

Lecture - 2014 Course Introduction

From Embryology

Contents

Course Introduction



This first lecture will be a general introduction to the course and the subject of Embryology.

Firstly, an introduction to the course, its content, method of presentation, assessment and an opportunity to ask questions.

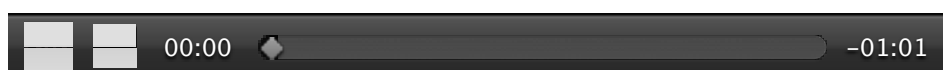
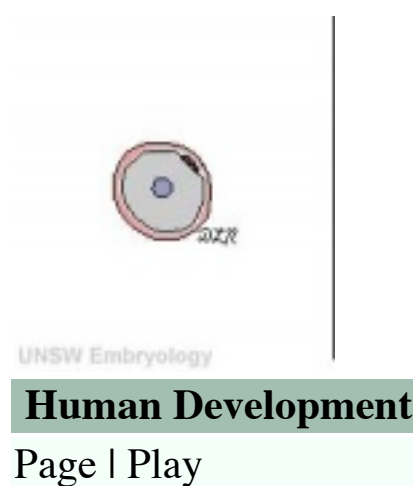
Secondly, some historic background to the subject and related current Australian trends. I do not expect you to remember specific historic dates or statistical data, this is provided as an introduction to the topic.

I like my lectures to be interactive, so ask me questions and I will also be asking you questions!

Course coordinator

Lecture Objectives

1. Understand the course objectives and assessment.
2. Brief understanding of the historic background of embryology.
3. Brief understanding of Australian data.
4. Broad overview of human development.



[Click Here](#) to play on mobile device

ANAT2341 Course Outline

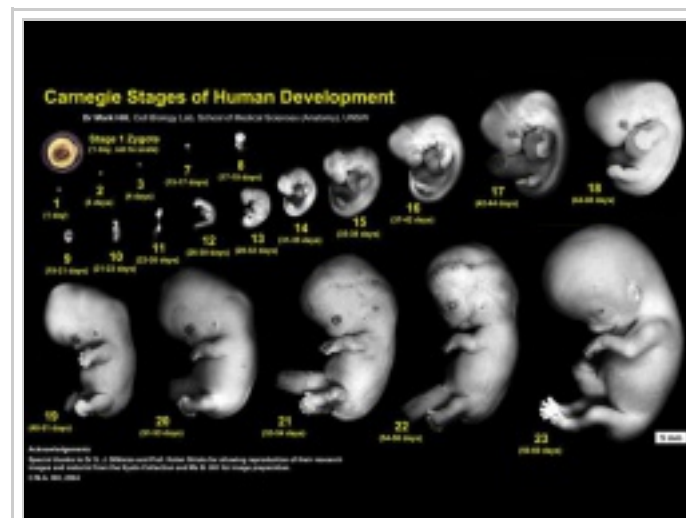
I will spend the first half going through the current course design, online support and assessment criteria. This is an opportunity to ask the coordinator questions about the course.

Course Links: Homepage | Overview | Timetable | Moodle
(<http://moodle.telt.unsw.edu.au/course/view.php?id=9262>)

Email me ([Mailto:m.hill@unsw.edu.au](mailto:m.hill@unsw.edu.au)) for any additional information or to make an appointment.

Textbooks

- Either of the textbooks listed below are recommended for this course and page references to both are given in each lecture.
- Both textbooks available at campus bookshop and online to UNSW students.
- There are additional embryology textbooks that can also be used, consult course organizer.

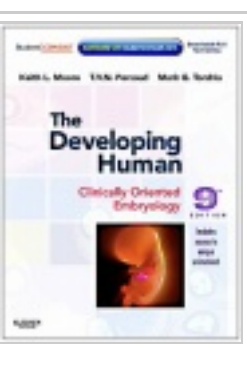


Human embryonic development (week 1 to 8)

UNSW Students: The following chapter links connect directly with a UNSW library connection, external computer access will require ZPass log-in. These links will not function for external users.

Citation: Moore, K.L., Persaud, T.V.N. & Torchia, M.G. (2011). *The developing human: clinically oriented embryology* (9th ed.). Philadelphia: Saunders.

