

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

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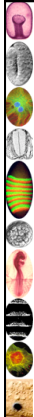
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Welcome to  
**Biology 376**  
**Animal Development**  
Dr. Curtis Loer  
Dept. of Biology  
Office: SCST 437  
cloer@sandiego.edu  
619-260-4129

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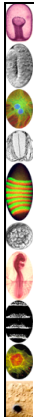
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Each of us was once a single cell. What happened after that remains one of the most amazing processes in the universe.

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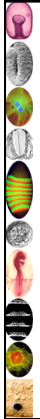
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Review of Syllabus, Course Mechanics

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

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BIO 376 NAVIGATOR BAR > HOME SYLLABUS ANNOUNCEMENTS Q&A LINKS GLOSSARY



**Biology 376 - Animal Development**  
Fall 2009



Course Instructor: Dr. Curtis Loer

<a href="#">Syllabus (PDF)</a>	<a href="#">Announcements/Handouts</a> 31 Aug 09 First Lab is Wed., Sept. 2!	<a href="#">Glossary</a> 31 Aug 09
<a href="#">Q &amp; A</a> 31 Aug 09	<a href="#">Developmental Biology Links</a> 31 Aug 09 2008 "Read More About It" pages	<a href="#">Textbook Home Page</a>
<a href="#">Web Search Utilities</a>	<a href="#">2002 Nobel Prize</a>	<a href="#">Animal Development Questions</a>
<a href="#">Last year's Biology 376 Home Page</a>	<a href="#">Primary Literature Resources</a>	<a href="#">Unrelated Odd Links</a>

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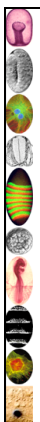
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Important reminders:

Lab begins today, 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

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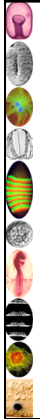
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**Office Hours**

Mon 2 - 4 PM  
Tues 8:30 - 10:30 AM  
Thurs 11 - 12 PM

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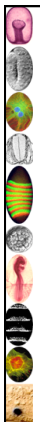
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**Animal Development Course Organization**

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.

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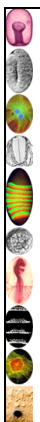
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**Developmental Biology**  
- study of life history of organisms

**Embryology**

- Descriptive embryology
- Comparative embryology
- Experimental embryology

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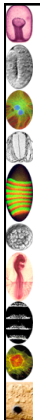
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Questions of Developmental Biology

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

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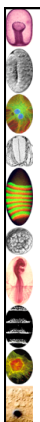
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Principle Features of Development

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

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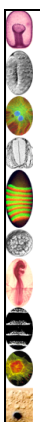
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Principle Features of Development

- Fertilization
- Cleavage
- Gastrulation
- Organogenesis
- Birth / Hatching
- Sexual maturation
- Gametogenesis
- Senescence / Death

Embryogenesis

Post-Embryonic Development

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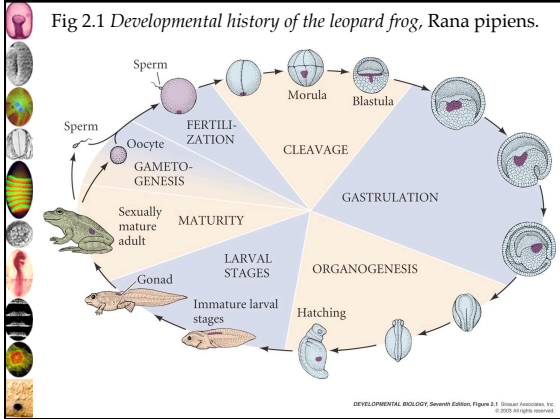
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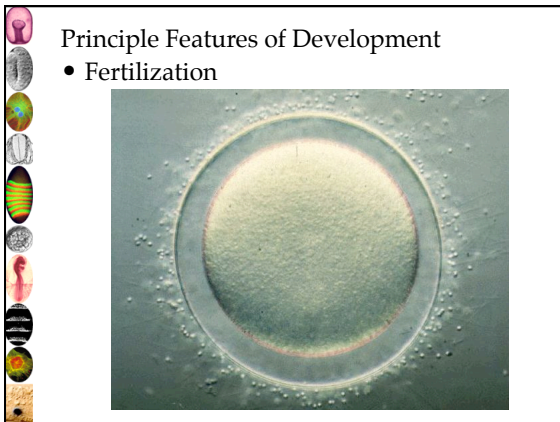
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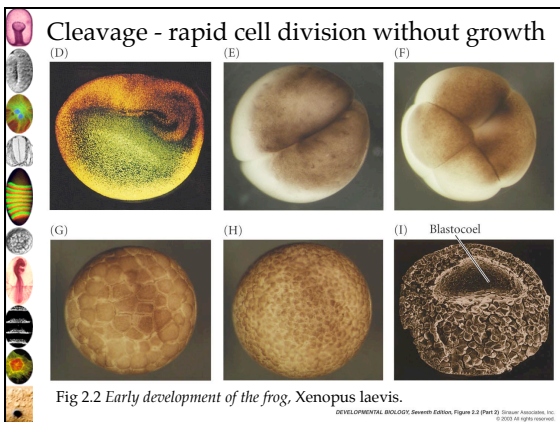
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**Principle Features of Development**

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

Zygote      Blastula      Gastrula

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**Principle Features of Development**

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

Gastrula  
↓  
Ectoderm

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**Principle Features of Development**

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

Gastrula  
↓  
Mesoderm

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**Principle Features of Development**

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

The diagram illustrates the process of gastrulation. At the top, a cross-section of a gastrula is shown with its internal structure. An arrow points down to the word "Endoderm". Below "Endoderm", three arrows branch out to three different types of cells, representing the differentiation of the endoderm into various tissues.

