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## NUS paper illustrates how light beam can be used to reel in objects

■ BY FENG ZENGKUN

IT IS a vacuum cleaner made out of light.

Scientists from the National University of Singapore (NUS) have published a paper showing how a beam of light could be used to reel in objects.

The optical vacuum cleaner could be mounted on spaceships to collect dust samples in space; or be used in medicine to diagnose diseases. The scientists said the invention could be cheaper and safer than existing methods as it does not involve chemicals.

The paper was published last month in international science journal *Physical Review Letters*.

Using light to move objects is not a new concept.

“Optical tweezers”, which use two beams to manipulate small particles, have existed since the late 1980s.

Last year, researchers from the Australian National University developed another laser beam system that can move very small particles up to 1.5m.

But these beams can move objects only laterally or push them away; scientists have sought ways to pull objects using the beams.

In September, Hong Kong researchers published a paper on the possible characteristics of such a beam; last month, Nasa awarded US\$100,000 (S\$129,000) to its scientists to pursue a similar project.

The NUS team’s paper is the first

to show how such a single suction beam could be constructed. They modelled a special lens that changes the properties of light.

The changed beam uses electromagnetic fields that move the object towards the light source.

Dr Qiu Cheng-Wei, an assistant professor at the NUS electrical and computer engineering department who co-authored the paper, said the beam could be used to diagnose diseases. Infected molecules are stiffer than healthy ones; the light beam can be calibrated to attract only molecules of a specified stiffness in tissue samples.

Dr Qiu said this way of testing cell samples is better than using chemicals as each test would require a new batch of chemicals. Also, chemicals may contaminate the particles being tested.

The scientists said the beam device would likely cost a few thousand dollars for the material to create the lens; safety is not a concern because only a low light intensity is required to move ultra-small objects, they added.

The beam could theoretically move objects of any size, but Dr Qiu noted: “Large objects would need a very high intensity light, which could end up burning them instead.”

The beam also requires very precise handling, as the particles must fall within a specific area in the beam’s cross-section.

The research was “inspired by Star Trek”, said Dr Qiu, and is a collaboration between NUS, the Technical University of Denmark and the Data Storage Institute at the Agency for Science, Technology and Research.

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