Links: Embryology Textbooks | UNSW Library (<http://www.library.unsw.edu.au>)

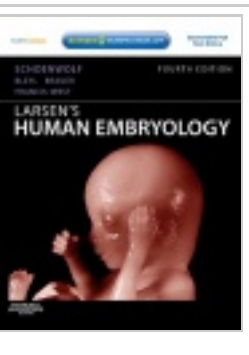


1. Introduction to the Developing Human (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00001-1&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00001-1>)
2. First Week of Human Development (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00002-3&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00002-3>)
3. Second Week of Human Development (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00003-5&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00003-5>)
4. Third Week of Human Development (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00004-7&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00004-7>)
5. Fourth to Eighth Weeks of Human Development (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00005-9&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00005-9>)
6. Ninth Week to Birth: The Fetal Period (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00006-0&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00006-0>)
7. Placenta and Fetal Membranes (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00007-2&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00007-2>)
8. Body Cavities and Diaphragm (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00008-4&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00008-4>)
9. Pharyngeal Apparatus, Face, and Neck (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00009-6&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00009-6>)
10. Respiratory System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00010-2&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00010-2>)
11. Alimentary System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00011-4&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00011-4>)
12. Urogenital System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00012-6&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00012-6>)
13. Cardiovascular System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00013-8&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00013-8>)
14. Skeletal System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00014-X&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00014-X>)
15. Muscular System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00015-1&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00015-1>)
16. Development of Limbs (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00016-3&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00016-3>)
17. Nervous System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00017-5&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00017-5>)
18. Development of Eyes and Ears (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00018-7&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00018-7>)
19. Integumentary System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00019-9&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00019-9>)
20. Human Birth Defects (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00020-5&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00020-5>)
21. Common Signaling Pathways Used During Development (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00021-7&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00021-7>)
22. Appendix : Discussion of Clinically Oriented Problems (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/page.do?eid=4-u1.0-B978-1-4377-2002-0..00030-8&isbn=978-1-4377-2002-0&uniqId=330028653-2#4-u1.0-B978-1-4377-2002-0..00030-8>)

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Citation: Schoenwolf, G.C., Bleyl, S.B., Brauer, P.R. & Francis-West, P.H. (2009). *Larsen's human embryology* (4th ed.). New York; Edinburgh: Churchill Livingstone.

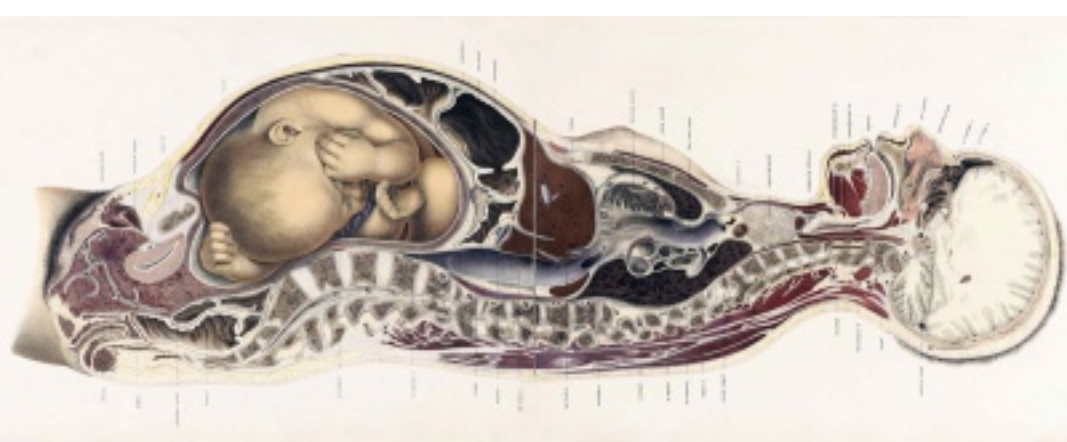
Links: Embryology Textbooks | UNSW Library (<http://www.library.unsw.edu.au>)



