AMB2020

L0.2

CMB Master - AMB

Advanced Molecular Biology

Introduction to course contents

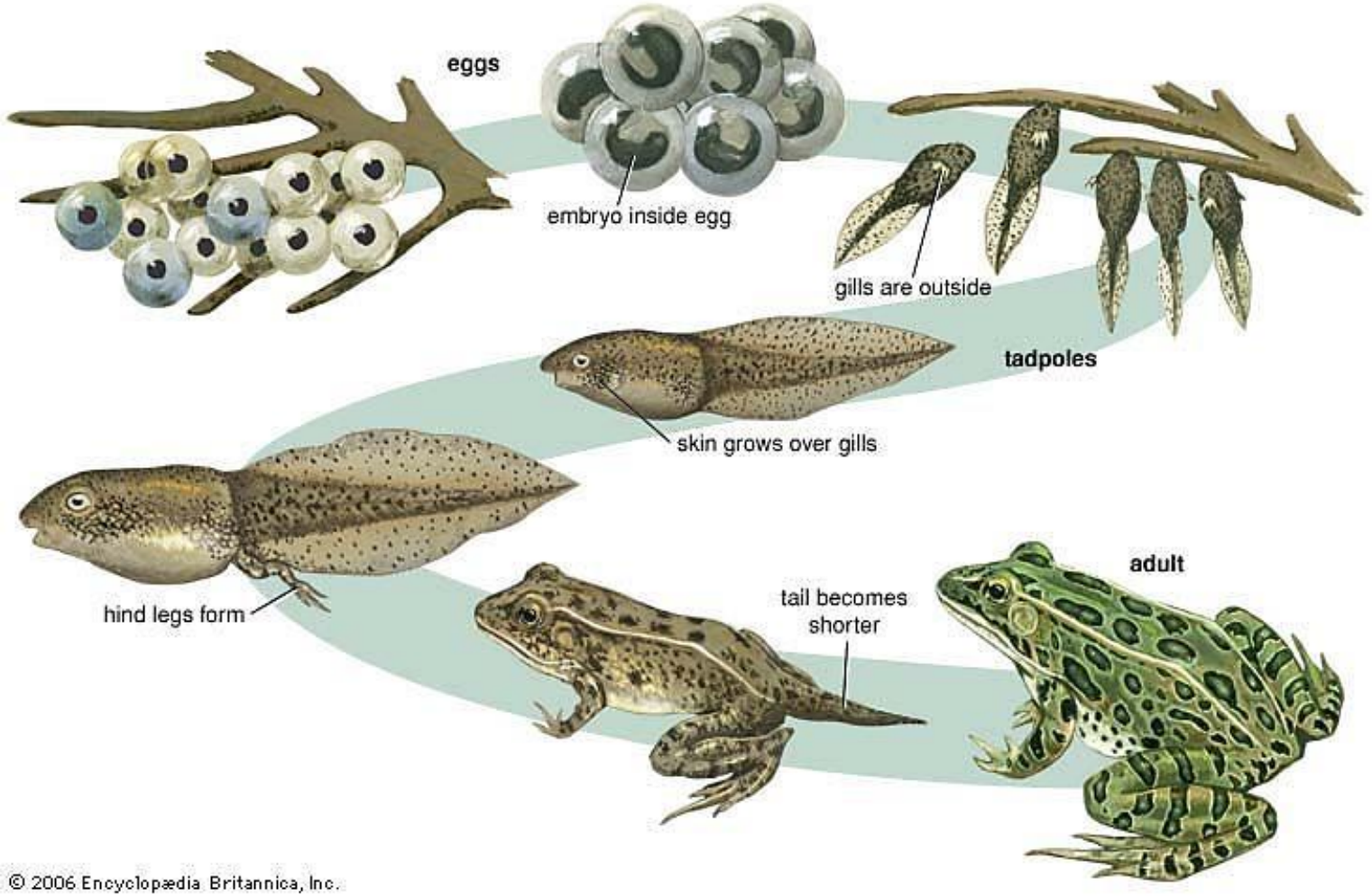
Genomes are extraordinarily complex

- Large number of protein-encoding genes
- Large number of non-protein coding genes
- Wide intergenic spaces
- Repetitive and transposable elements

