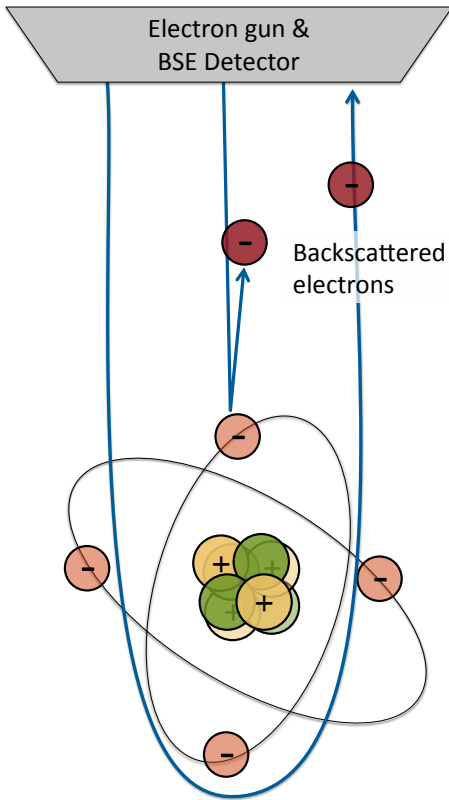


Secondary electrons are produced when the electron beam interacts with valence or conduction band electrons within the sample. As the electron beam passes by it imparts a small amount of energy to these shallow electrons, which is enough to remove them from the sample. These freed electrons are called secondary electrons.



Backscattered electrons are produced when the electron beam interacts more deeply with the sample. The incoming electrons experience elastic scattering as a result of direct collisions with the electron shell of an atom or due to electrostatic interactions with its nucleus that cause them to slingshot around the nucleus like an orbiter around the moon. In both cases the exit direction is generally 'back' toward the direction they came from, hence the name "backscattered". The frequency of such interactions increases with increasing atomic number because this increases both the number of electrons in the shell and the electrostatic charge of the nucleus. As a result, elements with higher atomic numbers produce more backscattered electrons and therefore, they appear brighter in backscattered electron imaging.

Cathode luminescence is a phenomenon in which an element emits light when bombarded by an electron beam. This occurs because the electron beam excites electrons within the atom causing them to jump to a higher energy level. When they drop back to their original, lower energy level, they release energy within the visible part of the spectrum.