Homework 9

Due Tuesday, March 5th in class

Read Ch. 6 - 8 of Jespersen and Fitz-Randolph.

Questions to think about and answer:

1. In today's class, we introduced the idea of resonance:

   - A system has a natural frequency f_0,
   - It is driven by an oscillating stimulation at frequency f,
   - It will have a frequency dependent response, $A(f)$, that is largest when f is *near* f_0.

   How does this match your everyday use of the word 'resonance'?

2. Chapter 6 of J & F-R adds on some history to our introduction of the Laws of Thermodynamics. Below, I have included another nice explanation. Physicists, in an effort to get past the formulas, sometimes express them this way,

   - *First Law*: You can't win.
   - *Second Law*: You can't break even.

   Comment on how this part-joke-part-not captures (or doesn't) what you think you understand about the First & Second Law.

3. Chapters 6 & 7 of J & F-R gives a whirlwind intoroduction to atoms and their behavior. We would like to know what puzzles you in order to address that, so give us three questions you have about atoms, connected to time-keeping or not.

> The Second Law recognizes that there is a fundamental dissymmetry in Nature... All around us are aspects of the dissymmetry: hot objects become cool, but cool objects do not spontaneously become hot; a bouncing ball comes to rest, but a stationary ball does not spontaneously begin to bounce. Here is the feature of Nature that both Kelvin and Clausius disentangled from the conservation of energy: although the total quantity of energy must be conserved in any process (which is their revised version of what Carnot had taken to be the conservation of the quantity of caloric), the distribution of that energy changes in an irreversible manner. The Second Law is concerned with the natural direction of change of the distribution of energy, something that is quite independent of its total quantity.
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> P. W. Atkins, *The Second Law* (1984)