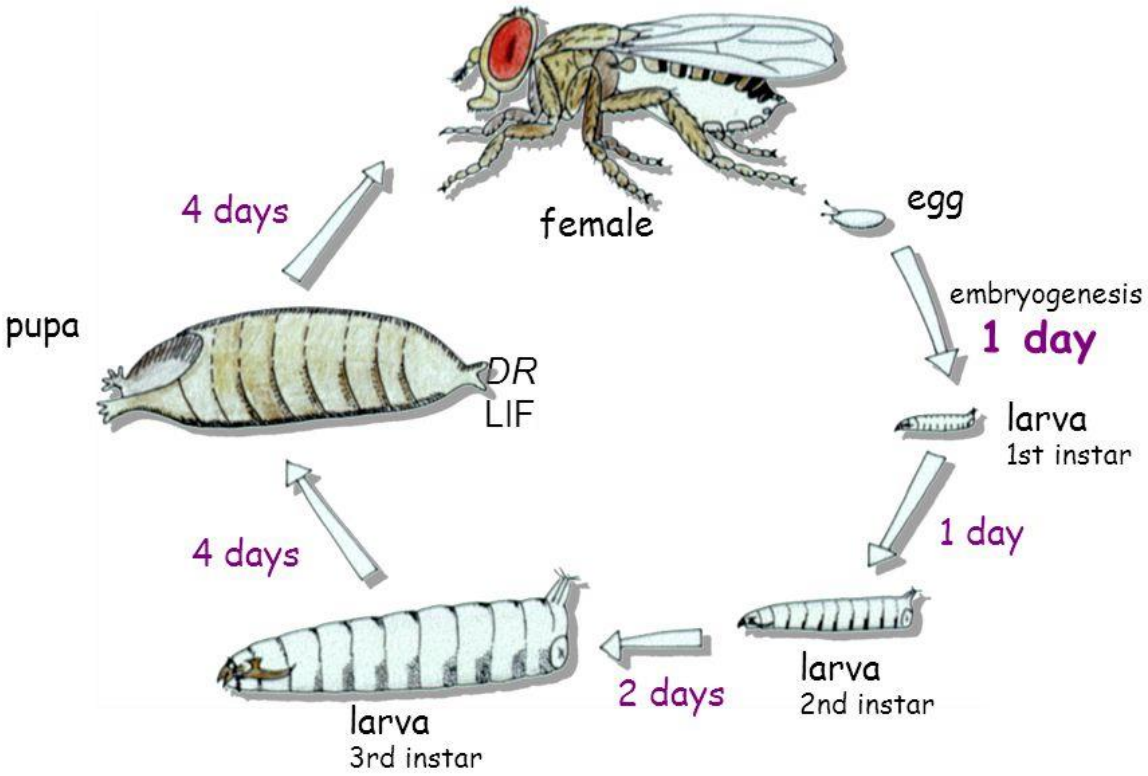
Genomes contain information for all the functions needed by an organism

- Cell division and Development
- Cellular differentiation, tissues organization
- Cell-to-cell communication
- Response to stimuli
- Response to environment
- Death
- …

Examples of the exquisite role of genome regulation are illustrated in embryo development



