Fluid lenses feel the pressure

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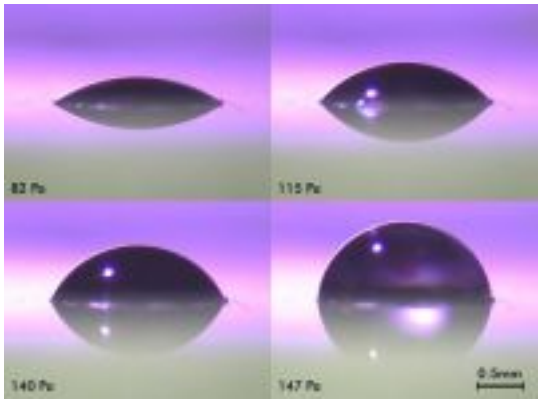
The new lens has been designed by Saman Dharmatilleke and colleagues at the Institute of Materials Research and Engineering (IMRE) in Singapore. It was made by housing a tiny drop of water -- or any other liquid with a high surface tension -- in the small aperture of a well. Applying pressure to the drop via an actuator changes the radius of curvature -- and hence the focal length -- of the drop. The focal length can therefore be tuned simply by varying the amount of pressure applied. The lenses can be made either from a liquid-air or a liquid-liquid interface.

Dharmatilleke and co-workers have been able to make two types of lenses with their technique: "bi-convex" lenses, in which both sides of the drop change shape, and "plano-convex" lenses, in which one side of the drop is planar and the other is convex. The latter are made by using one end of the aperture and sealing off the other with a thin transparent substrate. The new lenses can be made as small as 10 microns, making them the smallest lenses available today. They also consume very little power and are cheap to produce.

According to the team, the lenses would be ideal for devices that need to focus and zoom in on an object with precision, such as web cams, mobile phone cameras, bar-code scanners, and portable medical devices such as microscopes and endoscopes. The researchers have already licensed their technology to a Singapore engineering company PGS Precision Pte Ltd.

Although researchers at the electronics giant Philips developed a variable-focus fluid lens in 2004, it worked on different principles. It consisted of a drop of an electrically conducting aqueous solution surrounded by oil, the shape of which was changed by applying a voltage, rather than pressure. The voltage changed the extent to which the oil repelled the water.



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