GENOME553 Fall 2012

Paper for Tuesday 16 October 2012
Sánchez-Herrero, E., I. Vernós, R. Marco, and G. Morata. 1985. Genetic organization of *Drosophila* bithorax complex*. Nature* **313**: 108–113.

Questions for Thought (QfT)

As you read this paper, refer to FlyBase for any questions you might have about genes, deficiencies, or nomenclature. **Write down questions** you have about the biology of the system, body patterning, and the results of their screen. **Come up with at least three questions**. Turn in **your** questions as homework at the beginning of class. During class we will discuss your questions along with the QfT below.

1) What was known at that time (first two paragraphs of this paper)? **Propose two distinct molecular hypotheses to explain the genetic data available at that time**. What was the purpose of <u>these</u> experiments?

2) Figure 1: How did Sánchez-Herrero and colleagues identify new mutants? Outline their general strategy. Why did the authors use two different mutagens? Why did they cross to several different deletions? How did these efforts facilitate their analyses? **In what ways was their screen different from Hartwell's screen? What are the pros and cons of each approach?** For example, what kinds of genes does each approach miss?

3) BX-C complementation groups: Ed Lewis, who later won the Noble Prize for his work, had previously characterized the bithorax complex and had identified ~ one gene for each thoracic and abdominal body segment. Why did Sánchez-Herrero et al. identify only three homeotic genes? Did they miss a lot of genes? If so, why did they obtain multiple alleles of each complementation group? Furthermore, how could they have alleles that were viable yet still disrupted all the functions associated with that complementation group? **How did the authors reconcile these differences? Do you agree with their explanations? Explain.**

5) Some alleles of *Ubx* and *Abd-B* are dominant. **What kinds of molecular processes could produce a dominant phenotype?** Which of these explanations is appropriate here? **What are the genetic data that support a particular molecular explanation?**

6) Table 1: Why did the authors make clones in the adult? How did they know the patches they analyzed were actually mutant? **Explain your reasoning.**

7) Figure 4: The authors suggest that the bithorax complex is composed of three genes, each of which has multiple functions affecting different segments. Molecularly, how could such a system work? Several possibilities exist. **Propose two explanations and suggest an experiment that would distinguish between your hypotheses.**