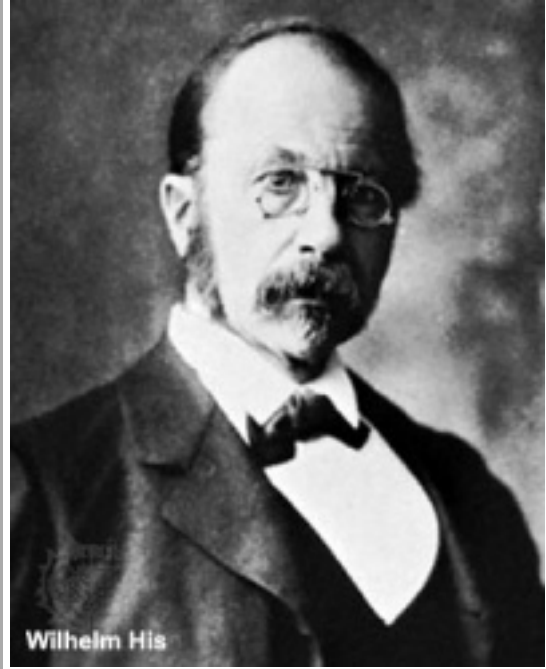
1. Gametogenesis, Fertilization, and First Week (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10001-6>)
2. Second Week: Becoming Bilaminar and Fully Implanting (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10002-8>)
3. Third Week: Becoming Trilaminar and Establishing Body Axes (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10003-X>)
4. Fourth Week: Forming the Embryo (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10004-1>)
5. Principles and Mechanisms of Morphogenesis and Dymorphogenesis (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10005-3>)
6. Fetal Development and the Fetus as Patient (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10006-5>)
7. Development of the Skin and Its Derivatives (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10007-7>)
8. Development of the Musculoskeletal System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10008-9>)
9. Development of the Central Nervous System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10009-0>)
10. Development of the Peripheral Nervous System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10010-7>)
11. Development of the Respiratory System and Body Cavities (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10011-9>)
12. Development of the Heart (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10012-0>)
13. Development of the Vasculature (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10013-2>)
14. Development of the Gastrointestinal Tract (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10014-4>)
15. Development of the Urogenital System (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10015-6>)
16. Development of the Pharyngeal Apparatus and Face (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10016-8>)
17. Development of the Ears and Eyes (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10017-X>)
18. Development of the Limbs (<http://er.library.unsw.edu.au/er/cgi-bin/eraccess.cgi?url=http://www.mdconsult.com/books/linkTo?type=bookPage&isbn=978-0-443-06811-9&eid=4-u1.0-B978-0-443-06811-9..10018-1>)

History

History - Embryologists | Embryology History | Human Embryo Collections



Braune - The Position of the Uterus and Fetus at Term (1872)



Wilhelm His (1831-1904)

His's Normentafel (Normal Table)

Anatomie menschlicher Embryonen (1882)

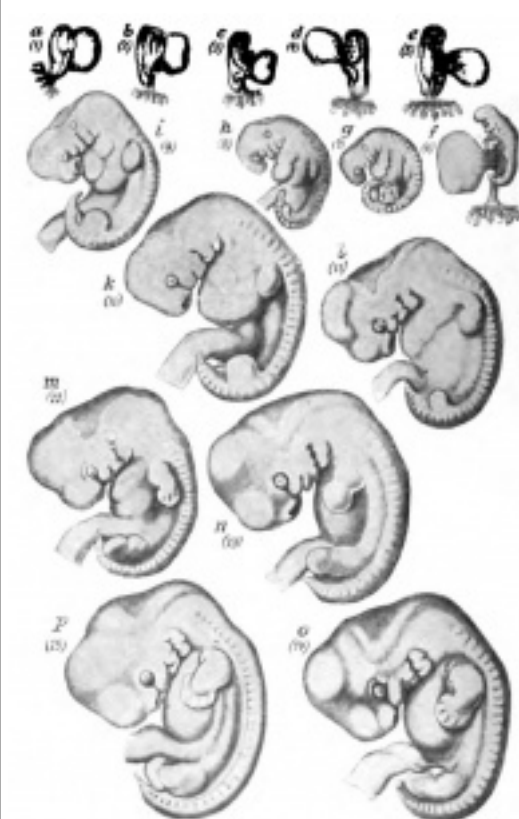


FIG. 24, top.—The embryos of His's Normentafel, from the Anatomical Atlas of His and Elze (Fig. 1, p. 8, 1882). His's numbers are given in parentheses.

