

Harnessing the potential of the oddly-shaped molecule

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Scientists at The University of Nottingham have made a discovery that could hold important implications for harnessing the potential of a single molecule at the nanoscale.

In a paper published in the journal *Nature Communications*, a team of physicists and chemists have demonstrated for the first time the way in which an irregularly shaped molecule is adsorbed on a surface.

It gives important information to scientists on how these molecules could be arranged to form structures, potentially to build tiny new [data storage](#) devices which are 40 to 50 times smaller than their existing silicon-based counterparts.

The research was led by Professor Peter Beton from the Nanoscience group in the University's School of Physics and Astronomy in collaboration with Neil Champness, Professor of Chemical Nanoscience in the School of Chemistry.

Professor Champness said: “The majority of work done in this area has focussed on symmetrically-shaped molecules, for example molecules which are square or spherical. The properties and behaviour of these molecules are comparatively easy for us to predict and understand.

“However, only a very small percentage of molecules are symmetrically-shaped and confining our use to those because they are better understood can be seriously constraining.

“Many of the more irregularly-shaped molecules have extremely useful properties — if we can store information on a single molecule which is normally around one nanometer, as opposed to the silicon-based equivalent of 40 to 50 [nanometers](#), we could potentially build devices which are much smaller in size but have a much denser [storage capacity](#) .”

The work has involved computer modelling a manganese-based molecule — shaped like a concave ‘jam doughnut’ — and predicting how it would be adsorbed on a gold surface before observing its actual behaviour in the lab. Due to the fragile nature of the molecules, the team had to use a novel electrospray deposition technique to get the molecules onto the surface without destroying their functionality.

The work builds on previous research by the team which was published by Nature back in 2003, where they demonstrated they could trap molecules in a honeycomb-like structure, similar to an egg box, to control the way in which [molecules](#) interact with each other and to build more effectively ordered molecular arrays.

The latest research has been supported by the European Community — Research Infrastructure Action, the Engineering and Physical Sciences Research Council (EPSRC) and the European Commission Early Stage Research Training Network, MONET.

More information: The full paper, Self-Assembled Aggregates Formed by Single-Molecule Magnets on a Gold Surface, can be accessed on the *Nature Communications* website at www.nature.com/ncomms .

Provided by Nottingham University

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