A sculpture you can't see: the chemistry behind the art

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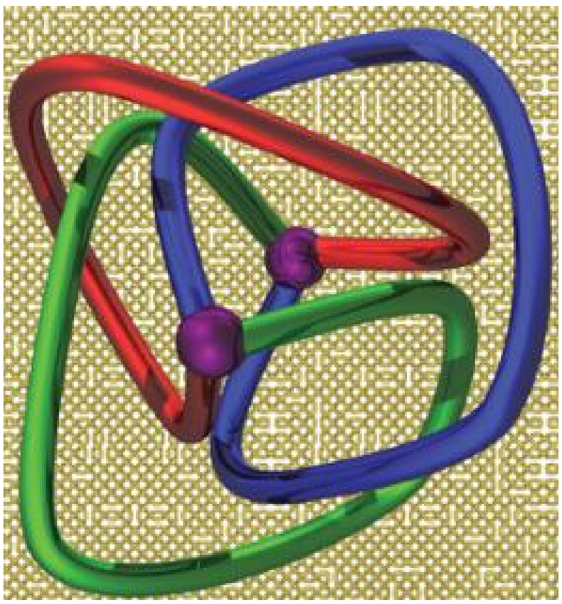

The "universal 3-ravel motif."

A University of Sydney professor is at the forefront of cutting edge work creating complex and beautiful molecular structures that, until recently, could only be made at a life-sized scale.

"Throughout human history aesthetically pleasing objects have been universally created and admired," said the University of Sydney's Leonard Lindoy, Professor of Chemistry and lead author of a paper featured in the latest issue of the prestigious Nature publication.

"We are just beginning to learn how to mimic this aspect of everyday life, building intricate structures that display artistic nuances at the molecular level, effectively spanning art and science," he said.

The *Nature* paper outlines Professor Lindoy's team's work creating a sculptural form of three interlinked arms, the shape of which could be described as a cross between an architecturally-designed piece of children's playground equipment and an attachment from a futuristic kitchen mixer.

The structure was formed in the lab over three months, when an iron solution plus other molecular building blocks was left to stand in a flask, resulting in deep red-colored crystals.

Initially the molecule's structure was football-shaped, with each of the arms attached to a point at both ends, with a void in the middle. But Professor Lindoy and colleagues found, "in an apparent demonstration of Aristotle's maxim that 'Nature abhors a vacuum'", that over time the arms became knotted and interlinked.

The resulting shape is known as a 'universal 3-ravel motif'. "The structure exhibits both remarkable intricacy and unusual beauty in its molecular form. There are only three or four previous examples of molecular structures in this particular kind of exotic formation," Professor Lindoy said.

While still in its infancy, Professor Lindoy said that his team's research into how molecules assemble could ultimately be applied in several areas including industrial processes, energy production and the development of molecular electronics. The work could also contribute to the development of tiny "molecular machines" that, for example, might mimic the role of a natural enzyme.