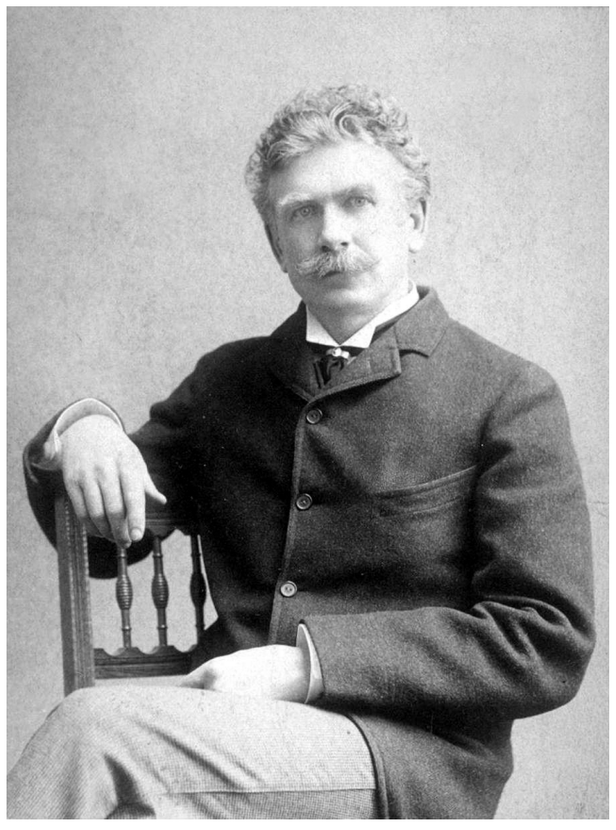
MAGNETISM, n. Something acting upon a magnet.

The two definitions immediately foregoing are condensed from the works of one thousand eminent scientists, who have illuminated the subject with a great white light, to the inexpressible advancement of human knowledge.

Ambrose Bierce



Arizona State University
SES 194

Energy in Everyday Life

Electric Fields

Frank Timmes

ftimmes@asu.edu

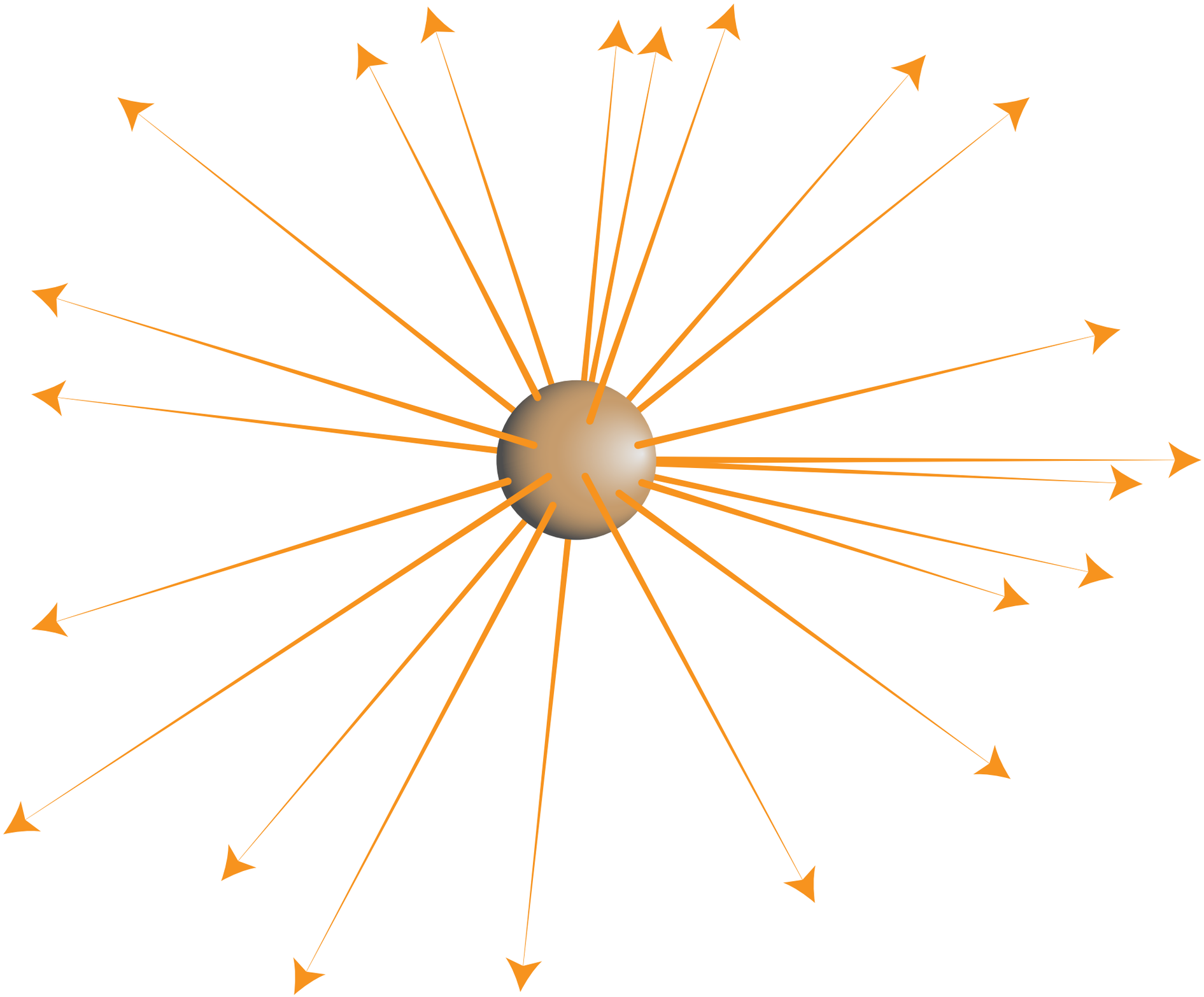
We measure charge in coulomb (C), honoring Charles Coulomb who first gave the law of electric force.

