

# “Prisoner of Light” ...

... putting the gentle force of light to work!

Not only is the Singapore sun hot on the skin, it also exerts an ever so slight pressure on whatever it shines on! The force of the sun’s rays is so gentle that its subtle effects escape human senses, but it is nevertheless large enough to push or levitate tiny objects like polymer molecules, particles or biological cells that are too small for our eyes to see.

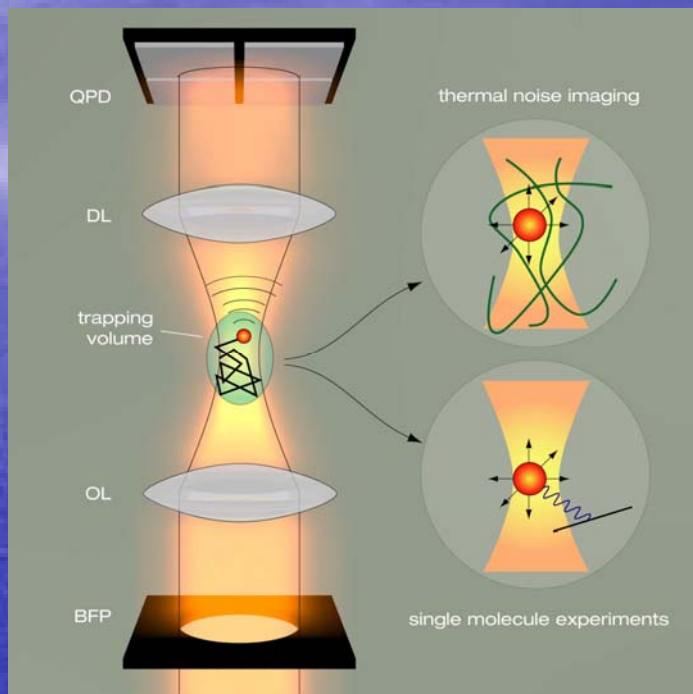
How can we make the force of light work for us?

A laser beam focused through a lens of an objective in a microscope can trap small particles or polymer molecules near the focal point. Moving the beam allows one to move the particles imprisoned by the beam. The result is an *optical trap*, which can be used like a “tweezer”. The tweezer also acts like an invisible spring without any mechanical arms and can exert a force more than a trillion times smaller than what we can feel. The optical tweezer can, therefore, be used as an optical tensiometer to measure forces between particles, the mechanical strength of a red blood cell, and the force needed to detach a polymer chain from a surface. The fluctuation of the position of a particle caught in the beam can also

Contact: Prof. Raj Rajagopalan

Tel: 6516 2186

Email: [chehead@nus.edu.sg](mailto:chehead@nus.edu.sg)



A laser “tweezer” formed by a focused laser beam can capture molecules and particles.

be used to measure the viscosity and the elasticity of the cytoskeletal material inside a biological cell in response to exposure to toxins or drugs, so that the behavior of biological or physiological materials can be examined in normal or diseased states.