

Physics 202, Lecture 2

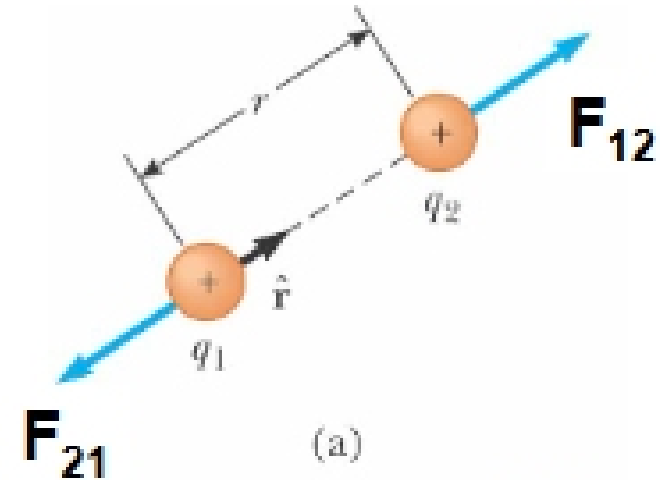
Today's Topics

- **Electric Fields**
 - Determining the Electric Field of given charge distribution (discrete and continuous)
 - Electric Field Lines
 - Motion of Charged Particles in External Electric Fields

Coulomb's Law: Vector Form

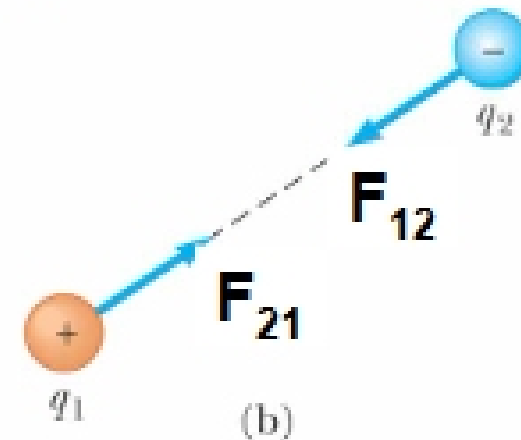
2 charges: force on q_2 by q_1

$$\vec{F}_{12} = k \frac{q_1 q_2}{r^2} \vec{r}_{12} = -\vec{F}_{21}$$



>2 charges: force on charge i

$$\vec{F}_i = \vec{F}_{1i} + \vec{F}_{2i} + \vec{F}_{3i} + \dots$$



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principle of linear superposition

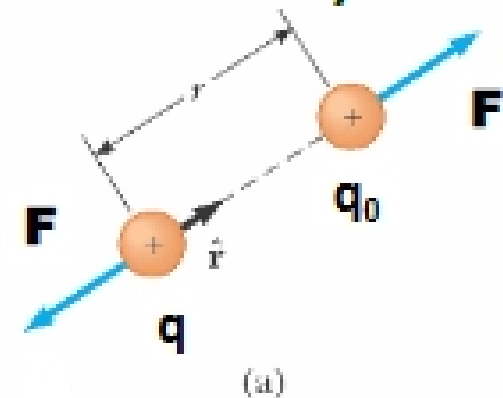
The Electric Field

Original (Coulomb's) view:

q applies electric force on q_0 (action at a distance)

$$\vec{F} = k \frac{q_0 q}{r^2} \hat{r}$$

Force on charge always proportional to strength of that charge!



“Modern” view:

q is source of electric field \mathbf{E} , (units: N/C) which fills all of space. Interaction with \mathbf{E} leads to a force on q_0

$$\vec{F} = q_0 \boxed{k \frac{q}{r^2} \hat{r}} = q_0 \vec{E}$$

q: source charge
 \mathbf{E} independent of q_0 !

(q_0 often called the “test charge”: take the limit as $q_0 \rightarrow 0$)