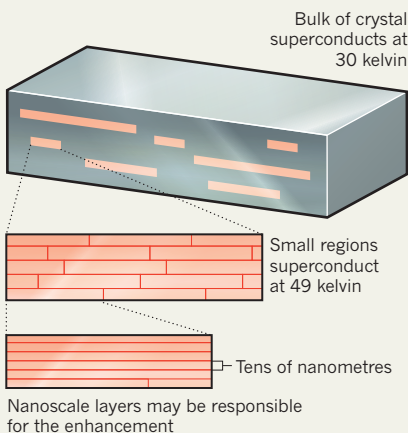


If correct, the result would show that interface superconductivity is consistent with a mechanism first advanced in 1973, which helps to explain low-temperature superconductivity. Proposed by US physicist John Bardeen and his colleagues, it posits that superconducting electron pairs are held together by an exciton, a particle produced by the scattering of electrons off a boundary. This does not explain all high-temperature superconductivity, but exploring it further might shed light on mechanisms that do.

Superconductivity is a field with a long history of mistaken claims and false hopes, and so it is unsurprising that Chu's result is provoking controversy. Critics say that it is difficult to measure superconductivity along narrow interfaces, let alone inside a crystal. And Johnpierre Paglione, a condensed-matter physicist at the University of Maryland in College Park, is dubious for a different reason. In 2012, he and his team reported<sup>3</sup> a higher-than-expected superconducting temperature for regions within the same material. But in a paper posted on arXiv on 13 September<sup>4</sup>, the researchers say that what they saw is a bulk property of these regions,

### AT THE INTERFACE

Nanoscale layering in an iron-based crystal could enhance its superconductivity.



caused by the doping with rare-earth elements, rather than an interface effect.

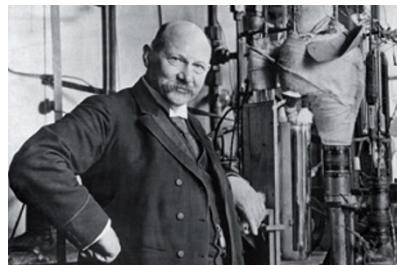
If the superconductivity was related to interfaces, Paglione says, he would not expect it to disappear when the doping is reduced — which it does. Instead, Paglione suggests that strain in certain regions of the crystal enhances superconductivity. Chu responds that doping above a certain level helps to create interfaces by pushing arsenic atoms out of the structure.

Ivan Bozovic, a physicist at Brookhaven National Laboratory in Upton, New York, who in 2008 created one of the first interfaced superconductors, raises another possibility. He says that the superconductivity might not be an interface effect; instead, it could be attributable to a structural change inherent to the arsenic-depleted regions. He would like to see whether Chu can isolate these regions to study them further — and perhaps use them to create other interfaces. “We’ve been looking for new superconductors for 100 years and interface superconductivity is a new trick,” says Bozovic, “so there’s a lot of room for new combinations.”■

1. Wei, F. Y. *et al.* Preprint at <http://arxiv.org/abs/1309.0034> (2013).
2. Wang, Q.-Y. *et al.* *Chin. Phys. Lett.* **29**, 037402 (2012).
3. Saha, S. R. *et al.* *Phys. Rev. B* **85**, 024525 (2012).
4. Saha, S. R. *et al.* Preprint at <http://arxiv.org/abs/1309.3576> (2013).

### ALL IN THE FAMILY

Superconducting temperatures have risen as new classes of material have been found.



**1911 4.2 kelvin:** Mercury. Superconductivity first discovered by Heike Kamerlingh Onnes (pictured).

**1986 30 kelvin:** Barium lanthanum copper oxide. First copper-based high-temperature superconductor.

**1993 133 kelvin:** Mercury barium calcium copper oxide. Record high-temperature superconductor.

**2008 26 kelvin:** Lanthanum iron arsenide. First iron-based high-temperature superconductor.

**2008 50 kelvin:** Layered insulating and metallic copper oxide. One of the first interface-enhanced superconductors.

**2013 49 kelvin:** Calcium iron arsenide doped with rare-earth elements. Claimed single-crystal interface enhanced superconductor.

### CORRECTIONS

The scale on the graph showing German science spending in the News story ‘Germany hits science high’ (*Nature* **501**, 289–290; 2013) had an incorrect scale. It should have run from €0 to €15 billion not €0–1.5 billion. And the News story ‘Grass gets greener’ (*Nature* **501**, 291; 2013) incorrectly identified the grain that produced high yields when grown in a field that previously hosted *Brachiaria* grasses. It was maize (corn), not wheat.

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