The coulomb is very large compared to the quantum of charge, $e = 1.6 \times 10^{-19}$ C. This means that a charge of -1 C contains ~6×10^{18} electrons.

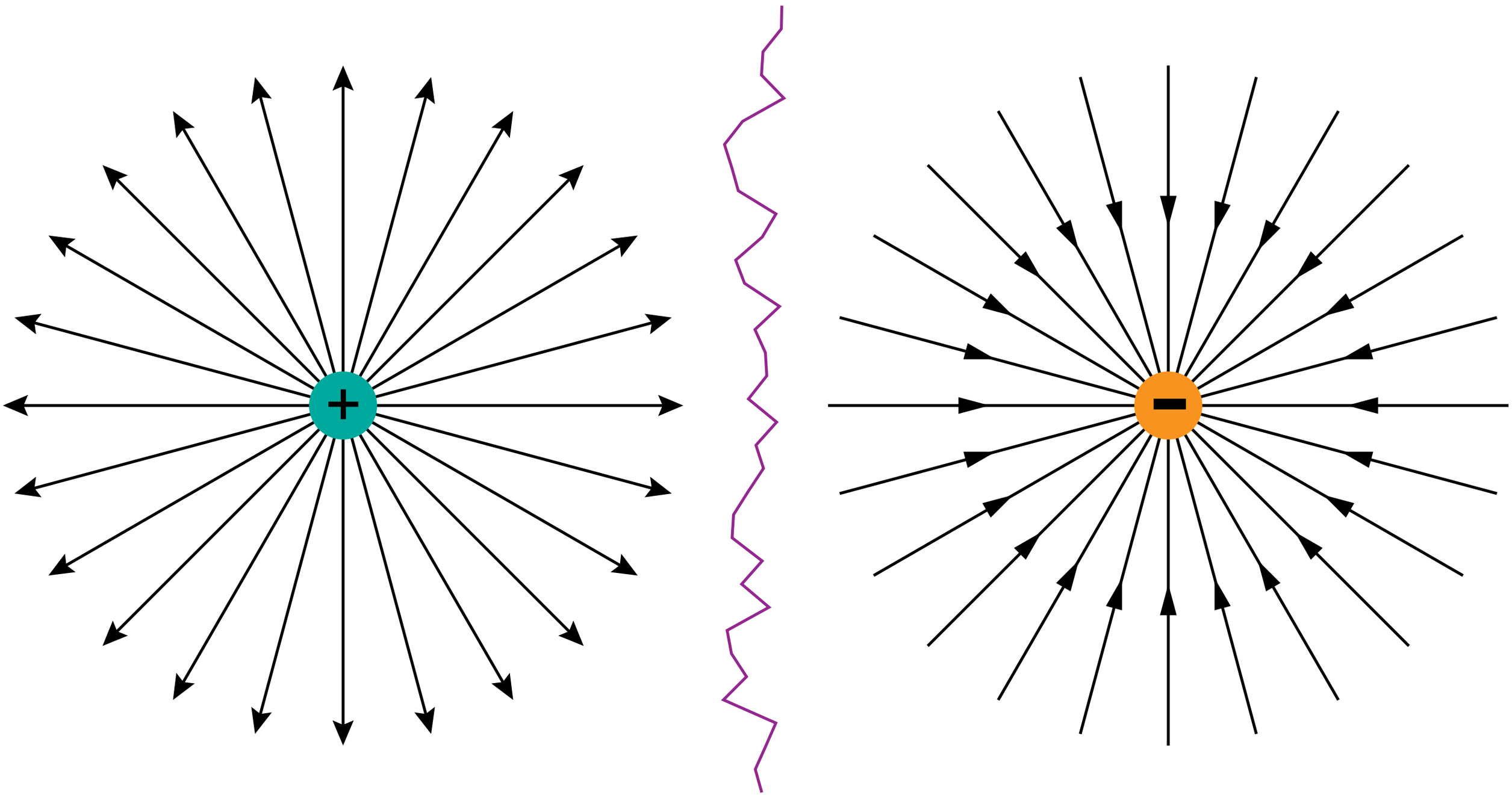
A typical finger-to-door spark involves the exchange of ~ 1 trillion electrons, about 10^{-7} Coulombs.

