

Developmental Biology: 303-34500**Early development: How to make a body**

		<u>readings</u>	
1	Jan 23	Course introduction	3-5
		<i>Video: Making Babies</i>	
	Jan 25	Fertilization: sperm meets egg	175-86
2	Jan 28	Fertilization: blocks to polyspermy, egg activation	187-95, 198
	Jan 30	Fertilization: mammalian fertilization	199-207, <i>Wassarman, Primakoff</i>
		<i>Discussion: In vitro fertilization</i>	<i>Mestel, Ryan, Kolata 1, Hall, Weiss</i>
	Feb 1	Overview of cleavage and gastrulation	211-17
		Echinoderm cleavage and gastrulation	217-18, 223-29
3	Feb 4	Amphibian cleavage and gastrulation	26-31, 291-302, 10-13
	Feb 6	Amniote cleavage and gastrulation: birds	336-42
		<i>Demonstration: Sea Urchin Gametes and Fertilization</i>	
	Feb 8	Amniote cleavage and gastrulation: mammals	348-53
		Maternal effects: snail cleavage	229-32
4	Feb 11	Neurulation and neural crest	373-83, 407-18, folic acid handouts
	Feb 13	Mesoderm and endoderm derivatives	443-53, 460-62, 471-72, 493-96
		<i>Demonstration: Xenopus development</i>	
	Feb 15	Quiz #1	
		Extraembryonic membranes, diversity	354-55, 501-03, 42-46
5	Feb 18	Overview of human development	348-55, 356-57, 374-82, 391-93, <i>GTZ ch 1</i>

Control of Gene Expression

	Feb 20	Genomic equivalence: cloning	77-84, 85-86, <i>McLaren</i>
		<i>Exam Review</i>	
	Feb 22	Exam #1 (through Feb 18)	
6	Feb 25	Control of gene expression, transcriptional control	86-92, 101-13
	Feb 27	Gene imprinting	207, 116-19
		<i>Discussion: egg and sperm donation</i>	<i>Cohen, Cleary, Harmon (1,2), Kolata 2</i>
	Feb 29	RNA processing, translational & post-translational control	125-37
7	Mar 3	Assays for gene function in development	92-98, <i>Capecchi</i>

Cell Determination: Asymmetric cell division and Induction

	Mar 5	Cell specification: autonomous & conditional	53-56, 57-62
		<i>Discussion: pre-implantation genetic diagnosis</i>	<i>Kolata 3, Belkin 1, Grady 1, Towner, Sanghavi</i>
	Mar 7	Asymmetric cell division: tunicates, molluscs	232-37, 237-41, <i>Pourquie, Nishida</i>
--	Mar 10-14	Spring Break: no class	<i>Maeder</i>
8	Mar 17	Embryonic induction, Cell signaling	305, 139-46, (147-71)

