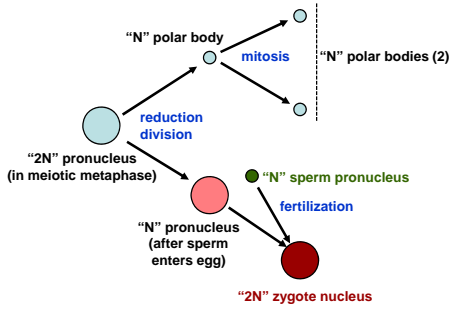
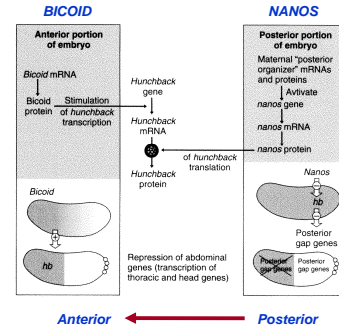


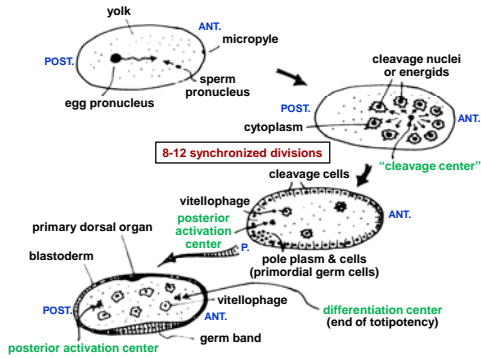
Fertilization



Establishment of polarity in *Drosophila* eggs: Maternal genes expressed in follicle cells produce "morphogens"



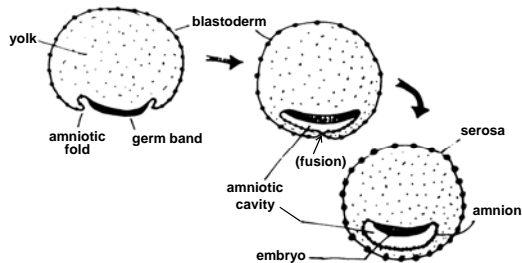
Superficial (meroblastic) cleavage [longitudinal sections]



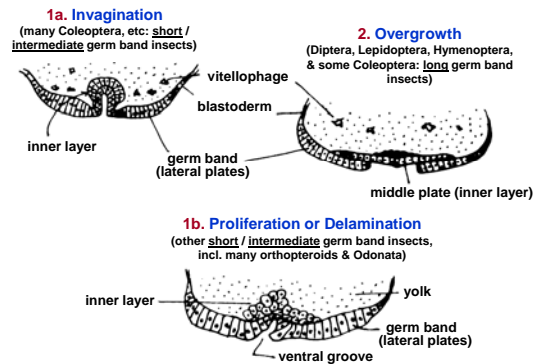
Different types of later embryological development

- (on a continuum)
- Short germ band insects**
 - Apterygota
 - Orthoptera: Caelifera
 - some Coleoptera (e.g. *Tribolium*)
 - Intermediate germ band insects**
 - Odonata
 - Orthoptera: Ensifera
 - some Coleoptera
 - Long germ band insects** (very distinct)
 - Diptera
 - Lepidoptera
 - Hymenoptera
 - some Coleoptera

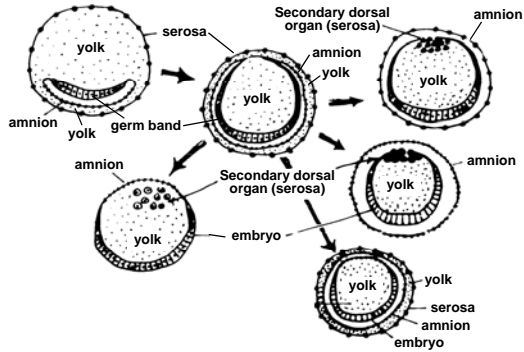
Embryonic membrane formation [cross-sections] typical of short / medium germ band insects



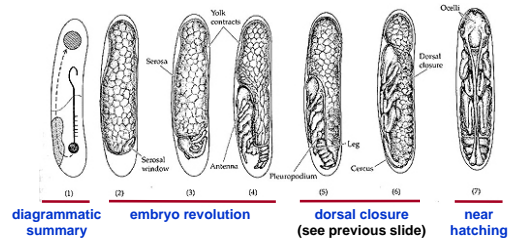
Types of "gastrulation" or endoderm/mesoderm formation [cross-sections]