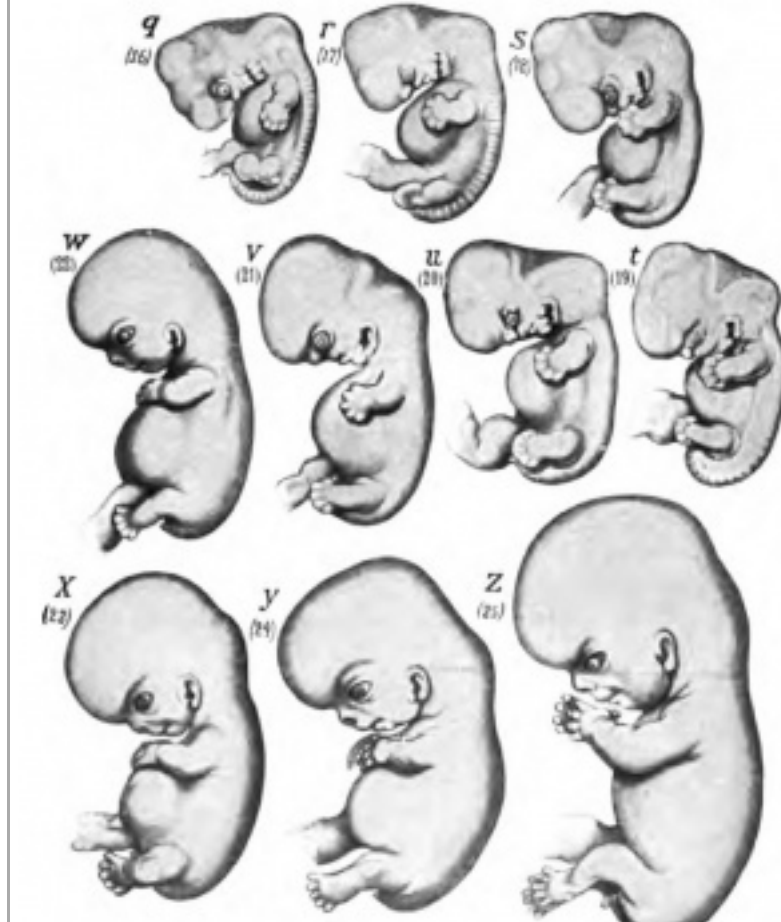
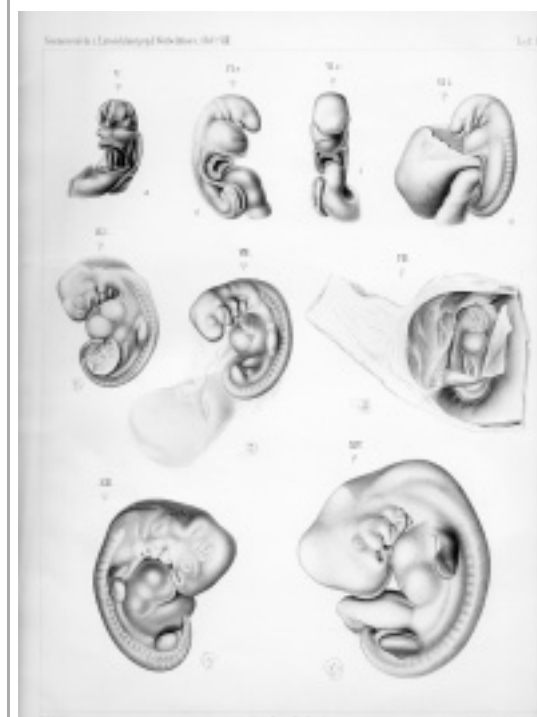
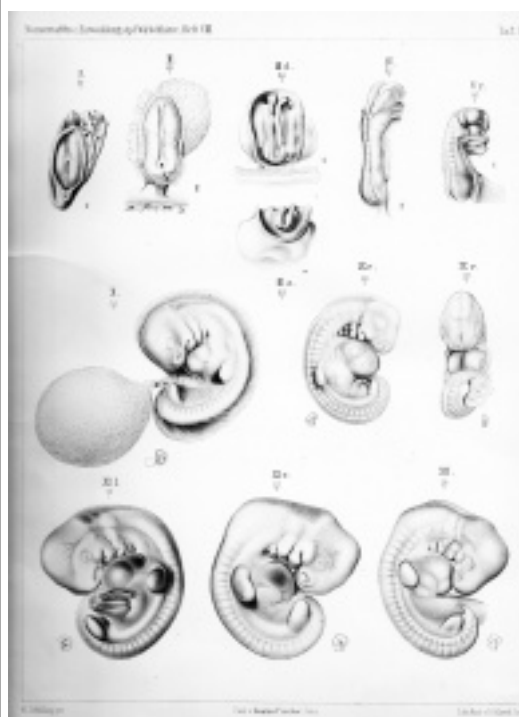


FIG. 24, bottom.—The embryos of His's Normentafel, from the Anatomical Atlas of His and Elze (Fig. 1, p. 8, 1882). His's numbers are given in parentheses.



