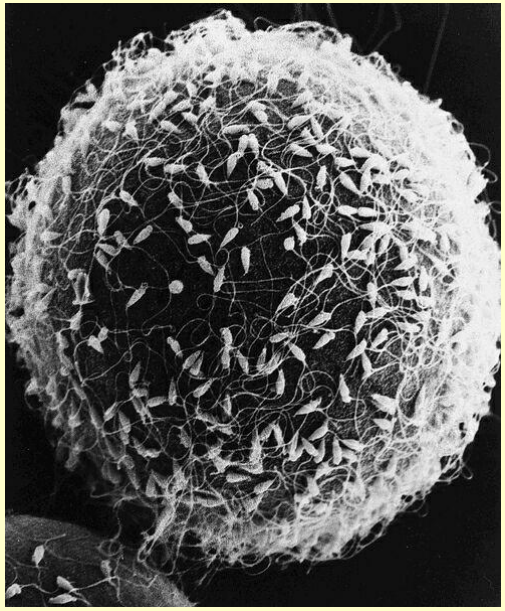
Bio 22: Developmental Biology
Background

- Embryology
  - Animals
  - Vertebrates
  - Anatomy
    - Aristotle to late 19th century
  - Experimental embryology
    - From 1880s

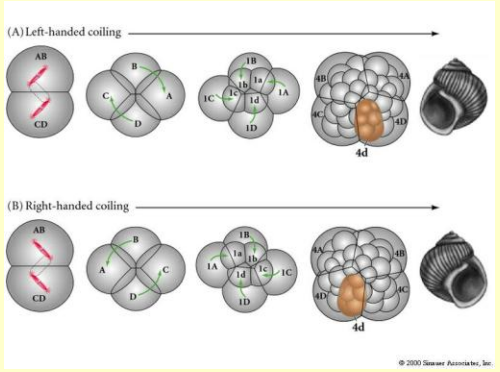


Developmental Biology

- Includes embryology
  - Adults
  - Plants
  - Unicellular organisms
  - New syntheses with evolution, molecular biology
  - Advances in molecular developmental genetics
    - Genetic homologies of developmentally important genes
  - Advances in cell signaling pathways
    - How do cells communicate?

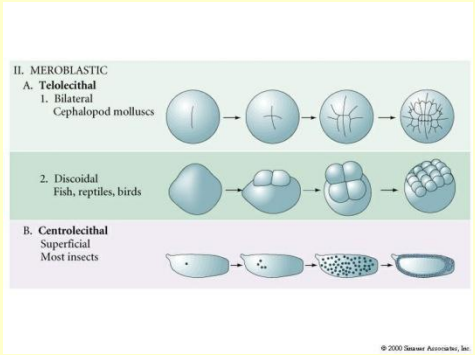
Characteristics and Concerns

- Changes with time on life scale not evolutionary scale
- Changes in form and function
  - Morphology
    - The other 3 dimensions
    - Getting right structures made in the right places
  - Biochemistry
    - Cell diversity is due to differences in proteins not DNA
- Eclectic: draws from most other biological fields



Questions to Consider

- How does a single cell lead to hundreds of different cell types?



- How can cells of organisms form ordered tissues and organs?
- How is cell division controlled?
- How do gametes transmit all information necessary for a new organism?
- How do developmental changes lead to evolutionary changes?

We Will See

- Different solutions to same problems
- Different problems solved by conserved underlying mechanisms

Mechanics: Lectures

- Facts
  - Variety of organisms
  - Distinguish
- Experiments
  - All “facts” are interpretations of observations and experiments
- Generalizations
  - How general are the ideas and can they be extended and tested?
  - Choice of right question put in a testable form
- Please ask questions
- Full notes available on CMS *after* lecture

Mechanics: Grades

- Three hour exams (one during finals)
  - Review session before each
  - Lectures are important
  - Book to supplement material in lectures
  - Some outside reading
- And anatomy exam
    - Based on 6 Wednesday lectures
    - In Merrill 220
    - = 10%
- Please check schedule carefully

DEVO BIO 22 (2011) LECTURE SCHEDULE POCCIA

DATE	LECTURE	TOPIC
Sep 7	1	Introduction
Sep 9, 12, 14	2-4	Gametogenesis
Sep 16, 19	5-6	Fertilization
Sep 21, 23, 26, 28	7-10	Early Invertebrate Development
Sep 30 Oct 3	11-12	Cell Specification
Oct 5, 7, 12	13-15	Communication and Signaling
Oct 10	FALL BREAK	
Oct 19, 21, 24	16-18	Axis Specification in Drosophila
Oct 26, 28, 31	19-21	Axis Formation in Amphibians
Nov 2, 4, 7	22-24	Early Development of Vertebrates
Nov 9		No class
Nov 16, 18, 28	25-27	Tetrapod Limb/Regeneration
Nov 19-27	THANKSGIVING BREAK	
Nov 30, Dec 2	28-29	Sex Determination
Dec 5, 7	30-31	Germ Cell Determination
Dec 9, 12, 14	32-34	Evo-Devo

EXAMS & REVIEW SESSIONS

Review Session	Oct 14	
Hour Exam I	Oct 17	Lectures 1-12
Review Session	Nov 11	
Hour Exam II	Nov 14	Lectures 13-21
Review Session	Dec 14	(1 pm)
Hour Exam III	**E**xam Week	Lectures 22-34

WEDNESDAY 1 PM SCHEDULE

Oct 19	Vertebrate Developmental Anatomy: Ectodermal Derivatives (brain, CNS, sense organs)
Oct 26	Vertebrate Developmental Anatomy: Ectodermal Derivatives (neural crest)
Nov 2	Vertebrate Developmental Anatomy: Ectodermal Derivatives (somatic, autonomic, epidermis)
Nov 9	Vertebrate Developmental Anatomy: Mesodermal Derivatives (somites, lateral plate)
Nov 16	Vertebrate Developmental Anatomy: Mesodermal Derivatives (muscle, circulation, kidney)
Nov 30	Vertebrate Developmental Anatomy: Endodermal Derivatives and Extraembryonic Structures
Dec 7	Vertebrate Developmental Anatomy Quiz
Dec 14	Review session

N.B. This schedule (updated) is available on http://www.amherst.edu/~dlpoccia or CMS website.
Textbook web page is on http://9e.devbio.com/

TEXTBOOK READING ASSIGNMENTS

Developmental Biology 9th Ed, S. Gilbert.

TOPIC	9th ed. PAGES
Introduction	Browse Chap. 1 and 2
Gametogenesis	600-613
Fertilization	Chap. 4
Early Invertebrate Development	Chap. 5
Mechanisms of Cell Specification	109-119
Communication and Signaling	Chap. 3
Axis Specification in *Drosophila*	Chap. 6
Axis Formation in Amphibians	Chap. 7
Early Development of Vertebrates	Chap. 8
The Tetrapod Limb	Chap. 13
Regeneration	560-579
Sex and Germ Cell Determination	Chap. 14, 583-598
Evo-Devo	Chap. 19

Required to read those sections relevant to lectures. Rest is optional.
Lecture notes will be posted online *after* lectures.
Three exams worth 90%. Vertebrate anatomy quiz 10%.
Look at website http://9e.devbio.com/ and www.devbio.com and CD-ROM *Vade Mecum* for lots of interesting stuff!

3D and Time Lapse

- 3D reconstruction of early worm embryo (*Cerebratulus*)
  - Orange microtubules
  - Blue microfilaments
- Development of the chordate *Corella* (ascidian)