ASSIGNMENT FOR WEEK 2

Download Platt's article on "strong inference." This is a classic paper that should be read (and reread over the years) by all experimental scientists. Platt describes a methodological framework for testing hypotheses in science. He was motivated by the old idea (from Chamberlain) of having *multiple* working hypotheses, not just a single one. In part, having multiple competing hypotheses reduces the risk that observer bias will influence results (after all, we all would like "our" hypothesis to be true!).

Platt then conceived what he called a "strong inference" approach, which consisted of three steps:

1) devise multiple (= alternative) hypotheses
2) devise a SINGLE "crucial" experiment that would exclude (= falsify) one or more of the multiple hypotheses
3) execute that experiment

The results might then lead to new competing hypotheses, and the process can be then reiterated. The process is like climbing a tree. At each fork, one uses the results of a critical experiment to decide whether to follow the left or the right branch.

Questions to think about for discussion in section:

Why is strong inference a useful experimental paradigm? What are the advantages that Platt outlines (as opposed to experiments that test only a single hypothesis at a time).

When can strong inference go wrong, or are there circumstances under which it might not apply?

Now let's derive a strong inference experimental design. Imagine that you are a behavioral ecologist, and you want to test the impact of body size on the fitness of a frog. One way to manipulate body size is to rear the frogs at low (yields large frogs) or a intermediate (yields small frogs) body temperature. You then set up an experiment that tests the hypothesis that " bigger is better" – in other words, that big frogs will be dominant over small frogs in mating, fecundity, or feeding success, or any performance trait of interest to you.

Next imagine that you are a physiological ecologist interested in *acclimation* to temperature. [Recall that acclimation is a phenotypic shift in response to (or in anticipation of) some environmental shift.] You want to test the "beneficial acclimation hypothesis" that a frog that develops at intermediate temperature will perform better at that temperature than will a frog that developed at a low temperature (and vice versa).

We now have two hypotheses as to how developmental temperature will influence adult frogs. In 1/2 to 1 page, derive and describe a SINGLE "crucial" experimental protocol

that simultaneously tests both hypotheses, and describe (graphical predictions are fine!) what would be the pattern of results you'd find if "bigger is better" holds, or if the "beneficial acclimation hypothesis" holds. Would the predictions be the same or different for the two hypotheses?