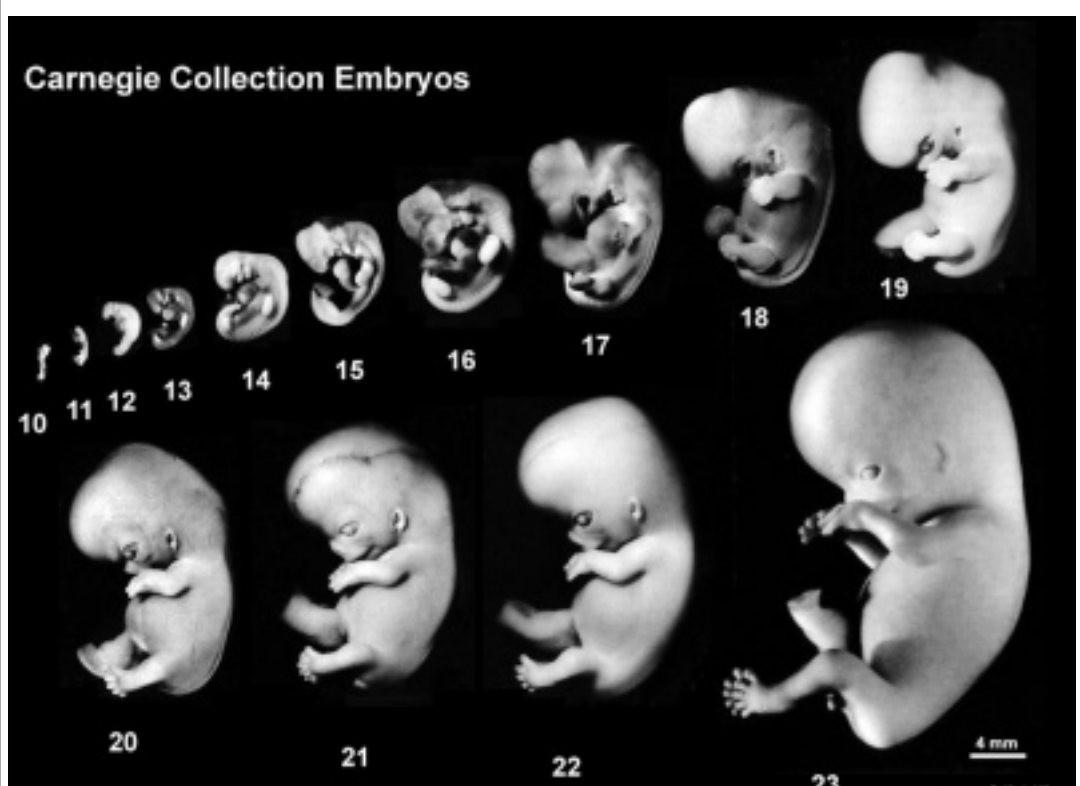
Franz Keibel (1861 - 1929)

Franz Keibel and Curt Elze (1908) Normal Plates of the Development of the Human Embryo



Franklin Mall (1862-1917)

