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## Scientists able to move an object without touching

GARETH EDWARDS

SCIENTISTS at Edinburgh University have developed a way of moving an object without touching it, in breakthrough research which could be as revolutionary as the discovery of electricity.

The team of researchers has been able to move objects across flat surfaces and even up a slope with nothing more than a light beam.

In the future, the technology could be developed to make molecular machines, and with research could eventually lead to the development of artificial muscles which can perform specific physical tasks.

Scientists believe such machines could one day be used to control the movement of drugs around the human body, making sure they go exactly where they are needed. And they could also find their way into "smart" materials, which can change their properties in response to a stimulus such as light.

Although many scientists are working with molecular machines - a process which involves making the parts of molecules move in a controlled fashion - the Edinburgh team is the first to make these machines interact with "real world" objects.

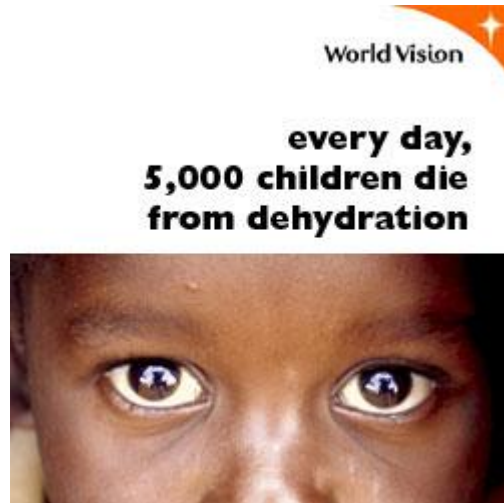
Until now, molecular machines have operated in isolation within the laboratory, but this latest piece of research brings them into contact with the everyday world.

The team, led by Professor David Leigh, covered a gold Teflon-like surface with specially-engineered synthetic molecular "shuttles", the components of which move up and down by a millionth of a millimetre when exposed to light.

So when they place water droplets on the surface and then stimulate it with ultra-violet light, the changes alter the surface tension of the liquid and this creates enough energy to move the droplet a distance of up to a millimetre.

Although the movement is tiny, it represents a great technological leap in the new emerging field of nanotechnology, the manipulation of materials at scales of a millionth of a millimetre.

In terms of scale, the process is mind-boggling, being akin to a conventional mechanical machine using a millimetre displacement of pistons to lift an object twice the height of the world's tallest building.



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Molecular machines are ubiquitous throughout biology, with muscle movement just one of their almost limitless functions.

Principal researcher Mr Leigh, Forbes Professor of Organic Chemistry at Edinburgh University, said: "Although man's understanding of how to build and control molecular machines is still at an early stage, nanoscale science and engineering could have a life-enhancing impact on human society comparable in extent to that of electricity, the steam engine, the transistor and the internet.

"Nature uses molecular machines in virtually every biological process and, when we learn how to build and control such structures, we will surely find that they have the potential to revolutionise molecular-based technologies, from health care to 'smart' materials."

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