this enables them to make a fairly confident estimate of the magnitude of superconducting transition temperature. In contrast, the problem of electron–electron repulsion-induced superconductivity tackled by Nandkishore *et al.* is less mature and more challenging[3]. Unlike in the Eliashberg theory, there is no small parameter that would help to close the formidable infinite hierarchy of quantum many-body equations of motion[4]. To try to overcome this, Nandkishore *et al.* set out to explore theoretically what happens when the magnitude of electron–electron interactions in graphene is dialled down, and analyse whether the system of degenerate electrons that exists under such conditions is stable. At the van Hove singularity the answer was no, even if the interactions are infinitesimally small.

The fundamental question for Nandkishore *et al.* was then: "What is the most dominant instability?" To answer this, the authors used a renormalization group approach[7–9] that tracks the renormalizations of interactions and external fields used to probe the different types of symmetry-breaking order that can emerge, as higher-energy electronic modes are progressively eliminated. Compared with previous attempts, this approach has the virtue of determining the leading instability with minimal theoretical bias[10], while treating density-wave instabilities and pairing instabilities on equal footing. The authors found that the three perfectly nested saddle points of graphene's honeycomb lattice lead to superconducting pairing as the most dominant ordering tendency. The renormalization group treatment points to a spin-singlet *d*-wave state, and the degeneracy between two gapless $d_{x^2-y^2}$ and d_{xy} paired states is lifted in favour of one of the two gapped complex linear combinations $d_{(x+iy)^2}$ or $d_{(x-iy)^2}$. These states spontaneously break time-reversal symmetry and lead to chiral Andreev states near the sample edges.

Whether these predictions survive when the strength of electron–electron interactions increases, and, in the presence of detrimental disorder in real samples, how large the transition temperature is, remain open and challenging questions. Yet the payoff for possible experimental observation of unconventional superconductivity in highly doped graphene, and with it achieving an important step towards understanding superconductivity driven by electron–electron repulsion, is too high to cease trying. ❐

Oskar Vafek is in the National High Magnetic Field Laboratory and Department of Physics, Florida State University, 1800 East Paul Dirac Drive, Tallahassee, Florida 32310-3706, USA.
e-mail: vafek@magnet.fsu.edu

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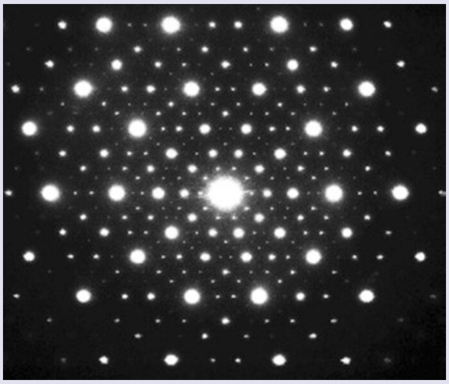
QUASICRYSTALS

Unearthly beauty

It is almost 30 years since Dan Shechtman's discovery, on 8 April 1982, of an icosahedral alloy of aluminium and manganese that displays long-range order in diffraction experiments but lacks translational periodicity. The material turned out to be an example of a new phase of matter, which Don Levine and Paul Steinhardt dubbed 'quasicrystals'. Following the original observation, for which Shechtman won the 2011 Nobel Prize in Chemistry, hundreds of other quasicrystals have been synthesized and characterized.

However, it wasn't until 2009 that evidence of a naturally occurring quasicrystal was reported, in a rock sample (*Science* **324,** 1306–1309; 2009). Luca Bindi, Steinhardt and collaborators have made further studies of that same sample and suggest that it is probably part of a meteorite — which would mean that the quasicrystal embedded in it is of extraterrestrial origin (*Proc. Natl Acad. Sci. USA* http://dx.doi.org/10.1073/pnas.1111115109; 2012).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The rock is held in the Museo di Storia Naturale at the Università degli Studi di Firenze. Catalogued as coming from the Koryak Mountains in far-eastern Siberia, the rock was identified as a candidate host for a natural quasicrystal after a decade-long systematic search initiated by Steinhardt and colleagues. That search had originally involved sifting through more than 80,000 data sets deposited in the International Center for Diffraction Data, but it didn't turn up any new quasicrystals, synthetic or natural. So the search was extended to include minerals having compositions similar to those of known synthetic quasicrystals, and this brought the Florentine sample onto the radar. From it came clear evidence of a natural icosahedral quasicrystal, in the form of micrometre-sized grains of an aluminum–copper–iron alloy.

Now known as icosahedrite, how this mineral formed has remained a mystery. There are several arguments against an anthropogenic origin, and now the study by Bindi *et al.* provides strong evidence that the sample isn't terrestrial at all. In particular, secondary-ion-mass-spectrometry experiments revealed oxygen-isotope compositions that clearly disfavour a terrestrial origin. The data are instead consistent with a scenario in which the mineral arrived on Earth in a meteorite of the so-called carbonaceous-chondrite type. That would make it about 4.5 billion years old, roughly the age of the Solar System — whereas the first lab synthesis of this particular quasicrystalline phase occurred only in 1987.

ANDREAS TRABESINGER