November 26, 2012   Physics 131   Prof. E. F. Redish
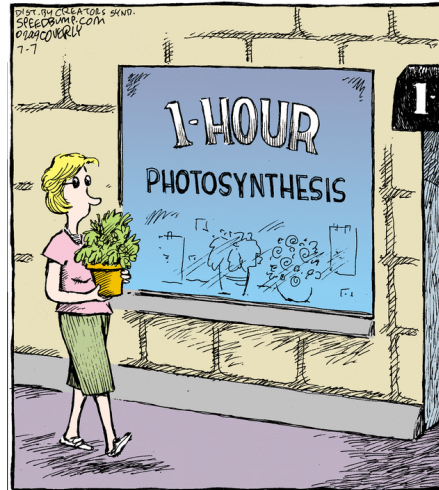
■ **Theme Music:**
   Earth, Wind, & Fire
      Energy

■ **Cartoon:**
   DaveCoverley
      Speed Bump

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Foothold ideas:
Potential Energy

■ For some forces work only depends
   on the change in position. Then the work done
   can be written
$$\vec{F} \cdot \Delta\vec{r} = -\Delta U$$

   U is called a *potential energy*.

■ For gravity, $U_{gravity} = mgh$

   For a spring, $U_{spring} = \frac{1}{2}\,kx^2$

   For electric force, $U_{electric} = k_C Q_1 Q_2 / r_{12}$

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Foothold ideas:
Conservation of Mechanical Energy

■ **Mechanical energy**

– The mechanical energy of a system of objects is conserved if resistive forces can be ignored.

$$\Delta(KE + PE) = 0$$

$$KE_{initial} + PE_{initial} = KE_{final} + PE_{final}$$

■ **Thermal energy**

– Resistive forces transform coherent energy of motion (energy associated with a net momentum) into *thermal energy* (energy associated with internal chaotic motions and no net momentum)

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