	Mar 19	Induction II: Morphogens, gradients <i>Demonstration: Chicken Embryo Cultures</i>	63-6, 383-85
Model systems			
	Mar 21	<i>C. elegans</i> development I	243-50
9	Mar 24	<i>C. elegans</i> development II	243-50, <i>Bargmann</i>
	Mar 26	<i>Drosophila 1</i> : early development; pattern genes <i>Exam Review</i>	253-59
	Mar 28	Exam #2 (through March 21)	
10	Mar 31	<i>Drosophila 2</i> : A-P polarity, <i>bicoid</i> , <i>nanos</i>	258-59, 266-81, <i>Nusslein</i>
	Apr 2	<i>Drosophila 3</i> : segmentation genes <i>Discussion: sex selection</i> <i>background: GTZ chapt 5, 6</i>	266-81 <i>Grady 2, Belkin 2, Goldberg</i>
	Apr 4	<i>Drosophila 4</i> : homeotic genes, D-V patterning	283-86, 263-66, <i>McGinnis</i>
11	Apr 7	Human embryonic stem cells	66-67, 684-91, <i>Wright, Zaehres</i>
	Apr 9	<i>Xenopus</i> : axis determ'n, germ layer formation <i>Discussion: cloning</i> <i>background: GTZ chapt 7, 8</i>	302-11 <i>Wilmut, McLaren, Shin, Kass</i>
	Apr 11	<i>Xenopus</i> : organizer	312-22
12	Apr 14	<i>Xenopus</i> : neural induction and development	312-22
	Apr 16	Vertebrate <i>Hox</i> genes <i>Discussion: embryonic stem cells</i> <i>background: GTZ chapt 9, 10</i>	358-64, <i>DeRobertis 1</i> <i>Cibelli, Dunn</i>
	Apr 18	Evolutionary conservation of D-V patterning	317, 726-29, 730-31, <i>DeRobertis 2</i>
13	Apr 21	Quiz #2	
		Limb development	505-19, 522-23, <i>Riddle</i>
	Apr 23	Sex Determination <i>Discussion: open</i>	529-42, 550-52
	Apr 25	Evolution and Development: Darwin's finches	737, <i>Yoon, Pennisi</i>
Student Presentations			
14	Apr 28	Evolution and development: sticklebacks, cavefish	15-17
	Apr 30	Student Presentations (3) <i>Course evaluations</i>	
	May 2	Student Presentations (3)	
15	May 5	Student Presentations (3)	
Finals		Final Presentations (6): Tues May 6, 4:30 pm	

Wednesday Schedule

Jan 23	<i>Video: Making Babies</i>	
Jan 30	<i>Discussion: in vitro fertilization</i>	<i>Mestel, Ryan, Kolata 1, Hall, Weiss</i>
Feb 6	<i>Demonstration: Sea Urchin Gametes and Fertilization</i>	
Feb 13	<i>Demonstration: Xenopus development</i>	
Feb 20	<i>Exam Review</i>	
Feb 27	<i>Discussion: egg and sperm donation</i> <i>background: GTZ chapt 3, 4</i>	<i>Cohen, Cleary, Harmon(2), Kolata 2</i>
Mar 5	<i>Discussion: pre-implantation genetic diagnosis</i>	<i>Kolata 3, Belkin 1, Grady 1, Towner, Sanghavi</i>
Mar 12	<i>Spring Break</i>	<i>Maeder</i>
Mar 19	<i>Demonstration: Chicken Embryo Cultures</i>	
Mar 26	<i>Exam Review</i>	
Apr 2	<i>Discussion: sex selection</i> <i>background: GTZ chapt 5, 6</i>	<i>Grady 2, Belkin 2, Goldberg</i>
Apr 9	<i>Discussion: cloning</i> <i>background: GTZ chapt 7, 8</i>	<i>Wilmut, McLaren, Shin, Kass</i>
Apr 16	<i>Discussion: embryonic stem cells</i> <i>background: GTZ chapt 9, 10</i>	<i>Cibelli, Dunn</i>
Apr 23	<i>Discussion- to be determined*</i>	
Apr 30	<i>Course evaluations</i>	

*possible topics:

- IVF: defects, age issues
- stem cells: human-animal chimeras
- gene therapy & gene doping
- germ-line genetic modification
- other issues that may arise

Articles for lectures:

- Wassarman et al. A profile of fertilization in mammals. *Nature Cell Biol.* 3, E59 (2001).
- Primakoff P and Myles DG. Penetration, adhesion and fusion in mammalian sperm-egg interaction. *Science* 296, 2183-5 (2002).
- McLaren A: Cloning: Pathways to a Pluripotent Future. *Science* 288, 1775-80, 2000.
- Capecchi M: Targeted Gene Replacement. *Scientific American*, March 1994.
- Maeder T: A few hundred people turned to bone. *Atlantic Monthly* February 1998.
- Pourquoié O: A macho way to make muscles. *Nature* (news & views) 409, 679-80, 2001.
- Nishida H and Sawada K. *macho-1* encodes a localized mRNA in ascidian eggs that specifies muscle fate during embryogenesis. *Nature* 409, 724-729, 2001.
- Bargmann C and Hodgkin J: Accolade for *elegans*. *Cell* 111, 759-762, 2002.
- Nüsslein-Vollhard C: Gradients that Organize Embryo Development. *Sci Amer*, Aug 1996.
- McGinnis W and Kuziora M: The Molecular Architects of Body Design. *Sci. Am.* Feb. 1994.
- Wright S. Human Embryonic Stem Cell Research: Science and Ethics. *Amer.Scientist* 87, 352, 1999.
- Zaehres H & Schöler HR: Induction of pluripotency: from mouse to human. *Cell* 131, 834-35. (2007)
- DeRobertis EM et al: Homeobox genes and the Vertebrate Body Plan. *Sci Am* 1990
- DeRobertis E, Sasai Y. A common plan for dorsoventral patterning in bilateria. *Nature* 380, 37 (1996)
- Riddle RD and Tabin CJ: How limbs develop. *Scientific American*, February 1999.
- Yoon CK: From a few genes, life's myriad shapes. *NY Times* 6/26/2007.
- Pennisi E: Bonemaking protein shapes beaks of Darwin's finches. *Science* 305, 1383 (2004)
- Izpisua-Belmonte JC: How the Body Tells Right from Left. *Scientific American* June 1999
- Essner J et al: Conserved function for embryonic nodal cilia. *Nature* 418, 37-8 (2002).

Articles for discussions:

- Mestel R. Birth by test tube turns 25. *Los Angeles Times* 7/25/03
- Ryan M. Countdown to a Baby. *The New Yorker*, July 1, 2002.
- Kolata G. (1) Medicine's Troubling Bonus: Surplus of Human Embryos. *NY Times* 3/16/97
- Hall CT. The forgotten embryo. *San Francisco Chronicle* 8/20/01.
- Weiss R. 400,000 human embryos frozen in US. *Washington Post* 5/8/03
- Cohen J. Grade A: The market for a Yale woman's eggs. *Atlantic Monthly* December 2002.
- Cleary C. Altruism, money motivate egg donors.... *Seattle Times* 11/4/02
- Harmon A. (1) Hello, I'm your sister. Our father is donor 150. *NY Times* 11/21/05.
- Harmon A. (2) Sperm Donor Father Ends His Anonymity. *NY Times* 2/14/07
- Kolata G. (2) Psst! Ask for Donor 1913. *NY Times* 2/18/07
- Kolata G. (3) Genetic defects detected in embryos just days old. *NY Times* 9/24/1992
- Belkin L. (1) The Made-to-Order Savior. *NY Times Magazine* July 1, 2001.
- Grady D. (1) Baby spared mother's fate after by genetic tests as embryo. *NY Times* 2/27/2002.
- Towner D. and Loewy RS. Ethics of preimplantation diagnosis for a woman destined to develop early-onset Alzheimer Disease. *J. American Medical Assoc.* 287, 1038-40 (2002).
- Sanghavi DM Wanting babies like themselves, some parents choose genetic defects. *NY Times* 12/5/06
- Grady D. (2) Girl or Boy? As fertility technology advances, so does an ethical debate. *NY Times* 2/6/07
- Belkin L. (2) Getting the Girl. *NY Times Magazine*, July 25, 1999
- Goldberg C. Test reveals gender early in pregnancy. *Boston Globe* 8/26/05
- Wilmut I et al. Somatic cell nuclear transfer. *Nature* 419, 583-86, 2002.
- Shin T et al.. A cat cloned by nuclear transplantation. *Nature* 415, 859, 2002.
- Kass LR: The wisdom of repugnance. *The New Republic* June 2, 1997.
- Cibelli JB et al. The First Human Cloned Embryo. *Scientific American* 286, 44-51 (2002)
- Dunn K. Cloning Trevor. *Atlantic Monthly* June 2002.
- Kolata G. Scientists brace for changes in path of human evolution. *NY Times* March 21, 1998.
- Wivel N and Walters L. Germ-line gene modification and disease prevention: some medical and ethical perspectives. *Science* 262, 533-38, 1993.