DEVELOPMENT

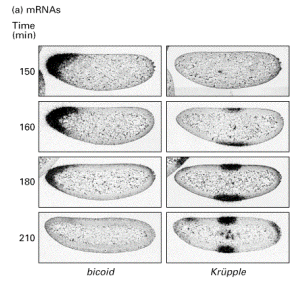
The egg/cell provides the molecular and architectural context for development

IMPORTANT ISSUES

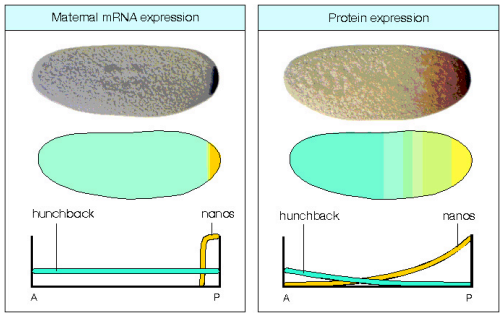
1. The egg has information pre-stored in it. **How do we identify the genes encoding this information**?

2. Not all genes are expressed in each cell/tissue. **How do we determine whether a gene is required for a particular developmental event?**

The Drosophila egg has maternal gene products localized



The Drosophila egg has maternal gene products localized



MATERNAL EFFECT MUTATIONS IDENTIFY DEVELOPMENTAL GENES WHOSE PRODUCTS ARE PRE-LOCATED IN THE EGG

ZYGOTIC LETHAL

+ / lethal ♀ X + / lethal ♂

↓

3 viable : 1 dead

MATERNAL EFFECT LETHAL

+ / lethal ♀ X + / lethal ♂

↓

ALL VIABLE

lethal / lethal ♀ X + / + ♂

↓

ALL LETHAL

MATERNAL EFFECT LETHAL

(Can the mother produce normal eggs)

+ / lethal ♀ X + / lethal ♂

↓

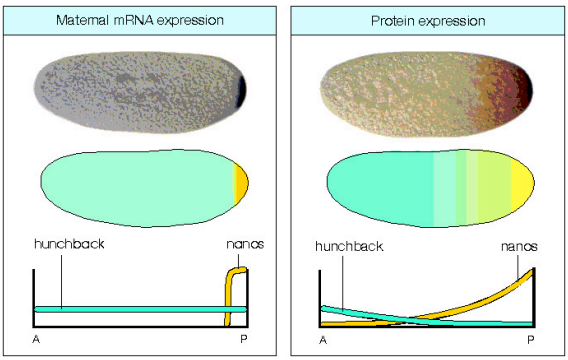
+ / + + / lethal lethal / lethal

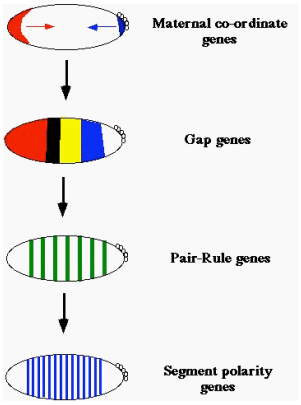
ALL VIABLE

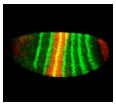
lethal / lethal ♀ X + / + ♂

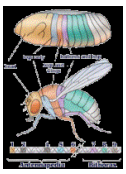
↓

ALL LETHAL ♀ and ♂









HOW CAN WE DETERMINE WHETHER A GENE'S FUNCTION IS AUTONOMOUS OR NON-AUTONOMOUS?

A CELL OR TISSUE MAY RECEIVE INFORMATION:

1. FROM THE CELL ITSELF-**AUTONOMOUS**

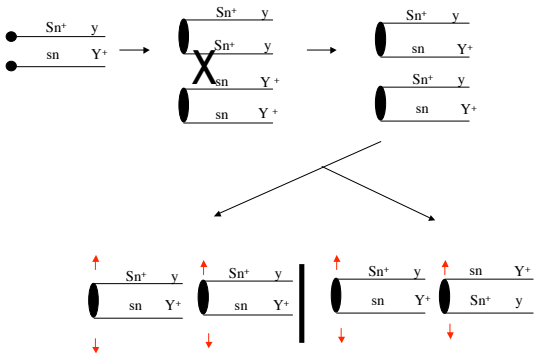
2. FROM ITS NEIGHBORS-**NON-AUTONOMOUS**

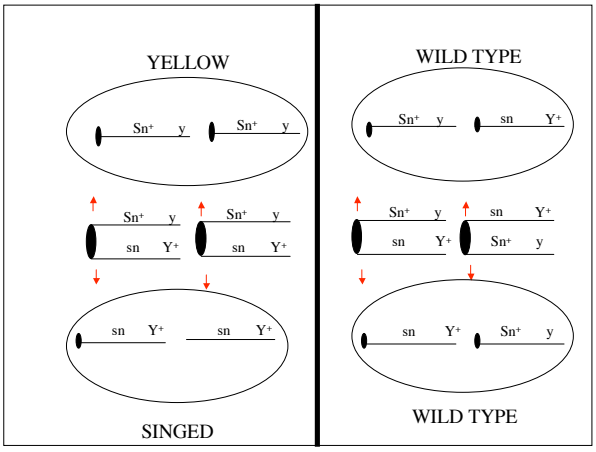
HOW CAN WE TELL IF A GENE FUNCTION IS REQUIRED IN A SPECIFIC TISSUE?

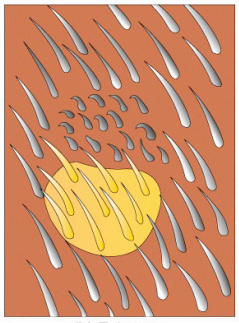
ANSWER:

GENERATE MUTANT CLONES WITHIN THE TISSUE

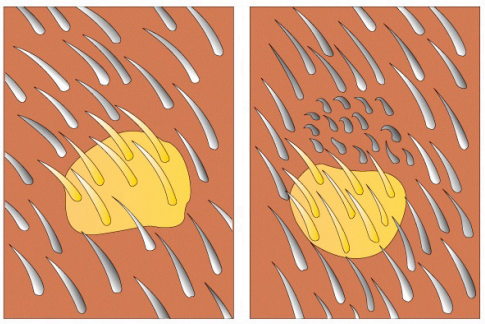
MITOTIC RECOMBINATION







(b) Twin spot

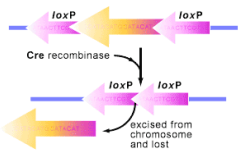


(a) Single yellow spot **(b)** Twin spot

HOW CAN WE TELL IF A GENE PRODUCT IS REQUIRED IN A PARTICULAR TISSUE?

METHOD: USE THE CRE/LOX SYSTEM TO ELIMINATE THE GENE ONLY IN THAT TISSUE.

CRE IS A RECOMBINASE CAUSING RECOMBINATION ONLY BETWEEN TANDEMLY REPEATED LOX SITES



HOW CAN WE DELETE A GENE IN A PARTICULAR TISSUE?

METHOD: PLACE CRE UNDER A TISSUE SPECIFIC PROMOTER AND THE GENE IN QUESTION FLANKED BY TANDEM LOX SITES

A CELL TYPE SPECIFIC PROMOTER DRIVES CRE EXPRESSION