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

The diagram is a circular flowchart showing the life cycle of a leopard frog. It starts with "Sexually mature adult" at the top left, leading to "Gonad" and "GAMETOGENESIS" (Sperm and Oocyte). This is followed by "FERTILIZATION" (Sperm and Oocyte), "CLEAVAGE" (Morula and Blastula), "GASTRULATION", "ORGANOGENESIS", "Hatching", "Immature larval stages", "LARVAL STAGES", and finally "Maturity".

DEVELOPMENTAL BIOLOGY, Seventh Edition, Figure 2.1 © Garland Science, Inc. © 2003 All rights reserved.

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**Principle Features of Development**

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

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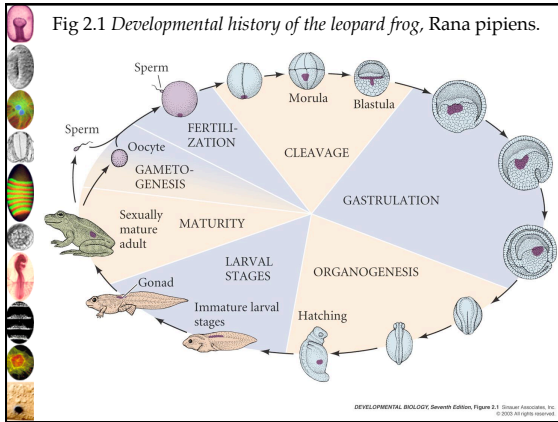
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**Principle Features of Development**

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

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**Principle Features of Development**

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

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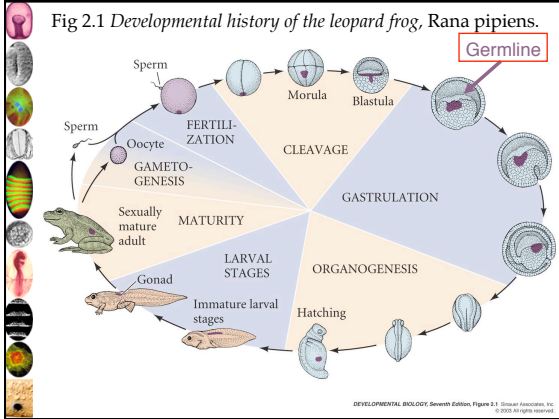
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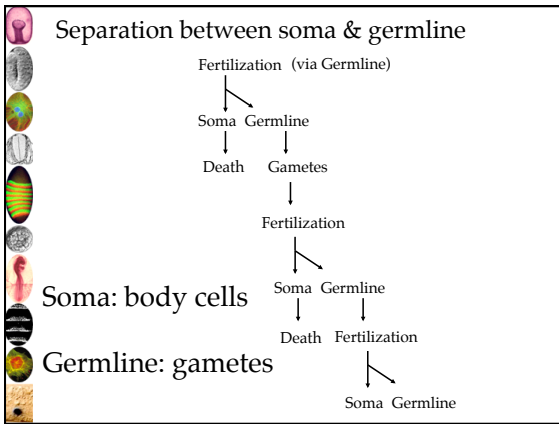
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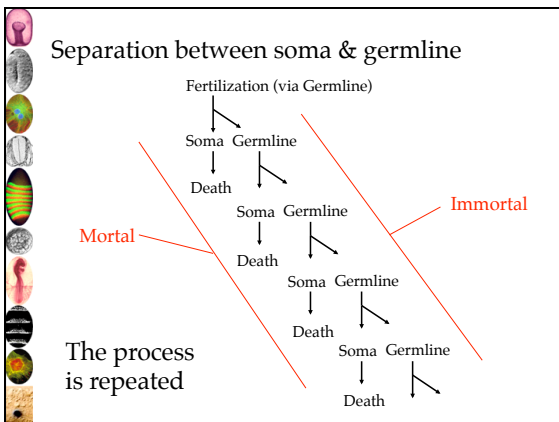
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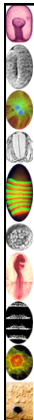
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The core concept of Development:  
Differential Gene Regulation  
& Genomic Equivalence

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

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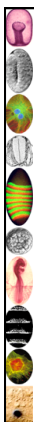
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The core concept of Development:  
Differential Gene Regulation  
& Genomic Equivalence

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

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