Nano shuttles suggest lifting things may become thing of the past (Update)

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A key technological breakthrough led by the University of Edinburgh suggests that a futuristic world where people can move objects about 'remotely' with laser pointers could be closer than we think. Chemists working on the nanoscale have managed to move a tiny droplet of liquid across a surface – and even up a slope – by transporting it along a layer of light-sensitive molecules.

Scientists at Edinburgh, Groningen and Bologna are the first to manipulate tiny nanoscale machines (two millionths of a millimetre high) so that they can move an object that is visible to the naked eye. The team has shifted microlitre drops of diiodomethane not just across a flat surface, but also up a one millimetre, 12 degree slope against the force of gravity. It may be the tiniest of movements, but, in the emerging discipline of nanotechnology, it represents a giant technological leap forward.

Although many scientists are working with so-called 'molecular machines' – a process which involves making the parts of molecules move in a controlled fashion – the Edinburgh-led 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 around us.

The research team has developed a Teflon-like surface that is covered with synthetic molecular 'shuttles', the components of which move up

and down by a millionth of a millimetre when exposed to light. The movement of droplets results from the change in surface properties after most of the shuttle molecules change position. The phenomenon is so efficient that it generates enough energy to move the droplet. In terms of scale, the process is mind-boggling: it is the equivalent of a conventional mechanical machine using a millimetre displacement of pistons to lift an object twice the height of the world's tallest building.

More …
Molecular machines are ubiquitous throughout biology (they make muscles move, for example), but making tiny artificial machines is not easy because the physics that govern how things behave at the molecular level is very different from conventional physics. That means the prospect of large objects being moved around remotely by lasers is still some way off, but this new study, reported in the current issue of Nature Materials journal, may prove useful for some 'lab-on-a-chip' diagnostic techniques, or for performing chemical reactions on a tiny scale without test tubes.

Principal researcher David Leigh, Forbes Professor of Organic Chemistry at the University of Edinburgh, said: "Nature uses molecular machines in virtually every biological process and, when we learn how to build and control such structures, we will surely find they have the potential to revolutionise molecular-based technologies, from health care to 'smart' materials. Molecular machines could be used to make artificial muscles, surfaces that change their properties in response to electricity or light or even – one day in the future – to move objects about a room using a laser pointer. These are not the self-replicating 'grey goo' nanorobots of science fiction, but rather the life enhancing technologies of tomorrow."

Source: University of Edinburgh