

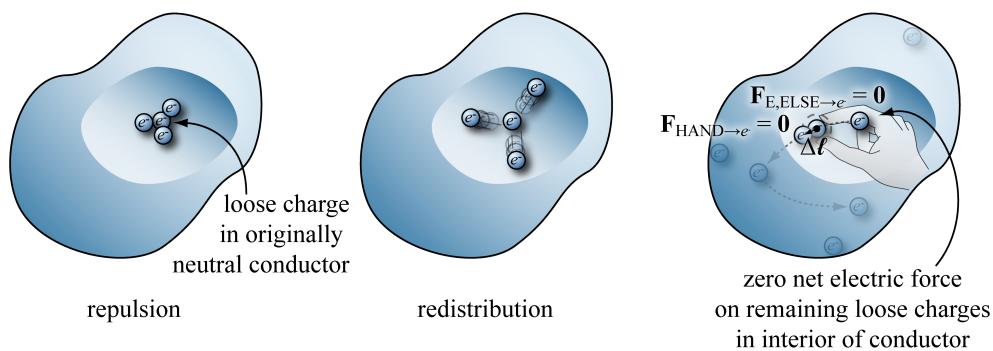
Conductors near electrostatic equilibrium

Equipotential set – a set of positions in space with the same potential (it takes no net work from an “external hand” to move a charge from one point in the set to another point in the set)

Electrostatic equilibrium – situation in which spatial distribution of charge is not changing

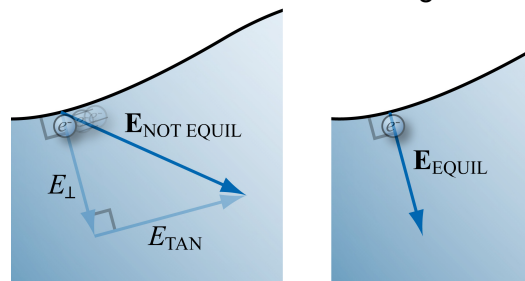
Conductor – material in which charge carriers (typically electrons in everyday solids) move very freely. The typical drag force on a charge carrier is so weak that even when only a slight electric force is exerted on a particular charge carrier, that charge carrier will move quickly enough that the spatial distribution of charge will be in the process of changing.

Conductors rapidly approach electrostatic equilibrium – Charge will continue to be redistributing itself in a conductor so long as the net electric force has not yet for every charge in the interior bulk of the conductor equaled zero. Because the net electric force on any particle is, in this way, kept almost always very close to zero in the bulk of the conductor, any contiguous portion of the material is almost always very nearly an equipotential set.



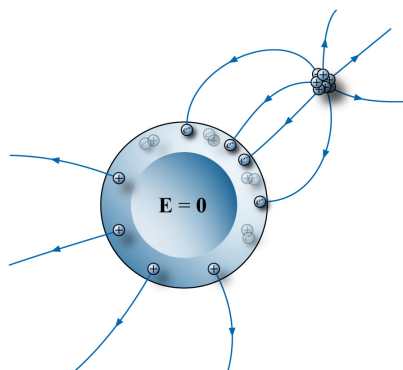
Excess charge resides on the surface of a conductor at electrostatic equilibrium – if excess charge were found in the bulk of a conductor, then the electric force it would exert on other loosely bound charge carriers in the bulk of the conductor would cause those charge carriers to move. The charge distribution would be in the process of changing. Thus, the conductor would not be at electrostatic equilibrium.

Electric field at surface of a conductor at electrostatic equilibrium is perpendicular to surface – otherwise, a component of the electric field tangential to the surface would cause charge redistribution along the surface.



Shielding

Faraday cage: Shielding inside from outside



Concealing inside from outside

