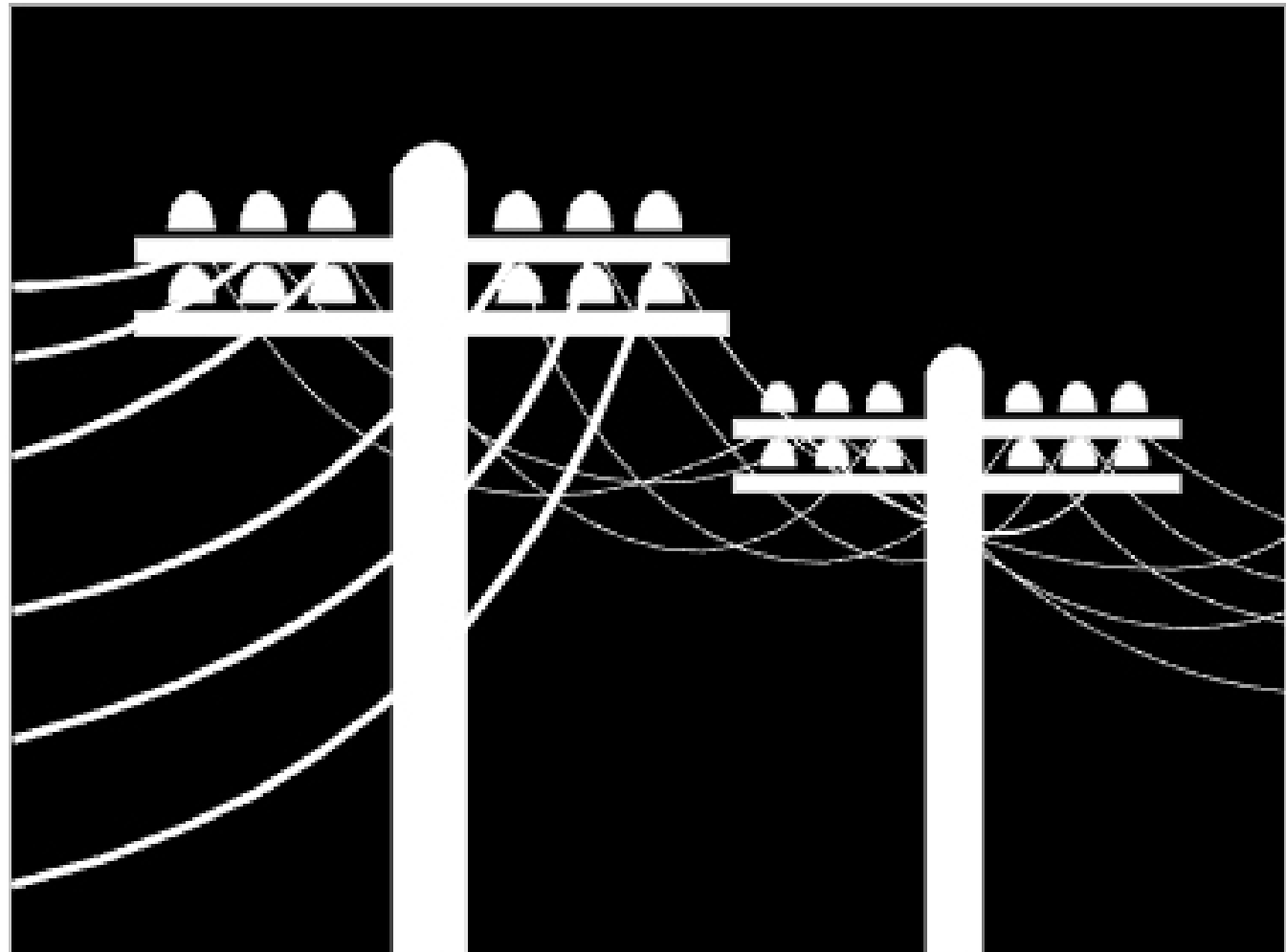

Today in Physics 217: conductors

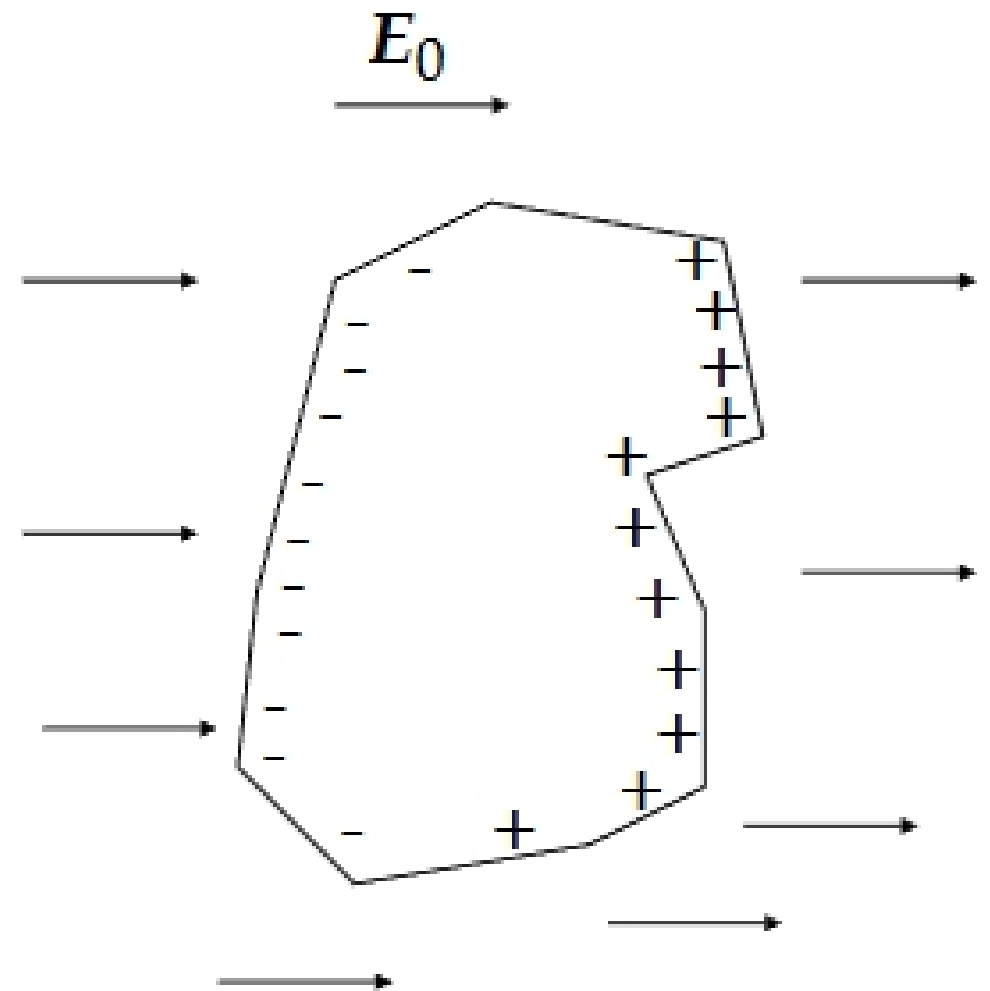
- Conductors: $E = 0$,
 $V = \text{constant}$ inside.
- Examples
- Forces on
conductors from
surface charge



Conductors

Conductors are materials that contain charges that can move about freely (within the material) in response to an applied electric field.

- ❑ Metals are good examples; for *most* metals, the mobile carriers are electrons.
- ❑ Better conductors have higher densities of free (mobile) charges.



A metal in an externally-applied electric field. Electrons have moved to the “upstream” surface, leaving fixed positive charges behind.

Conductors (continued)

Implications of the free, mobile charges in conductors in electrostatics:

- **$E = 0$ inside a conductor.** If it weren't, charges would move; the free charges move whenever the field is nonzero, and stop only when $E = 0$ inside.
- **$\rho = 0$ inside a conductor.** This is because, for any surface completely within the conductor,

$$Q_{\text{enclosed}} = \frac{1}{4\pi} \oint E \cdot da = 0$$

because $E = 0$ there.

- **Any net charge lies on the surface.** That's as far as it can travel under the influence of the external electric field; also, there'd be nonvanishing E and ρ if this weren't true.