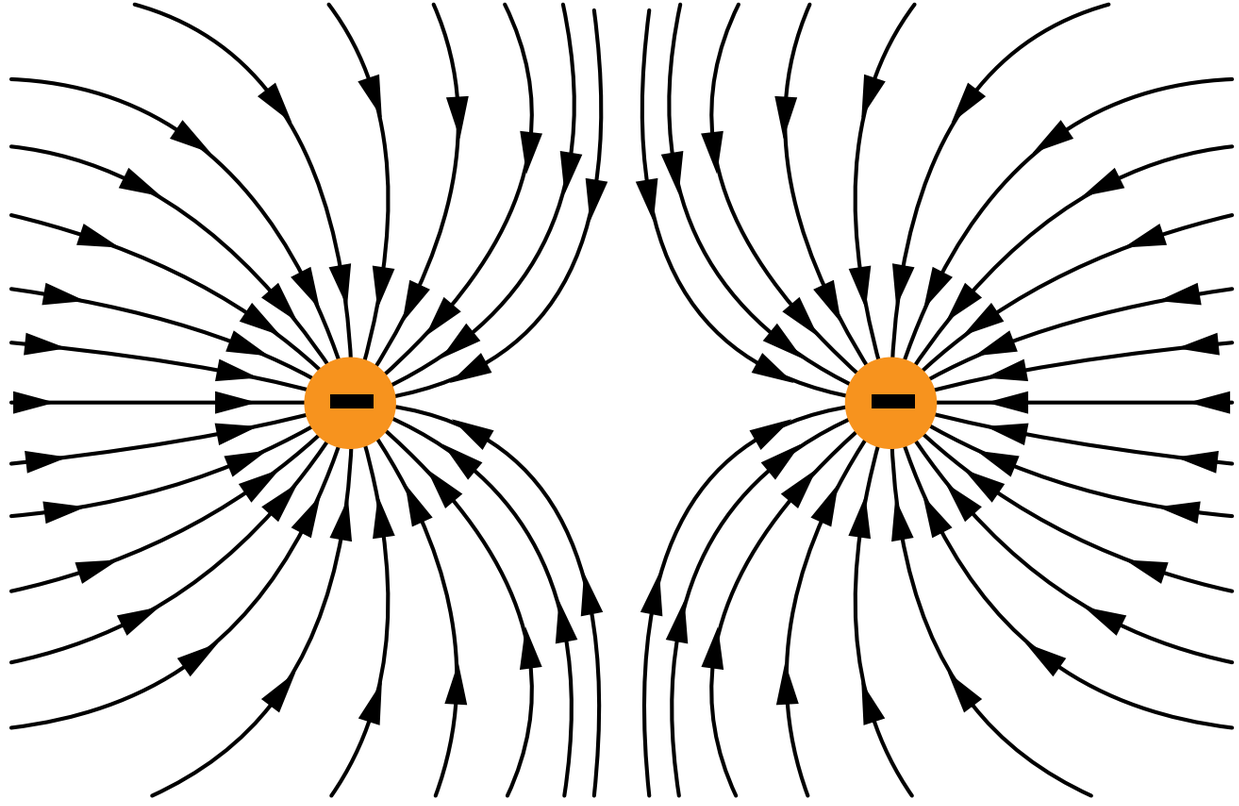
1 coulomb of free electrons in copper has a size of ~ 1 grain of sand (~0.04 cm diameter).

