Light throws a curve ball

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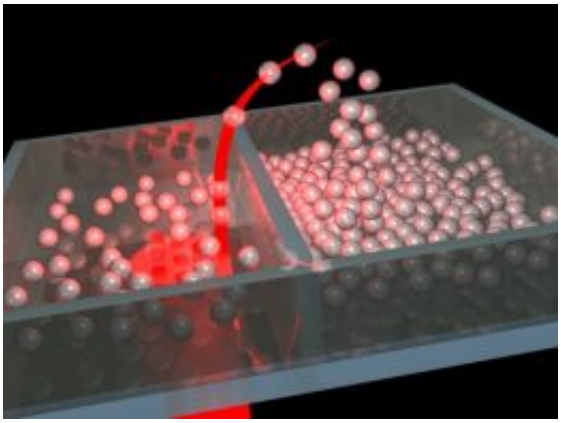

The image shows an animation of the Airy beam working as a snowblower conveying particles from one compartment to another.

(PhysOrg.com) -- Researchers at the University of St Andrews have made a surprise discovery using light beams that can travel around corners.

The academics have developed the concept of moving particles within light beams that follow curves rather than go along straight lines building on their work in the area of optical manipulation.

Professor Kishan Dholakia of the School of Physics and Astronomy commented, "Physics holds many surprises; our understanding of how light moves and behaves is challenged by such beams and it is exciting to see them move into the interdisciplinary arena - light has thrown us a

curve ball.

"A standard beam of light spreads as it travels due to the wave effect known as diffraction. Take a laser pointer - even that would be 100km wide if this light beam were to reach the moon.

"Our research has shown that certain light beams do not diffract or spread - they can travel around corners and propel particles round corners. This is a new discovery in the phenomenon of light moving particles."

Thirty years ago scientists found that the Airy beam, named after the famous British astronomer Sir George Airy, had a mathematical parallel in optics. Recently, it was discovered that the beam actually 'bends' or curves as the beam moves through space unlike a laser pointer, for example.

The St Andrews team have now taken things much further by utilising this unusual curving property of Airy beams to send particles literally around curves and corners, sweeping aside or 'clearing' particles within a sample chamber.

Team member Joerg Baumgartl said, "The Airy beam allows us to clear a sample chamber without any moving light fields: in essence it acts like a small snow-blower for microscopic glass particles and even cells. It could have major applications in microfluidic engineering and cell biology."

The findings of Joerg Baumgartl, Michael Mazilu and Kishan Dholakia in the School of Physics and Astronomy are published in the latest edition of the journal *Nature Photonics*.

The team are now exploring a number of new avenues with these light

fields including intriguing new particle sorting as well as possible methods for separating chosen cells from a given population.

"This beam shows a wonderful example of how an elegant but perhaps obscure mathematical discovery in quantum mechanics has powerful analogies to laser beams and in turn leads to important new applications for science," said Michael Mazilu.

Provided by University of St Andrews