

The Scale of Things - Nanometers and More

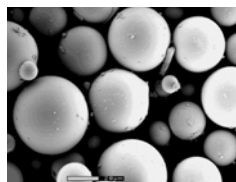
Things Natural



Dust mite
200 μm



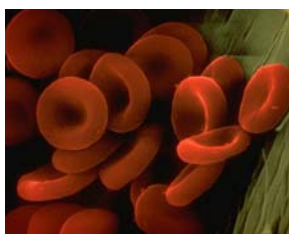
Ant
~ 5 mm



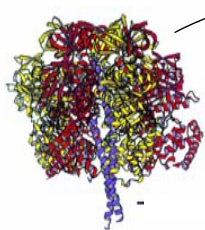
Fly ash
~ 10-20 μm



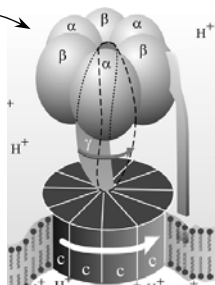
Human hair
~ 60-120 μm wide



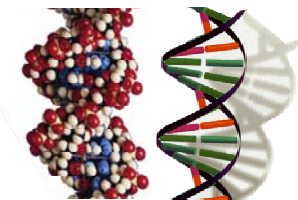
Red blood cells
(~7-8 μm)



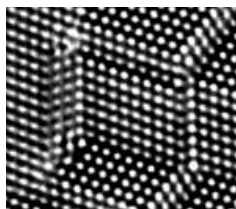
~10 nm diameter



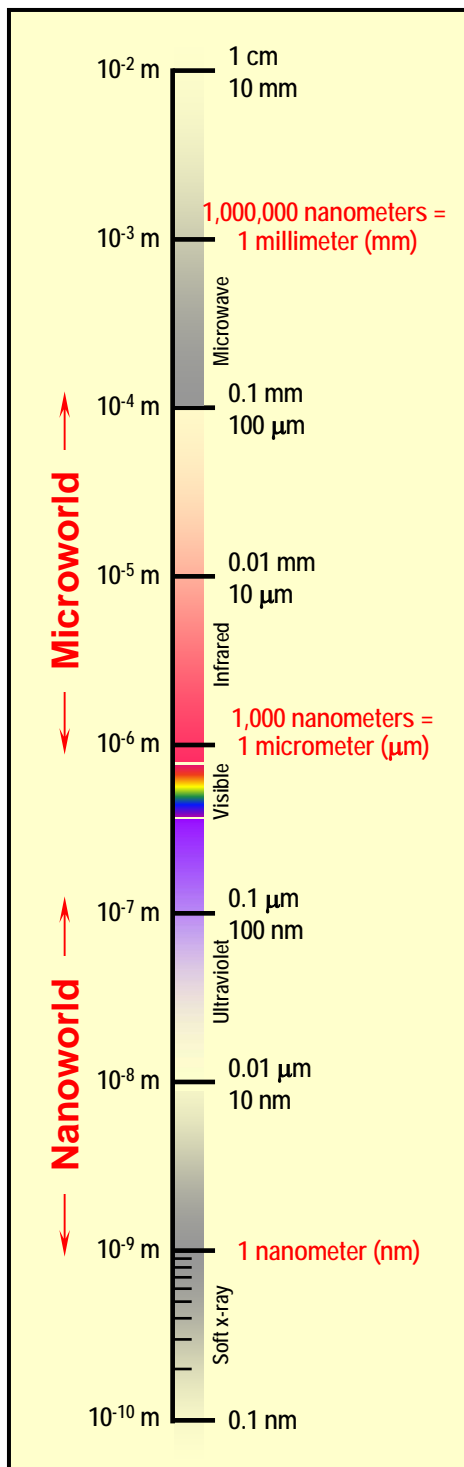
ATP synthase



DNA
~2-1/2 nm diameter



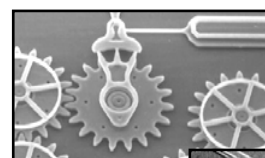
Atoms of silicon
spacing ~tenths of nm



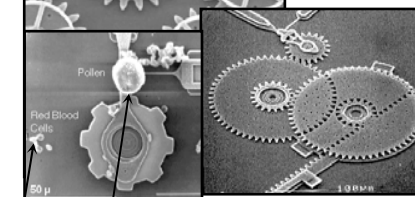
Things Manmade



Head of a pin
1-2 mm



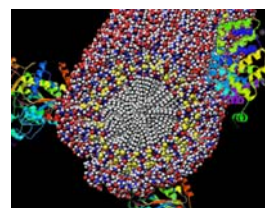
MicroElectroMechanical (MEMS) devices
10 -100 μm wide



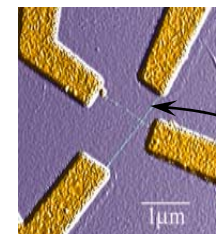
Pollen grain
Red blood cells



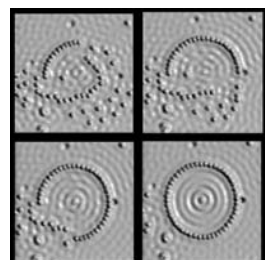
Zone plate x-ray "lens"
Outer ring spacing ~35 nm



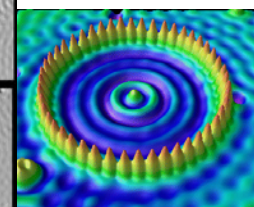
Self-assembled,
Nature-inspired structure
Many 10s of nm



Nanotube electrode

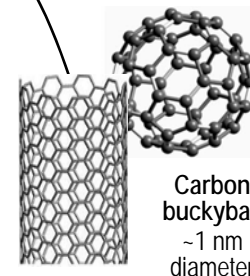


Quantum corral of 48 iron atoms on copper surface
positioned one at a time with an STM tip
Corral diameter 14 nm



The Challenge

Fabricate and combine nanoscale building blocks to make useful devices, e.g., a photosynthetic reaction center with integral semiconductor storage.



Carbon nanotube
~1.3 nm diameter