■ **<u>Theme Music:</u> Desi Arnaz**
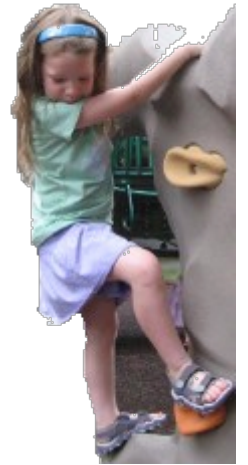
Perhaps

■ **<u>Cartoon:</u> Pat Brady**

Rose is Rose

Foothold ideas:
Entropy

■ Entropy – an extensive measure of how well energy is spread in a system.

■ Entropy measures

- The number of microstates in a given macrostate

$$S = k_B \ln(W)$$

- The amount that the energy of a system is spread among the various degrees of freedom

■ Change in entropy upon heat flow

$$\Delta S = \frac{Q}{T}$$

Foothold ideas: Transforming energy

- Internal energy: thermal plus chemical

$$\Delta U$$

- Enthalpy: internal plus amount needed to make space at constant p

$$\Delta H = \Delta U + p\Delta V$$

- Gibbs free energy: enthalpy minus amount associated with raising entropy of the rest of the universe due to energy dumped

$$\Delta G = \Delta H - T\,\Delta S$$

- A process will go spontaneously if $\Delta G < 0$.

Reading question

When the partition in the box is lifted the molecules can diffuse to the other side; however, they are not doing work because they are only diffusing due to random motion. Why then when you only put a hole in the partition and have the molecules travel to the other side and hit a turbine is that considered doing work? Is it simply because the molecules hit the fan and thus lose energy and give it to the turbine?