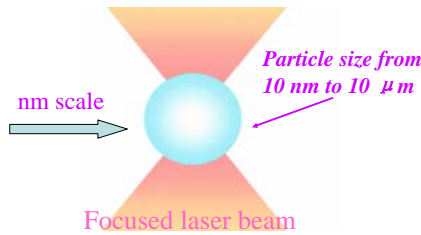


Driving question: How to manipulate microsize and nanosize objects like cells?

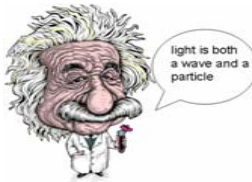
Macroscale tweezers (~ cm)



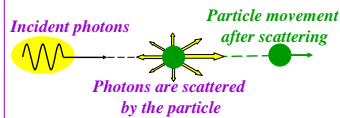
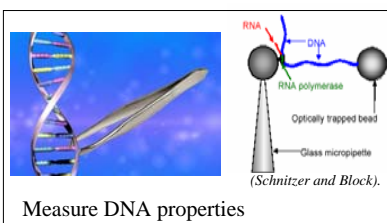
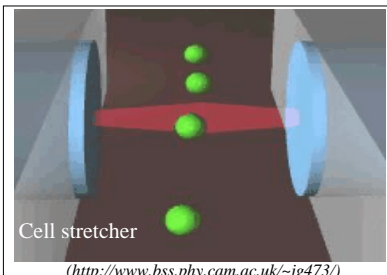
Micro or nanoscale tweezers: optical tweezers



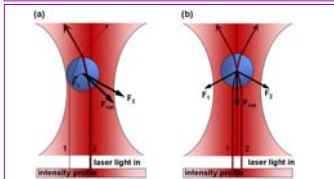
How do optical tweezers work and what can they do?



Some applications

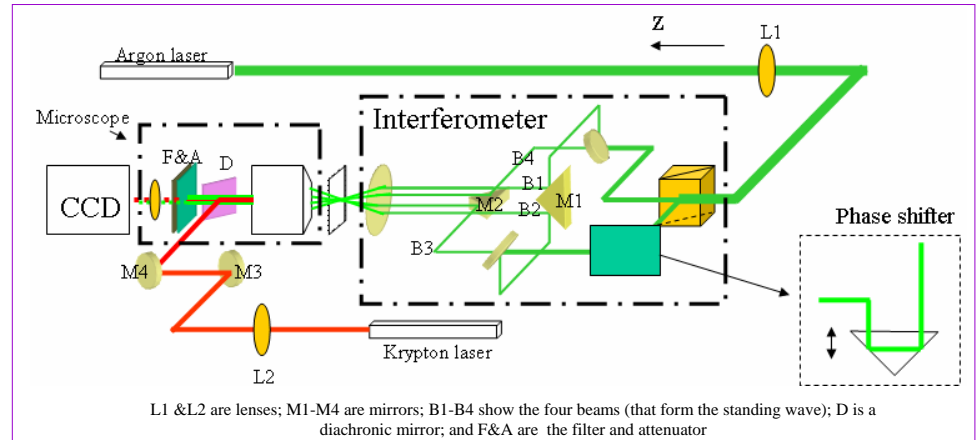


Comet tail formed mainly by the radiation pressure from the sun light.



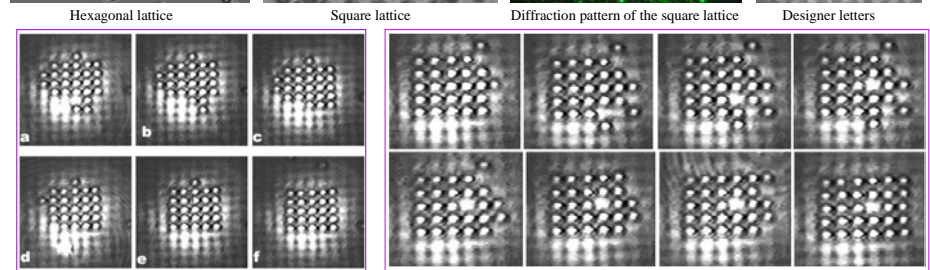
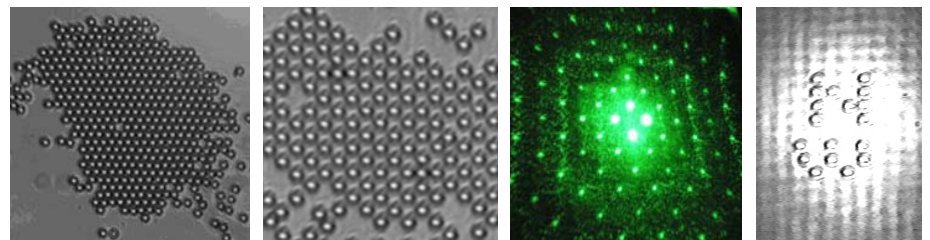
(http://en.wikipedia.org/wiki/Optical_tweezers)

When a microsphere is displaced from the center of a focused laser beam, the net force on the sphere points to the beam waist (intensity maximum)



Two-dimensional optically assisted assembly

With several coherent laser beams, we can make different kinds of interference patterns. The particles in the solution will be trapped in the intensity maxima of the interference patterns, and form colloidal lattices. With the "helper" beam, we can arrange the randomly trapped spheres around to make designer lattices.



The procedure of making a perfect square lattice

The procedure of making a center defect

Acknowledgements: This work was supported by the National Center for Learning & Teaching in Nanoscale Science and Engineering (NCLT) under Grant EHR04-26328 and made use of facilities provided by the NSF-supported MRSEC program under Grant DMR 05-20513.