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Nanomachines: Maxwell's Demon becomes a reality

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BEIJING, Feb. 1 (Xinhuanet) -- In 1867 Scottish physicist James Clerk Maxwell envisioned a microscopic engine that became known as Maxwell's Demon. Today, scientists at the University of Edinburgh say they have created an atom-sized motor that could lead to man-made nanomachines.

A nanomachine is an incredibly tiny device whose parts consist of single molecules. Nature uses nanomachines for everything from photosynthesis to moving muscles in the body and transferring information through cells.

Scientists are trying to unravel the secrets of nanomachines and nanotechnology, which works on a tiny scale. One nanometer is about 80,000 times smaller than the thickness of a human hair.

"We have a new motor mechanism for a nanomachine," said David Leigh, a professor of chemistry at the University.

"Molecular machines allow life itself to occur at a molecular level," Leigh told Reuters. "Our new motor mechanism is a small step towards doing that sort of thing with artificial molecular machines."

His mechanism traps molecular-sized particles as they move. As Maxwell had predicted long ago, it does not need energy because it is powered by light.

"While light has previously been used to energize tiny particles directly, this is the first time that a system has been devised to trap molecules as they move in a certain direction under their natural motion," said Leigh, who reported the findings in Thursday's issue of the journal Nature. "Once the molecules are trapped, they cannot escape."

Leigh credits Maxwell for establishing the fundamentals for understanding how light, heat and molecules behave.

In an earlier study, he and his team showed a nanomachine could move a droplet of water uphill by using molecular force. Although the movement was small, it was a big step in learning to make machines with artificial molecules.

The new motor mechanism will enable scientists to do things that are much closer to what biological machines do.

Nanotechnology is already being used in cosmetics, computer chips, sunscreens, self-cleaning windows and stain-resistant clothing.

Leigh believes nanoscale science and engineering could have a huge impact on society -- comparable to the impact of electricity, the steam engine and the internet.

But quite how, is difficult to predict.

"It is a bit like when stone-age man made his wheel and asking him to predict the motorway," he explained. "It is a machine mechanism that is going to take molecular machines a step forward to the realization of the future world of nanotechnology. Things that seem like a Harry Potter film now are going to be a reality."

(Agencies)

Editor: Gareth Dodd

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