? All the ingredients for a successful device seem to be working and ready to go. The spin packets are quite robust, spreading out with a reduced diffusion constant, for reasons that are theoretically well understood[11–13]. The mobility of the spin packets is found to be essentially identical to the electron mobility, and therefore very high, at least in the important regime of weak injection[11,12]. The precession induced by the spin–orbit coupling is nicely observed at low temperature. There is a catch though: the coherent precession of the spins disappears above 150 K, which is higher than the temperature at which spin transistors have operated so far, but still too low for room-temperature applications. The reason for this loss of coherence is not well understood at present — a fact that precisely highlights where efforts should be focused to achieve a viable device. ❐

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MATERIALS PHYSICS

Sleight of handedness

Playing topological tricks with molecular assemblies might seem like frustrating work for very small hands, but Thomas Gibaud and colleagues have hit on a unique way of performing such tricks — by manipulating topological frustration using molecular handedness (*Nature* **481,** 348–351; 2012).

Gibaud *et al.* mixed rod-like viruses with polymers that induce attractive interactions between the rods, effectively (or thereby) condensing them into liquid-like monolayer membranes that resemble disks with exposed edges. They found that the interfacial tension between the disks and the surrounding polymers could be regulated by modifying the viruses' temperature-dependent chirality.

Electron tomography measurements reveal that at high temperatures, for which the rods are completely achiral, they align parallel to the layer normal in the bulk. Along the membrane periphery, however, the rods preferentially orient themselves tangentially to the layer, minimizing the rod–polymer interaction (and thus the interfacial tension) at the expense of the elastic energy associated with the twist. When the temperature is decreased enough to re-introduce the natural molecular chirality, the rods' twisted edge topology becomes the preferred configuration, capable of satisfying chiral interactions. By isolating the chiral contribution to the interfacial tension in a series of careful experiments, the authors could attribute a reduction in this tension to the introduction of chirality unambiguously.

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One might well speculate that at low enough temperatures, the chiral contribution could dominate the tension associated with the achiral system. And herein lies the topological trick: such a temperature regime permits the spontaneous formation of edges within the system. The *Nature* study proves this point in spectacular fashion, showcasing the viral self-assembly of a number of structures, including twisted ribbons, helices and spirals. The paper also highlights the exquisite dynamical control afforded by the system's temperature dependence, which allowed the authors to induce transitions between different topologies.

One of the most vivid examples of the power of this technique involves the reversible manipulation of an achiral disk into a linear twisted ribbon. The transition is rendered irreversible when the ends of the ribbon are joined, constraining the system enough to prevent reversal when the temperature is increased. This illustrates how deftly the new strategy exploits an inherent frustration born of chiral interactions competing with geometrical constraints — a highly complex mechanism, over which Gibaud *et al.* can now claim impressive control.

ABIGAIL KLOPPER