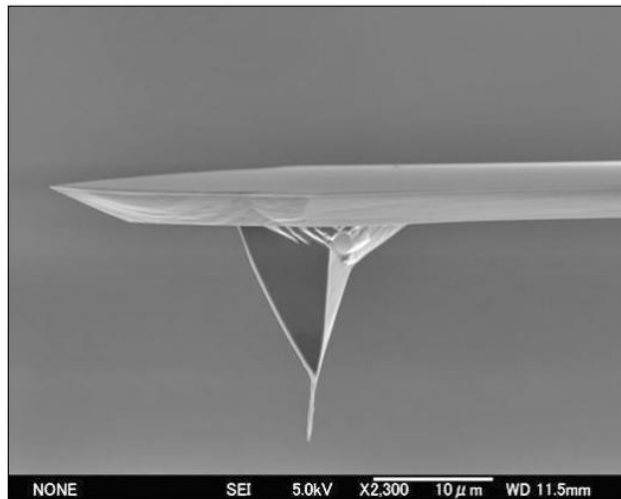




Lecture-5. Microscopy. SEM

You can use a scanning electron microscope (SEM) — which creates images of invisibly tiny things by bombarding them with a stream of electrons — to look at features on a scale as small as 10 nanometers (billionths of a meter). Figure 3-8 shows an SEM image of a nanotube hanging from one of the pyramidshaped tips used in atomic force microscopes.



An SEM shoots a beam of electrons at whatever you're examining, transferring energy to the spot that it hits. The electrons in the beam (called primary electrons) break off electrons in the specimen. These dislodged electrons (called secondary electrons) are then pulled onto a positively charged grid, where they're translated into a signal. Moving the beam around the sample generates a whole bunch of signals, after which the SEM can build an image of the surface of the sample for display on a computer monitor. SEMs can ferret out quite a bit of information about the sample:

- Topography: surface features such as texture
- Morphology: shape, size, and arrangements of the particles that compose the object's surface
- Composition: elements that make up the sample (This can be determined by measuring the X-rays produced when the electron beam hits the sample.)