SENIC—Nanoscale Science and Engineering Exploring Tools of Nanotechnology

Explore!

Part 1

1. Take some Legos® and decide how you would build a model of one of the molecules shown.
2. But wait, the Legos® represent atoms in the nanoworld and you are in the macro world.
3. Put the gloves/mitts on and then begin to build. Was it easy or hard?

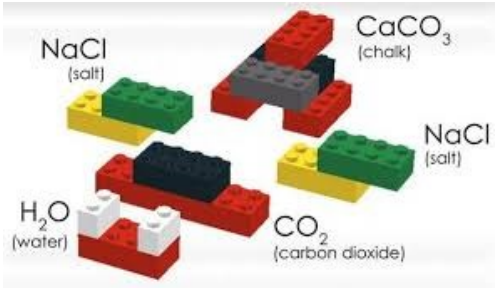

Image: Courtesy UC Berkeley Lawrence Hall of Science

Part 2

1. Close your eyes and use the tip of your finger to trace along your arm from shoulder to fingertips. What did you feel?
2. Pick up the refrigerator magnet and the small magnetic strip.
3. Run the strip lengthwise along the back of the magnet. Do the same along the short side of the magnet.
4. Did you feel something? What was it?

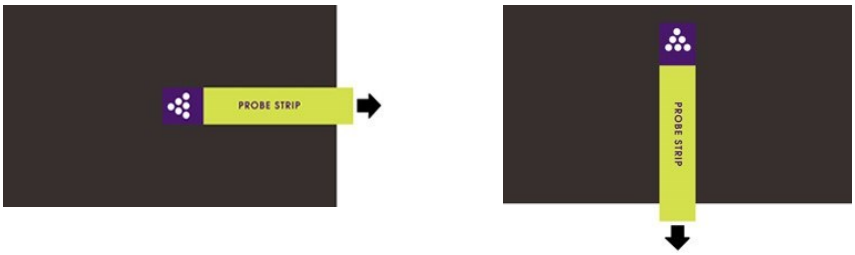

Image: NiseNet.org

How do we see small things?

Nanotechnology is the science of small things. It takes very sophisticated instruments to see nanostructures. Optical (light) microscopes have limitations based on the wavelength of visible light (390—700nm). To image nanostructures we use instruments not limited to the range of visible light - these include Scanning Electron Microscopes and Atomic Force Microscopes (AFM). An AFM has a resolution on the order of fractions of a nanometer, more than 1000 times better than an optical scope. The AFM probe reacts to the forces of the sample's surface to create a high resolution 3-D image. It creates a topography of the surface similar to sonar mapping of the seafloor.

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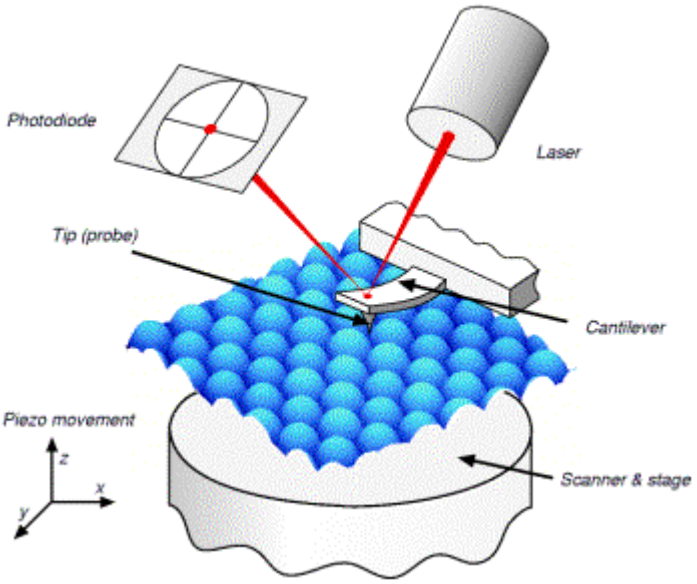
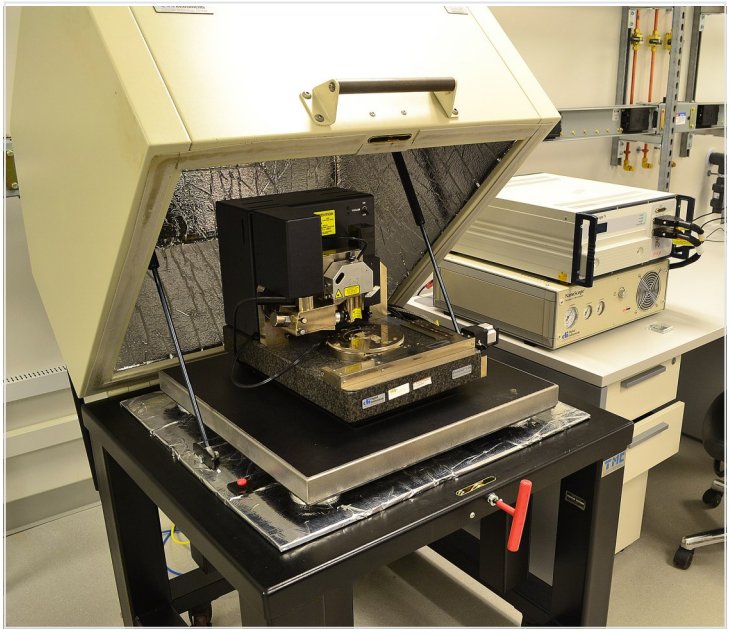
Scanning probe microscopes trace surface features by movement of a very fine pointed tip mounted on a flexible arm which moves across the object's surface. One kind, Atomic Force Microscope (AFM) measures interaction of forces between the probe tip and sample providing information on the mechanical properties of the surface. AFMs are widely used to measure surface topography of many different types of nanoscale samples.



Schematic of AFM
Image courtesy of SP Technical Research Institute of Sweden and KTH Royal Institute of Technology



Veeco AFM: Institute for Electronics and Nanotechnology, Georgia Tech

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National Nanotechnology Coordinated Infrastructure

NSF