

## Week 4 / 5 Questions (Genetic Control of the *Drosophila* Body Plan)

### 1. Why is it advantageous to use *Drosophila* to study development?

Ease of study  $\therefore$  the following 8 elements that contribute to this ease.

1. Rapid life cycle
2. Low chromosome number (4)  $\therefore$  easy to track chromosomes in knockouts
3. Sophisticated genetic & molecular genetic techniques
4. Genome sequenced – annotated
5. *Drosophila* community – research conferences
6. Embryos develop externally to mother
7. History and resources - flybase.org
8. Conservation of developmental genes and mechanisms – genes + mechanisms conserved between human + fly

### 2. What are maternal genes and what is their role in development?

**Maternal effect genes** = responsible for the polarity of the egg and embryo  $\rightarrow$  the developing egg (oocyte) is polarized by differentially localized mRNA molecules.

The genes that code for these mRNAs are maternal effect genes + encode for proteins that are translated upon fertilization to establish concentration gradients that span the egg.

***Bicoid* + *Hunchback*** = maternal effect genes most important for patterning of anterior parts (head + thorax) of the *Drosophila* embryo.

***Nanos* + *Caudal*** = maternal effect genes that are important in the formation of more posterior abdominal segments of the *Drosophila* embryo

### 3. What is a syncytium? What is the significance of this in development?

Syncytium = multinucleated/polynuclear eukaryotic (has more than one nucleus per cell) cell results from multiple cell fusions of uninuclear cells (cells with a single nucleus).

- The zygotic nucleus undergoes 13 rapid rounds of nuclear division **without cell division**  $\therefore$  results in a **syncytium**
  - a single cell with many nuclei + no cell membranes.
  - $\therefore$  large molecules such as proteins that are usually unable to be secreted, are able to easily diffuse between nuclei as there are no cell membranes present