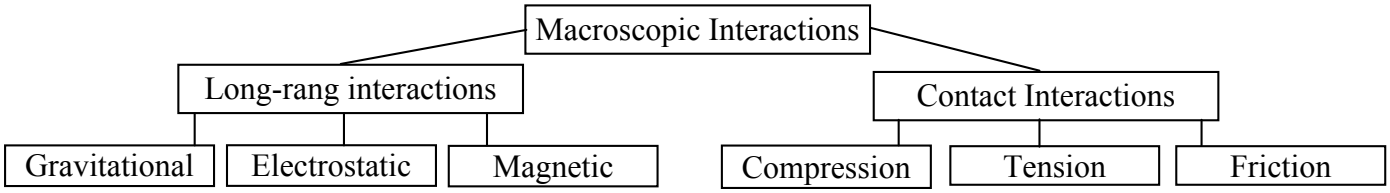
Fundamentals of Physics: Problem Set #1
Models and Interactions

$$\vec{v} = \frac{d\vec{r}}{dt} \;;\; \vec{p} = m\vec{v} \;;\; \Delta\vec{p} = \vec{p}_{\text{final}} - \vec{p}_{\text{initial}} \;;\; \vec{F}_A = \frac{[d\vec{p}]_A}{dt} \;;\; \vec{F}_g = m\vec{g}$$

Fundamental Interactions: Strong (quarks, gluons) Electromagnetic (all charged particles)
Weak (quarks, leptons) Gravitational (all particles)



Due: Friday Aug. 30 in class

Notes: 1) Our first quiz is this Friday (8/30) and will cover the two minute problems in C1-C2.
2) Lab starts this week. You need to purchase a quadrille-ruled lab notebook for this.
Also, if you have Excel on a *laptop* (not ipad), please bring it to lab.

Reading assignment: for Wednesday, C1, C2 (models and interactions)
for Friday, C3 (vectors)

Problem assignment:
(WARNING - The problem numbering scheme in the text can be a bit confusing, so ALWAYS double check the problem numbers to make sure you don't work the wrong problems!)

C1B.6 (water density using unit operators)
C1M.9 (period of a mass-spring oscillator from dimensional analysis)

C2B.2 (impulse for a moving object)
C2B.10 (impulse for dropped objects)
C2B.13 (interactions for a refrigerator magnet)
C2M.4 (momentum transfer in a collision)

A1. In physics, we often model complicated objects with simple shapes. Model yourself as a cylinder of height *h* and radius *r*. Assuming you have an average density equal to that of water, determine the radius for the model cylinder with your height and weight. Comment on your result.

Bonus: C1R.3 (can you see the mountain Mauna Kea from a beach on the island of Kauai?)
[You will need to draw a picture that includes the curvature of the earth's surface.]