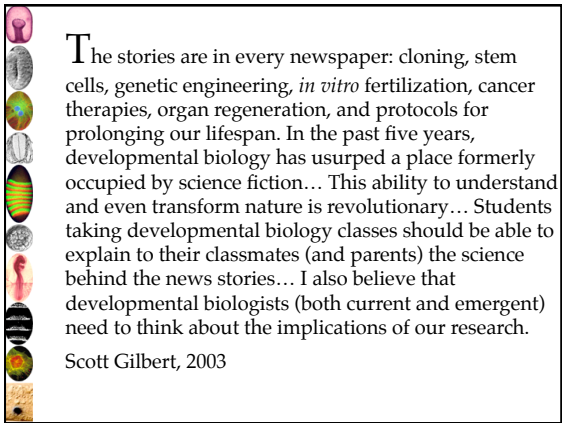


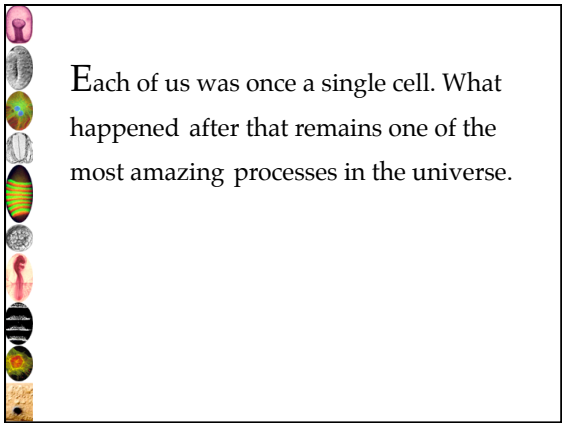
The stories are in every newspaper: cloning, stem cells, genetic engineering, *in vitro* fertilization, cancer therapies, organ regeneration, and protocols for prolonging our lifespan. In the past five years, developmental biology has usurped a place formerly occupied by science fiction… This ability to understand and even transform nature is revolutionary… Students taking developmental biology classes should be able to explain to their classmates (and parents) the science behind the news stories… I also believe that developmental biologists (both current and emergent) need to think about the implications of our research.

Scott Gilbert, 2003

Welcome to

Biology 376
Animal Development

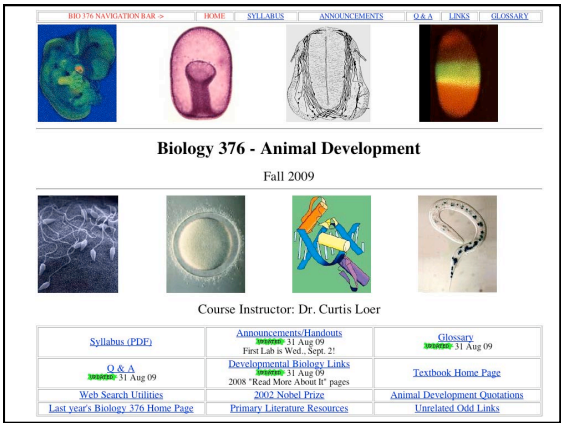
Dr. Curtis Loer
Dept. of Biology
Office: SCST 437
cloer@sandiego.edu
619-260-4129



Each of us was once a single cell. What happened after that remains one of the most amazing processes in the universe.

Review of Syllabus, Course Mechanics

Text: *Developmental Biology*, Gilbert ©2003
(still using 7th edition)



Important reminders:

Lab begins <u>today</u>, Wednesday, Sept. 2
- lab manual and notebook available for purchase in lab today (bring ca$h)
- read first lab and background material
- other lab supplies needed by next week
- quiz on microscopy at end of lab

Office Hours

Mon 2 - 4 PM

Tues 8:30 - 10:30 AM

Thurs 11 - 12 PM

Animal Development Course Organization

1. Phenomena of development
   - what, when and where
2. Mechanisms of development
   - how
3. Special topics
   - in depth focus on specific areas
   a. Nervous system development
   b. Programmed cell death/apoptosis
   c. Cancer biology
   d. Evolution & development "Evo-devo"

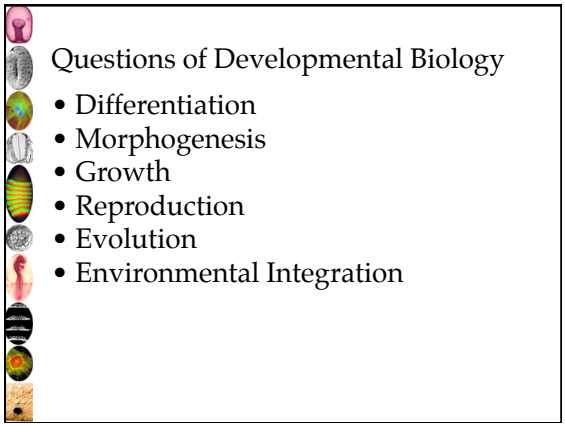
History - who - science is done by real people.