Carnegie Collection



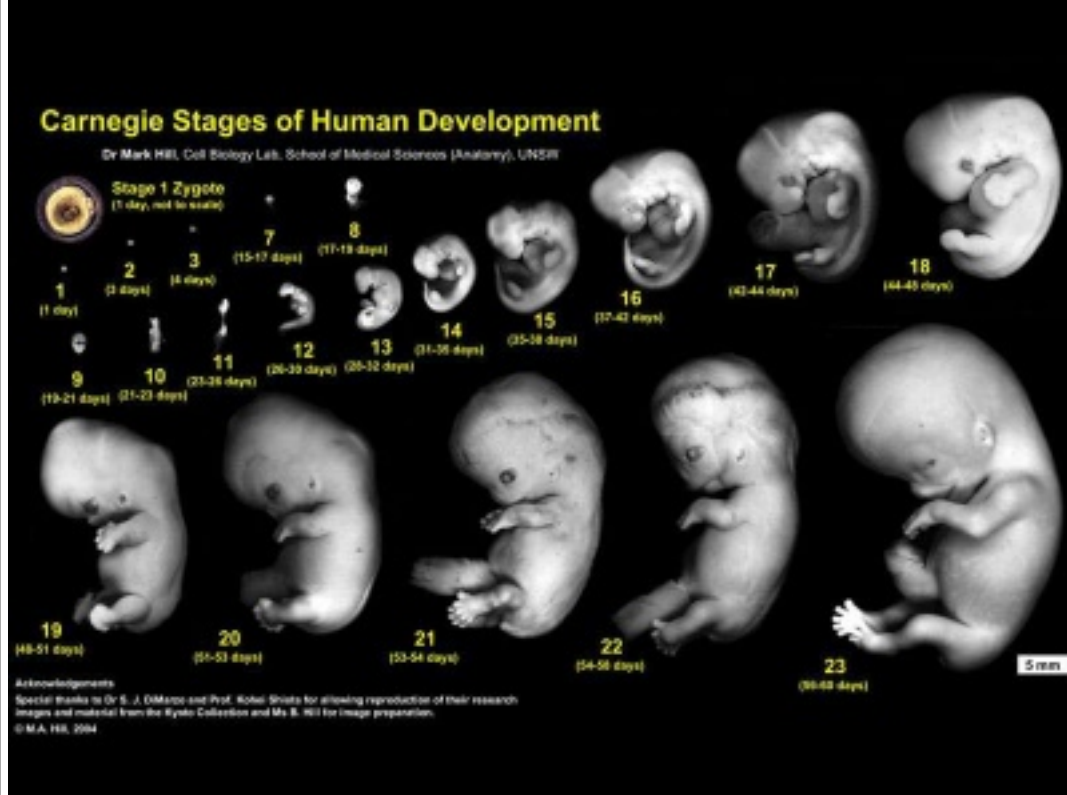
Begun by Dr. Hideo Nishimura (1912-1995)



Developed by Kohei Shiota

and currently curated by Shigehito Yamada.

Kyoto Collection



**[Collapse]
Animal
Models**



Frog Links: Frog Development | 2009 Student Project | Hans Spemann | 1921 Early Frog Development | 1951 Rana pipiens Development | Rana pipiens Images | Frog Glossary | John Gurdon | Category:Frog | Animal Development

- The frog was used by many of the early embryology investigators and currently there are many different molecular mechanisms concerning development of the frog.
- The eggs develop independently, in relative synchrony and are relatively see-through making staging and observation fairly easy.
- The frog was a key model for the study of the process of gastrulation.



Chicken Links: Introduction | Chicken stages | Hamburger Hamilton Stages | Witschi Stages | History of the Chick (1883) | Chicken Embryo Development Plates (1900) | Chick Early Embryology (1920) | Category:Chicken

- The chicken embryo develops and hatches in 20-21 days and historically these were one of the first embryos to be studied. Cutting a window in the egg shell allows direct observation of the embryo. The Hamburger & Hamilton chicken development staging allowed researchers to develop this model as a key embryological tool.
- Key research involved the transplanting of quail cells into chick embryos, to later identify their contribution to different embryonic structures, particularly for somite, neural tube and neural crest development.



Mouse Links: Introduction | Mouse Stages | Mouse Timeline | Mouse Timeline Detailed | Mouse Estrous Cycle | Mouse Knockout | Movie - Cephalic Plexus | ANAT2341 Project (2009) | Category:Mouse

- The mouse has always been a good embryological model, easy to generate (litters 8-20) and quick (21d).
- Mouse embryology really expanded when molecular biologists used mice for gene knockouts.



Fly Development - The fruitfly (*Drosophila*) was and is the traditional geneticist's tool. It has been transformed to an magnificent embryologist's tool, with developmental mechanisms being uncovered in this system combined with homology gene searches in other species. The fly genome was one of the first to be completely sequenced. In early development nurse cells *sacrifice* their cytoplasmic contents to allow egg growth and early pattern formation is through the localization of maternal messenger RNAs (mRNAs).



Worm Development - Early embryological studies of the worm *Caenorhabditis elegans* (*C.Elegans*, so called because of its "elegant" curving movement) characterized the fate of each and every cell in the worm through all stages of development. This worm has recently had its entire genome sequenced.