Every charge has an electric field.

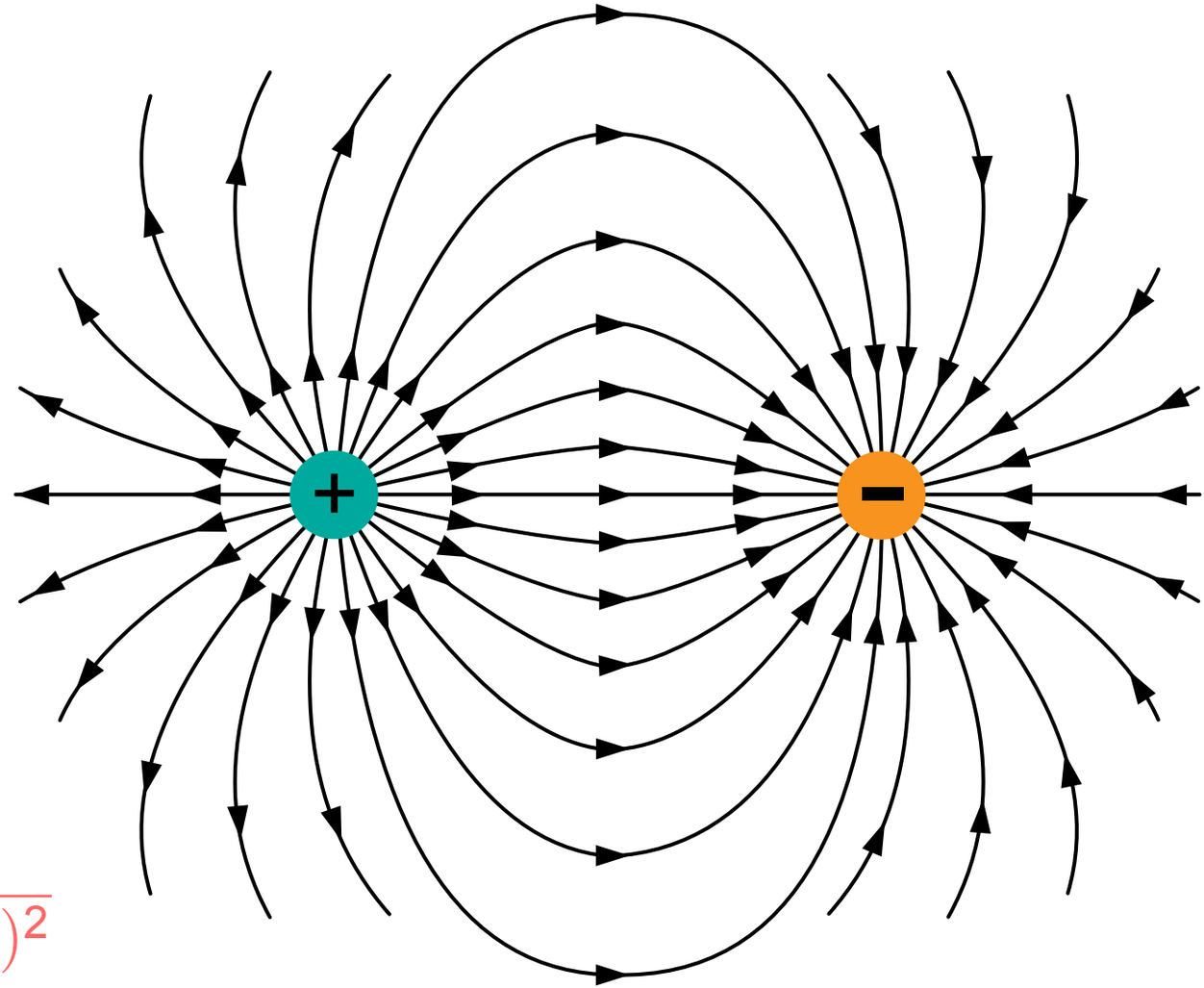


Electric field lines from positive charges point outward, and point inward