Developmental Biology

- study of life history of organisms

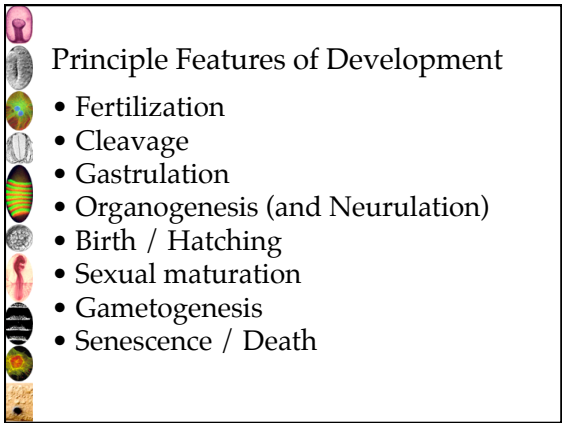
Embryology

- Descriptive embryology
- Comparative embryology
- Experimental embryology



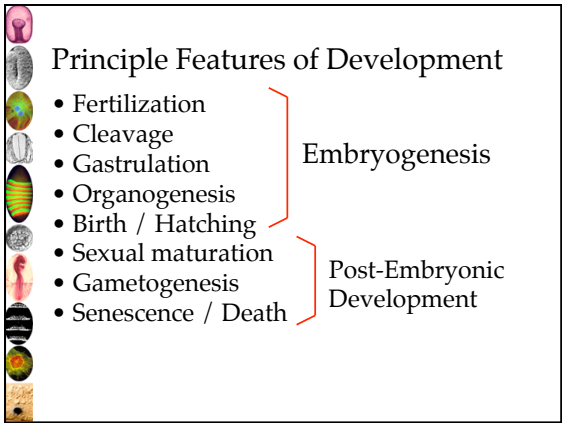
Questions of Developmental Biology

- Differentiation
- Morphogenesis
- Growth
- Reproduction
- Evolution
- Environmental Integration



Principle Features of Development

- Fertilization
- Cleavage
- Gastrulation
- Organogenesis (and Neurulation)
- Birth / Hatching
- Sexual maturation
- Gametogenesis
- Senescence / Death



Principle Features of Development

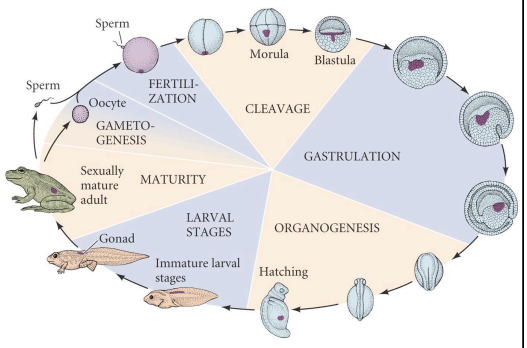
- Fertilization
- Cleavage
- Gastrulation
- Organogenesis
- Birth / Hatching

Embryogenesis

- Sexual maturation
- Gametogenesis
- Senescence / Death

Post-Embryonic Development

Fig 2.1 *Developmental history of the leopard frog,* Rana pipiens.



Principle Features of Development

- Fertilization

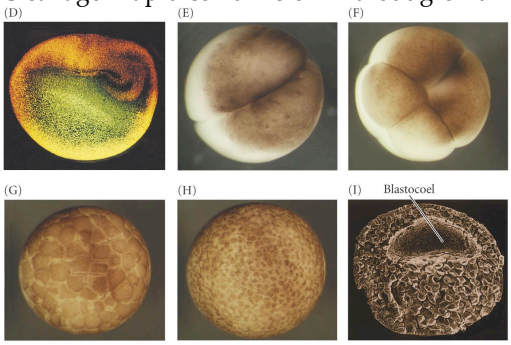
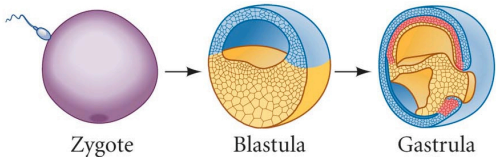


Fig 2.2 *Early development of the frog,* Xenopus laevis.