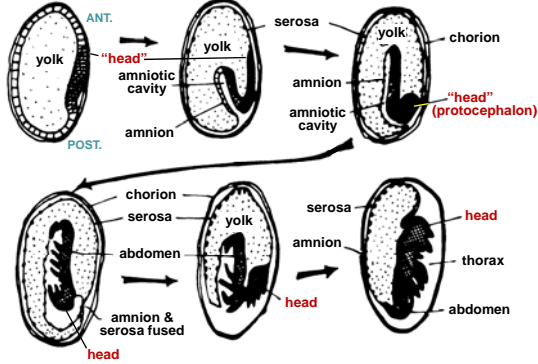
Four general pathways for dorsal closure
(puts the yolk inside the embryo)



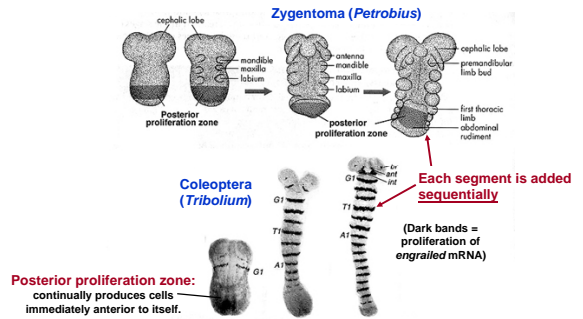
Blastokinesis in an intermediate germ band insect
(Orthoptera: Gryllidae: *Acheta*)



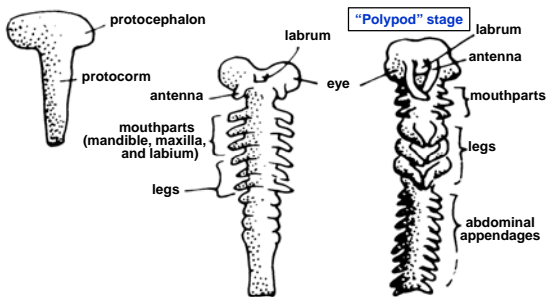
Blastokinesis in short / intermediate germ band insects
(Apterygota, Odonata, Orthoptera, some Coleoptera)



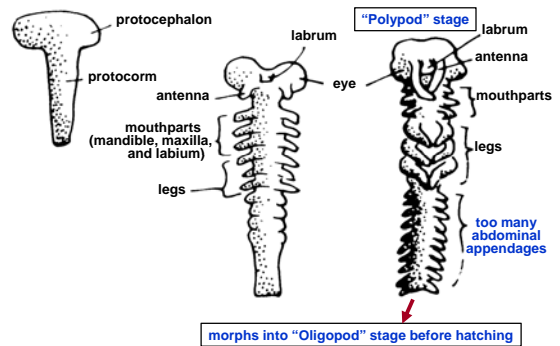
Segmentation & appendage formation, short germ band insects
(Apterygota, caeliferan Orthoptera, some Coleoptera)



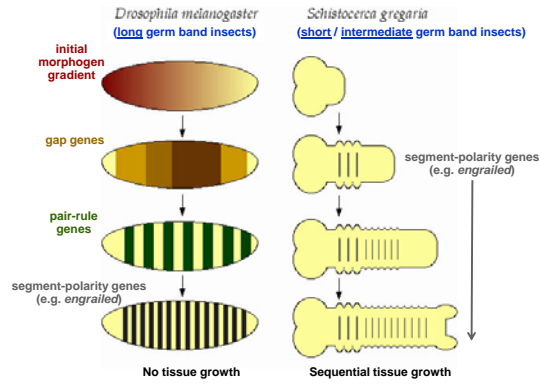
Summary of segmentation & appendage formation in short / intermediate germ band insects