for negative charges.

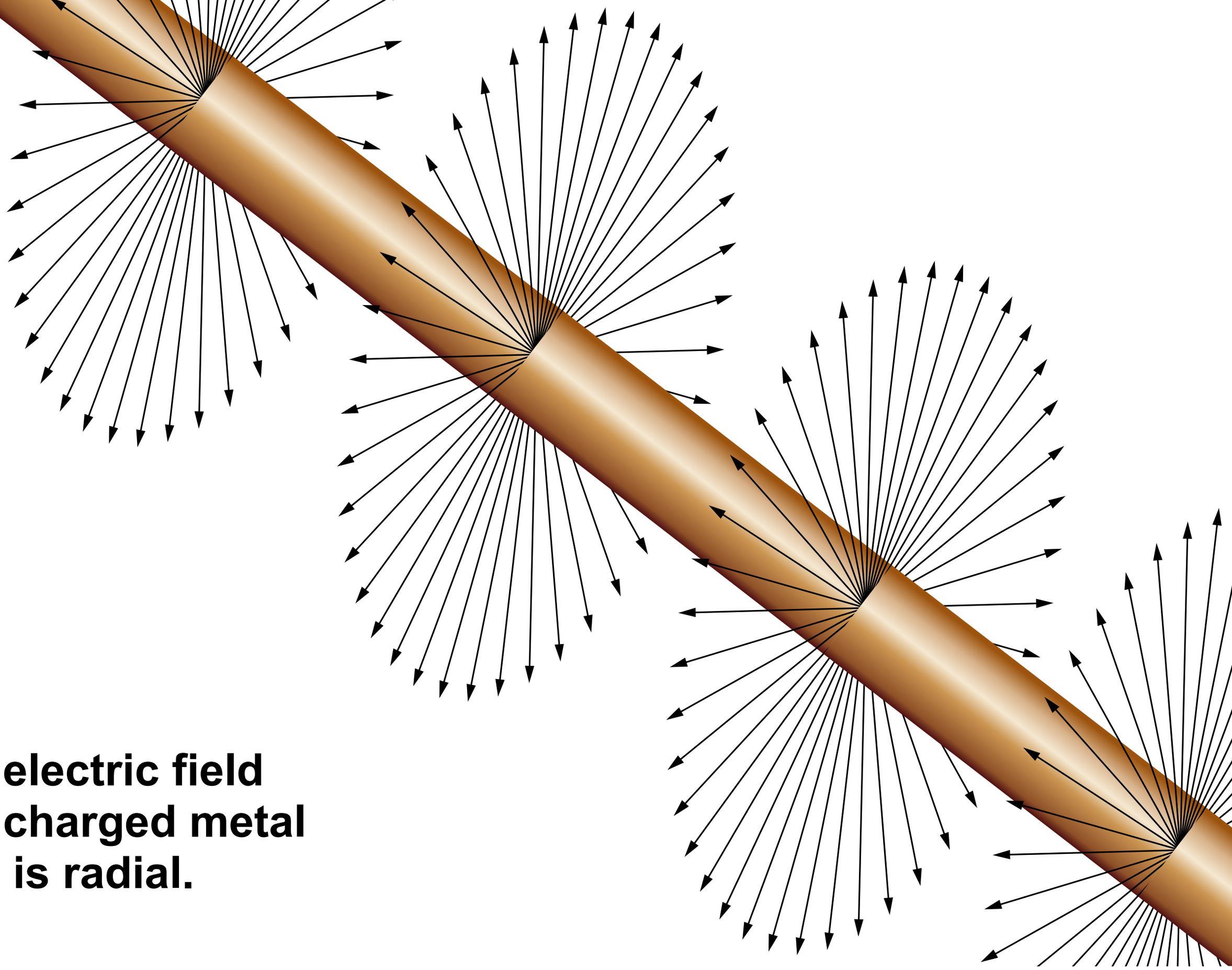




Electric field lines from positive and negative charges interact with each other.