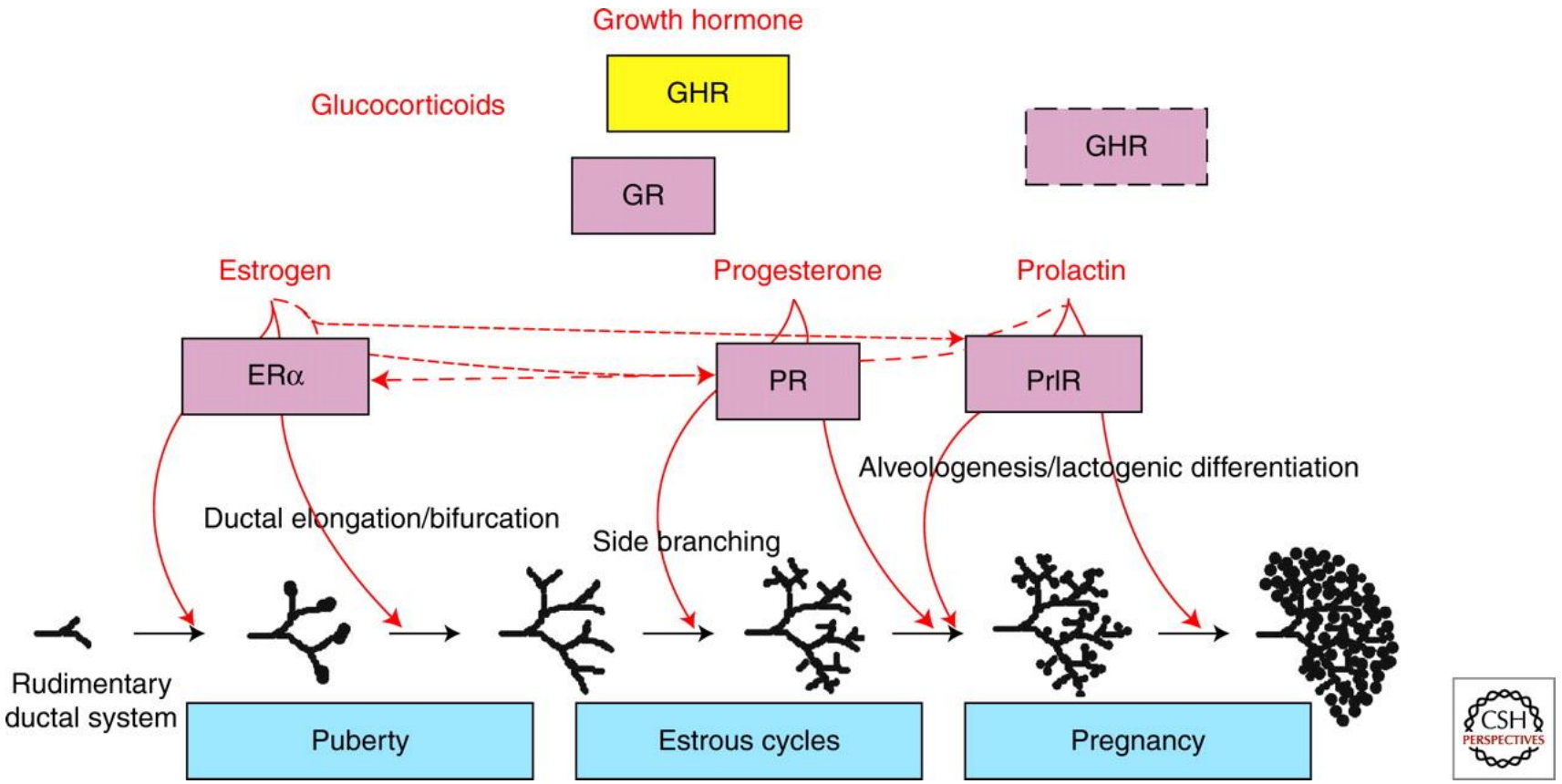
Life cycle of *Drosophila*



butterfly


HHMI

Control of mammary gland development by hormones.



Cathrin Brisken, and Bert O'Malley Cold Spring Harb Perspect Biol 2010;2:a003178

Cells activate timely specific **genetic programs** to give diversified functions.

A genetic program is the sum of gene products necessary to perform a function

We say «**gene expression**» to indicate the fact that the cell contains a functional product encoded by a gene:

- transcription → RNA
- processing and localization
- (translation and post-translation if protein)

The expression of genes is carefully controlled (gene regulation)

In Humans, we know more than 2,500 proteins employed to control gene expression only concerning the level of gene transcription. 10% of our Genome is dedicated to this activity.

The genome **Regulatory Network** is very complex. It is devised to fullfill a number of requirements:

- Which genes ?
- When ?
- How much ?
- For how long ?

How does the Regulatory Network «sense» the needs ?

Regulation of **gene** transcription is a classical theme in Molecular Biology

Studies started as far as in early ‘80s

and great discoveries were made in middle 90’s with the isolation and characterization of Transcription Factors and structural resolution of RNA Polymerase II complex at gene promoters

However, **genome** regulation has been made possible only after NGS technologies were available in 2008-2010.

We start studying genome regulation using a great review article written by Michael Levine and colleagues in 2014 in «Cell», one of the most important journals for Molecular Biology

This will be your first Textboox

Textbook G (where G stands for «general», since the knowledge in it spans most of the course.

Read it thoroughly, try to understand as much as you can.

Then, do **Moodle - Activity 1**

(it will close Wednesday at 9:00 am)

End lesson 0

March 2, 2020
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