

# ELECTRON MICROSCOPE

An ordinary <sup>light</sup> microscope has essentially the following four important parts:

1. The source of light
2. The specimen
3. The lenses that makes the specimen seem bigger
4. The magnified image of the specimen.

## ELECTRON MICROSCOPE

The electron microscope consist of:

### 1. ELECTRON SOURCE

The light source is replaced by a beam of very fast moving electrons.

### 2. SPECIMEN

The specimen usually has to be specially prepared and held inside a vacuum chamber from where the air has been pumped out (bcz electrons donot travel very far in air)

### 3. ELECTROMAGNETS

The lenses are replaced by a series of coil-shaped electromagnets through which the electron beam travel. In an ordinary microscope, the glass lenses bend (or refract)



the light beams passing through them to produce magnification. In an electron microscope, the coils bend the electron beams the same way

#### 4. ELECTRON MICROGRAPH / IMAGING

The image is formed as a photograph (called an electron micrograph) or as an image on a TV screen.

### TRANSMISSION ELECTRON MICROSCOPES

A TEM has a lot in common with an ordinary optical microscope. ~~The~~ A thin slice of the specimen is prepared quite carefully and placed in a vacuum chamber in the middle of the machine. An electron beam is fired down through the specimen from a giant electron gun at top. The gun uses electromagnetic coils and high voltages (typically from 50,000 to several million volts) to accelerate the electrons to very high speeds. As electrons can behave like waves. The faster they travel, the smaller the waves they form and more detailed the images they show up. Having reached top speed, the electrons zoom through the specimen and out the other side, where more coils focus them to form an image on screen or on a photographic plate.



TEMs are the most powerful electron microscopes: we can use them to see things just 1nm in size, so they effectively magnify by a million times or more

# SCANNING ELECTRON MICROSCOPES

SEMs are designed to make images of the surfaces of tiny objects. Just as in a TEM, the top of a SEM is a powerful electron gun that shoots an electron beam down at the specimen. A series of electromagnetic coils pull the beam back and forth, scanning it slowly and systematically across the specimen's surface. Instead of travelling through the specimen, the electron beam effectively bounces straight off it. The electrons that are reflected off the specimen are directed at a screen, similar to cathode-ray TV screen, where they create a TV like picture.

SEMs are generally about 10 times less powerful than TEMs. On the plus side, they produce very sharp, 3D images (compared to the flat images produced by TEMs) and their specimens need less preparation.