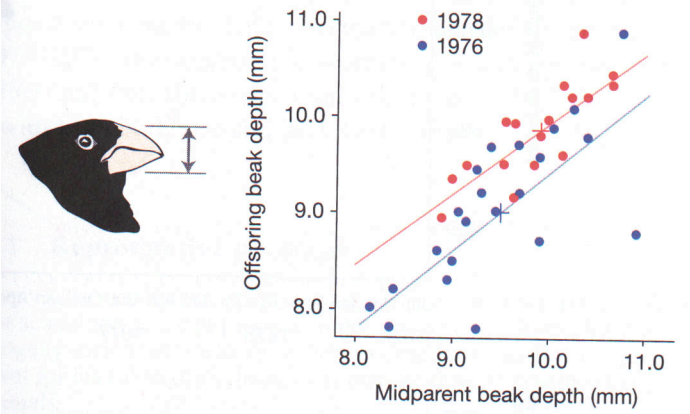
Quiz 3

1. Examine the figure below from your textbook.



a. Explain why the slope of a parent-offspring regression like the one above *may* result in an *overestimate* of the heritability of a trait. (10 pts.)

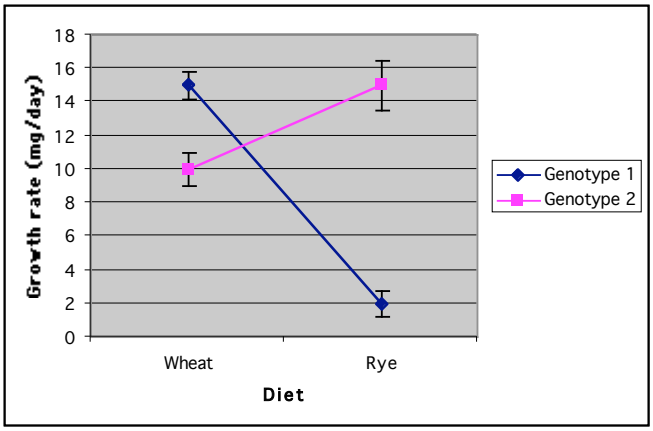
b. Notice that the intercepts appear to be different for the 1976 and 1978 lines. How can you explain this difference? (Remember that the finch population experienced a drought in 1977) (10 pts.)

c. Note that the slopes from the two years appear to be similar. What is the biological significance of this? (10 pts.)

2. *Tribolium* (flour beetles) are used as laboratory animals, but also exist in "natural" populations as pests of stored grain. The following figure shows the results of an experiment in which 2 inbred lines of *Tribolium* were raised on two different types of grain flour.

a. If you did an ANOVA on the results of this experiment, would you likely get a significant **Genotype** effect? **Diet** effect? **Genotype x Diet** interaction? Explain your answers. (15 points)

b. Imagine that the results of the last experiment showed the following pattern. What would be the significance of this result in considering evolution in natural populations of these beetles. (15 points)



3a. Galen, in her study of alpine sky pilots, found relatively high heritability (0.5) for corolla flare, a trait which is under strong directional selection. Describe two mechanisms that could maintain high heritability for corolla flare in the face of such strong selection. (10 points)

b. Using artificial flowers, Galen discovered that bumblebees preferred flowers significantly larger than the largest flower in the natural populations. She hypothesized that larger flowers lose more water, thus imposing a cost on large flower size. Design an experiment to test Galen's hypothesis, explaining your experimental design (including what you would measure). Don't forget to indicate the results that would support Galen's hypothesis. (20 points)

c. Describe an alternative hypothesis to Galen's that would explain why flower size is not as large as the "optimal" size for bumblebee pollination. (10 points)