Conventional scanning electron microscopes are limited in their ultimate data acquisition rate at a given resolution by statistical electron-electron interaction (so-called Coulomb interaction) as well as band width of detectors and deflection systems. We increased imaging speed dramatically by using multiple electron beams in a single column and parallel detection of the secondary electrons. The multi-beam SEM generates multiple overlapping images during a single scan pass, thereby covering a larger area in shorter time as compared to a single-beam SEM at the same pixel size. Examples of applications in material sciences will be presented.