2.1: Concepts and Principles - The Gravitational Analogy

The Gravitational Analogy

In introducing the concept of the electric field, I tried to illustrate it by drawing an analogy with the gravitational field, (pic). This analogy can be extended to electric force and gravitational force.

From mechanics, the relationship for the gravitational force on an object is:

pic

where

- m is the mass of the particle of interest,
- and (pic) is the net gravitational field at the location of the particle of interest. (This field was typically approximated as that of the earth, but should actually be the field created by all of the massive particles in the universe, other than the particle of interest.)

Mass is the property that allows particles to *create* gravitational fields and it is also the property that allow thems to *interact* with other particles' gravitational fields. This interaction is termed the gravitational force.

Wouldn't it be great if charge played the same role with regard to the electric field? Well, it is great! The electric force on a particle is given by the relation,

pic

where

- q is the charge on the particle of interest,
- and (pic) is the net electric field at the location of the particle of interest (created by all of the *other* charged particles in the universe).

All charged particles create electric fields, but this is only half of the story. All charged particles also interact with *other* particles' electric fields. This interaction is termed the electric force.

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