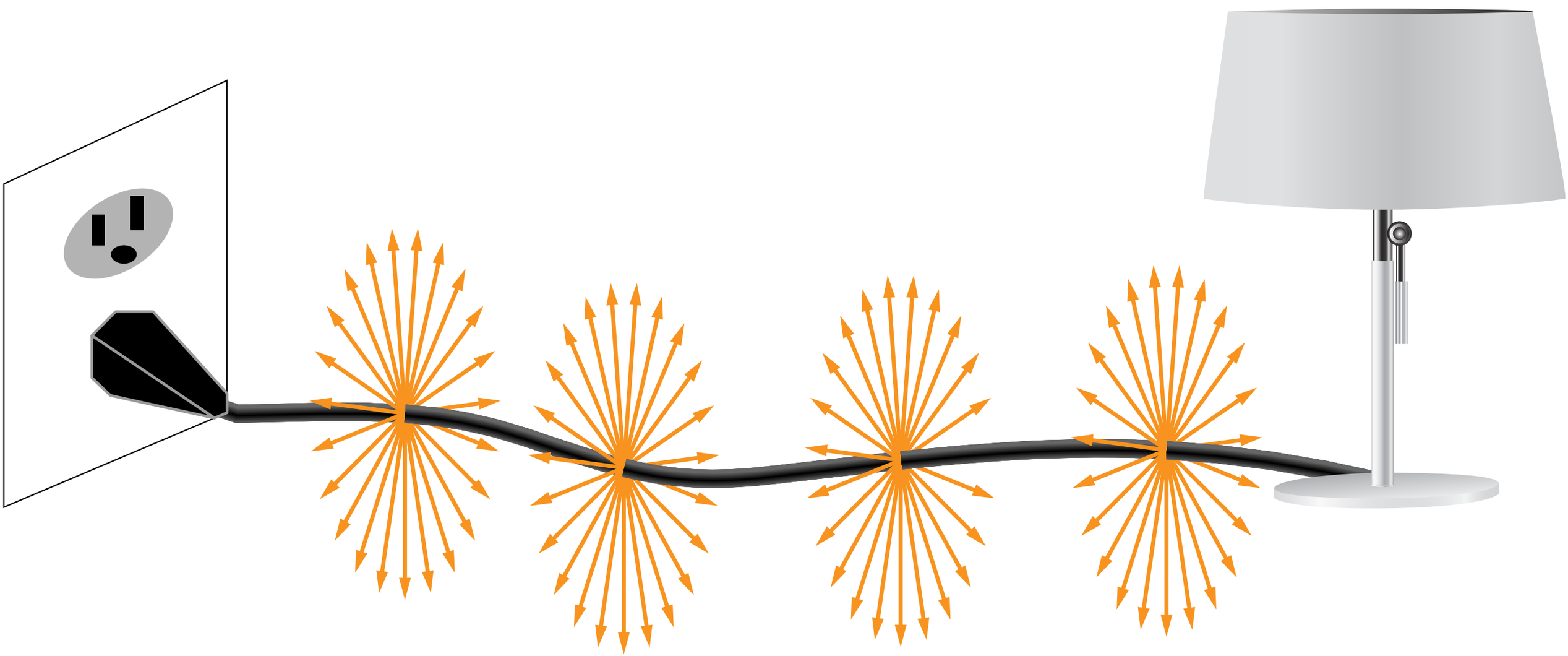


$$F_E = \text{constant} \times \frac{\text{charge}_1 \times \text{charge}_2}{(\text{distance between centers})^2}$$



The electric field of a charged metal wire is radial.

For example, in your living area …



Lamp plugged in but turned off. Electric field around wire.