Loss of extra appendages late in embryo development

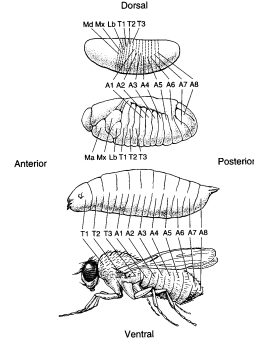


Another interpretation: Parallel vs. serial/sequential segmentation

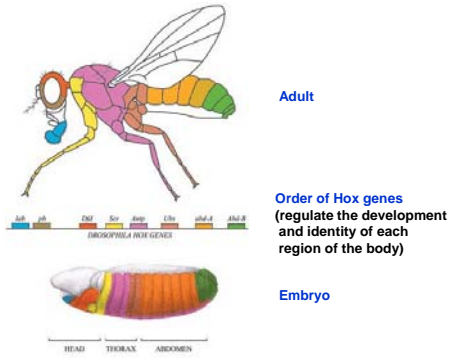


Fate map, *Drosophila* – a long germ band insect

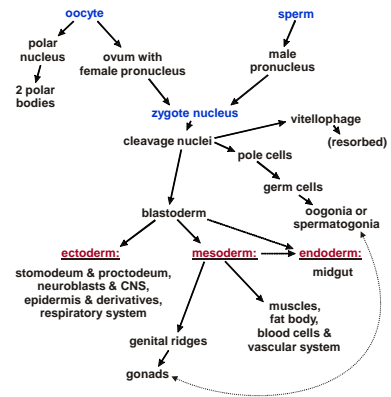
Polarity, pattern formation, and appendage formation



The eight Hox genes of *Drosophila*



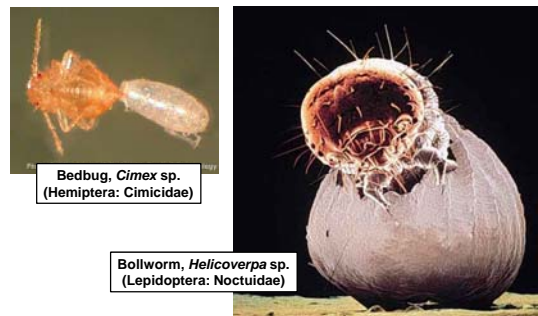
Summary of development



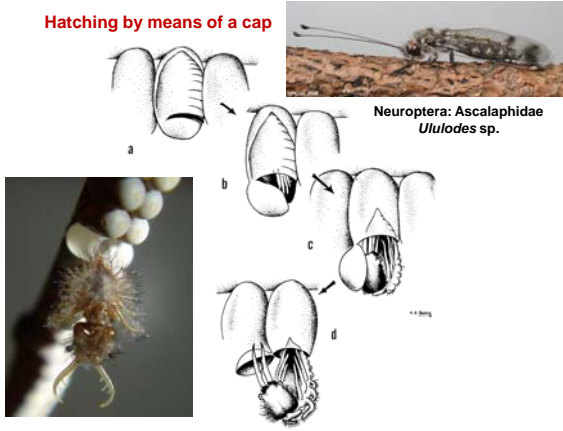
Haemocoelom, coelom, and mixocoelom



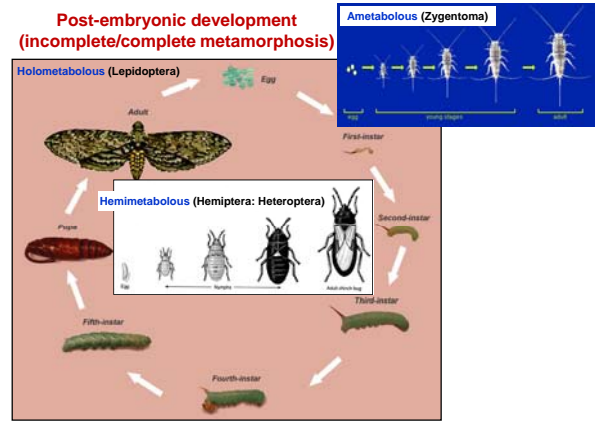
Hatching of the egg (eclosion)



Hatching by means of a cap



Post-embryonic development (incomplete/complete metamorphosis)



Pupal types (Endopterygota/Holometabola)

Dectitious exarate (Megaloptera: Corydalidae)



Adectitious exarate (Coleoptera, etc.)



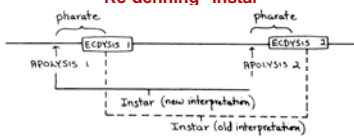
Adectitious obtect (Lepidoptera: Sphingidae)



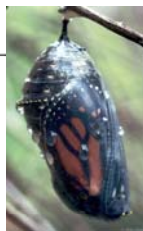
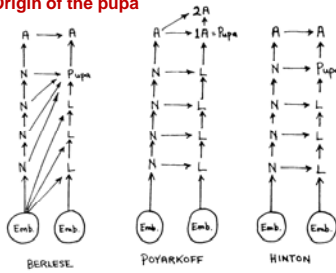
Secondary return to adectitious exarate: the puparium of higher Diptera



Re-defining "instar"



Origin of the pupa



Pharate adult (monarch butterfly)