how the microscope can be used to direct the course of chemical reactions and make unstable 'intermediate' molecules. To produce triangulene, the team began with a precursor molecule called dihydrotriangulene, which lacks the reactive unpaired electrons.

The researchers deposited these molecules on a surface — salt, solid xenon and copper are all suitable — and inspected them under the microscope. They then used two successive voltage pulses from the tip, carefully positioned above the molecules, to blast off two hydrogen atoms and create the unpaired electrons. The work is published in *Nature Nanotechnology*[1].

The team then imaged the products with the microscope, first picking up a carbon monoxide molecule to acquire the high resolution. The images had the shape and symmetry predicted for triangulene. Under the high-vacuum, low-temperature conditions of the experiments, the molecules remained stable for as long as the researchers looked.

"To my knowledge, this is the first synthesis of unsubstituted triangulene," says chemist Takeji Takui of Osaka City University in Japan, who has previously synthesized triangulene-type molecules[2].

Moriarty calls the work elegant, but is surprised that triangulene remained stable on a copper surface, where he might have expected it to react with the metal. In one set of experiments, says Pavliček, the molecule was still sitting on the copper four days after the team made it.

The researchers also probed triangulene's magnetic properties. They found that, as they had expected, the two unpaired electrons have aligned spins — the quantum-mechanical property that gives electrons a magnetic orientation.

This could make triangulene useful in electronics, they say. Takui agrees, and foresees applications in quantum computing, quantum information processing and a field known as spintronics, in which devices manipulate electron spins to encode and process information.

Making molecules one at a time might not seem very promising, but Gross points out that current quantum computers use only a handful of quantum bits, or qubits, each of which could correspond to a single molecule. Even if you need to make 100 such molecules "by hand", he says, "it would be worth going through that manual labour".

And although it's not clear how easily the approach could be applied to molecules that aren't flat, Gross says that such atom manipulation can be performed for 3D molecules to some extent.

Even with triangulene and related graphene-like fragments, "there's a lot of exciting science still to be done", says Moriarty. The IBM team "continues to set a high bar for the rest of us", he adds. ■

1. Pavliček, N. *et al. Nature Nanotechnol.* http://dx.doi.org/10.1038/nnano.2016.305 (2017).
2. Morita, Y., Suzuki, S., Sato, K. & Takui, T. *Nature Chem.* **3,** 197–204 (2011).
3. Gross, L., Mohn, F., Moll, N., Liljeroth, P. & Meyer, G. *Science* **325,** 1110–1114 (2009).
4. Pavliček, N. *et al. Nature Chem.* **7,** 623–628 (2015).

CORRECTION

The Editorial 'Keep science on track' (*Nature* **542,** 137; 2017) wrongly attributed to Till Sawala and then to Nadine El-Enany the opinion that the proposed boycott of US-based conferences is intended to demonstrate against a ban that hurts everyone. The article also misquoted Nadine El-Enany (originally incorrectly attributed to Sawala) as saying a petition she co-organized aimed to stop more countries being added to the blacklist. In fact, El-Enany had referred to concerns about people who are not from the seven Muslim-majority countries stipulated in the travel ban, but who are nevertheless facing detention and harassment at the border. Sawala had referred to the unsustainable cost of the ban on science and on the life of scientists.

© 2017 Macmillan Publishers Limited, part of Springer Nature. All rights reserved.