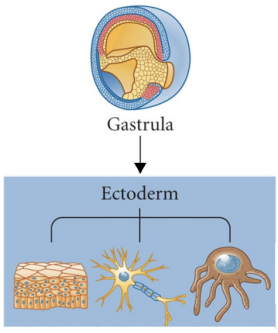
Principle Features of Development

- Fertilization
- Cleavage
- Gastrulation - rearrangement of cells into layers - formation of "primary germ layers"



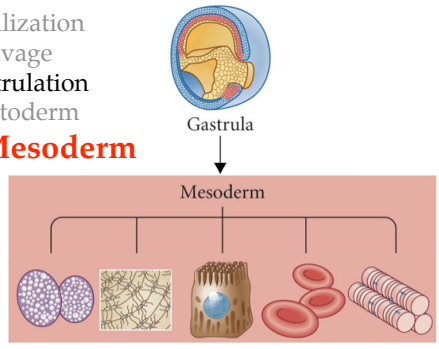
Principle Features of Development

- Fertilization
- Cleavage
- Gastrulation
  - **Ectoderm**



Principle Features of Development

- Fertilization
- Cleavage
- Gastrulation
  - Ectoderm
  - **Mesoderm**



Principle Features of Development

- Fertilization
- Cleavage
- Gastrulation
  - Ectoderm
  - Mesoderm
  - **Endoderm**

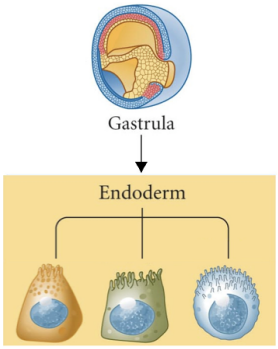
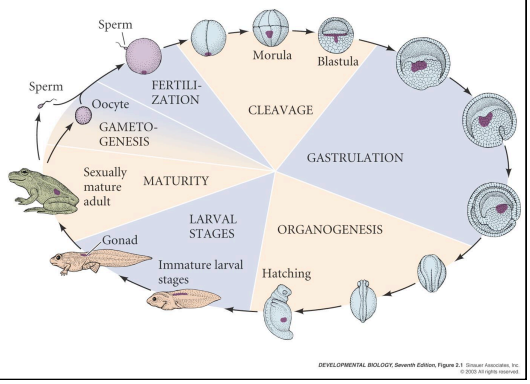


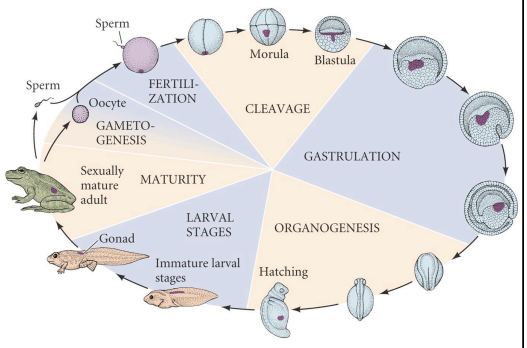
Fig 2.1 *Developmental history of the leopard frog,* Rana pipiens.



Principle Features of Development

- Fertilization
- Cleavage
- Gastrulation
- Organogenesis - in the vertebrates, this includes Neurulation

Fig 2.1 *Developmental history of the leopard frog,* Rana pipiens.



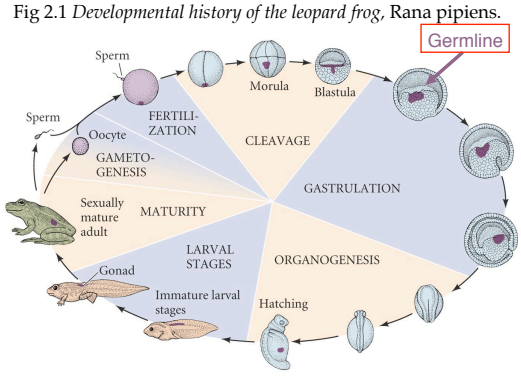
Principle Features of Development

- Fertilization
- Cleavage
- Gastrulation
- Organogenesis
- Birth / Hatching

Principle Features of Development

- Fertilization
- Cleavage
- Gastrulation
- Organogenesis
- Birth / Hatching
- Maturation and Gametogenesis
- Aging / Senescence

Fig 2.1 *Developmental history of the leopard frog,* Rana pipiens.



Separation between soma & germline

Fertilization (via Germline)

Soma Germline

Death Gametes

Fertilization

Soma Germline

Death Fertilization

Soma Germline

Soma: body cells

Germline: gametes

Separation between soma & germline

Fertilization (via Germline)

Soma Germline

Death

Soma Germline

Death

Soma Germline

Death

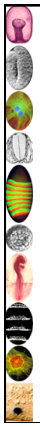
Soma Germline

Death

Mortal

Immortal

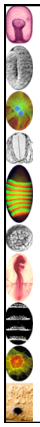
The process
is repeated



The core concept of Development:

Differential Gene Regulation
& Genomic Equivalence

All cells have the same genes (genomic equivalence), but each cell turns on a specific subset of those genes (differential gene regulation).



The core concept of Development:
Differential Gene Regulation
& Genomic Equivalence

All cells have the same genes, but each turns on a specific subset of the genome.

Levels of Gene Regulation:
- Transcription
- RNA processing, stability
- Translation
- Post-translational modification