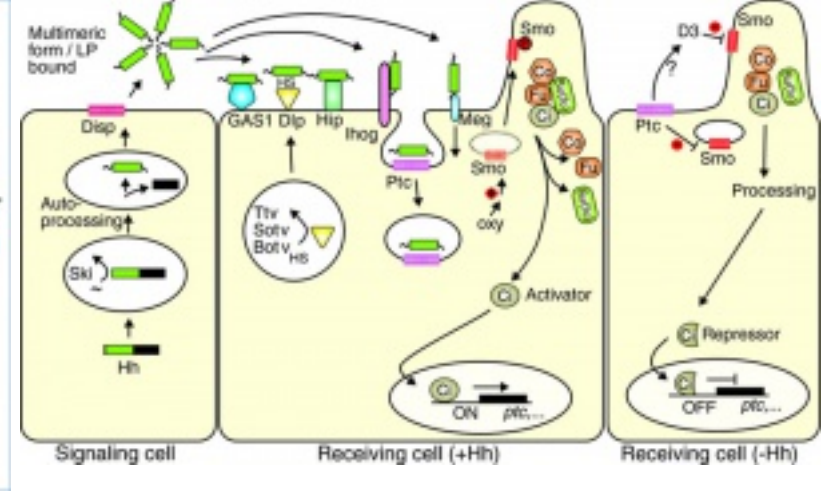
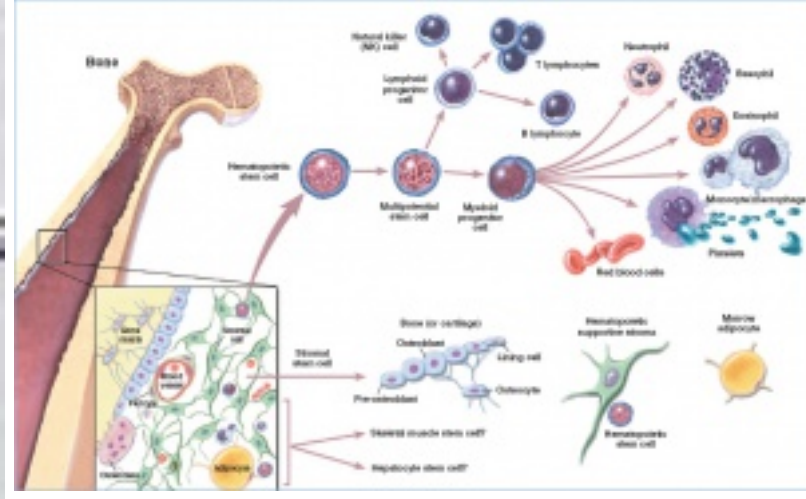
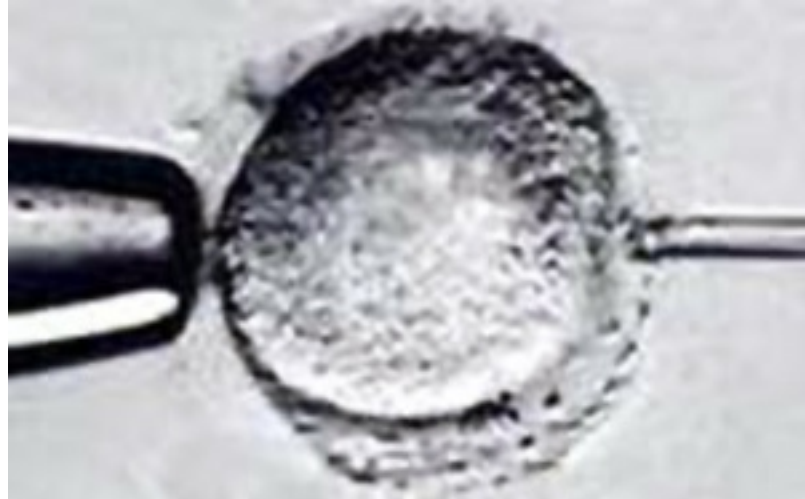


Zebrafish Development - Zebrafish are seen as the latest and greatest "model" for embryological development studies. They can be easily genetically altered and develop as practically "see through" embryos, all internal development can be clearly observed from the outside in the living embryo.

In Vitro Fertilization (1978)

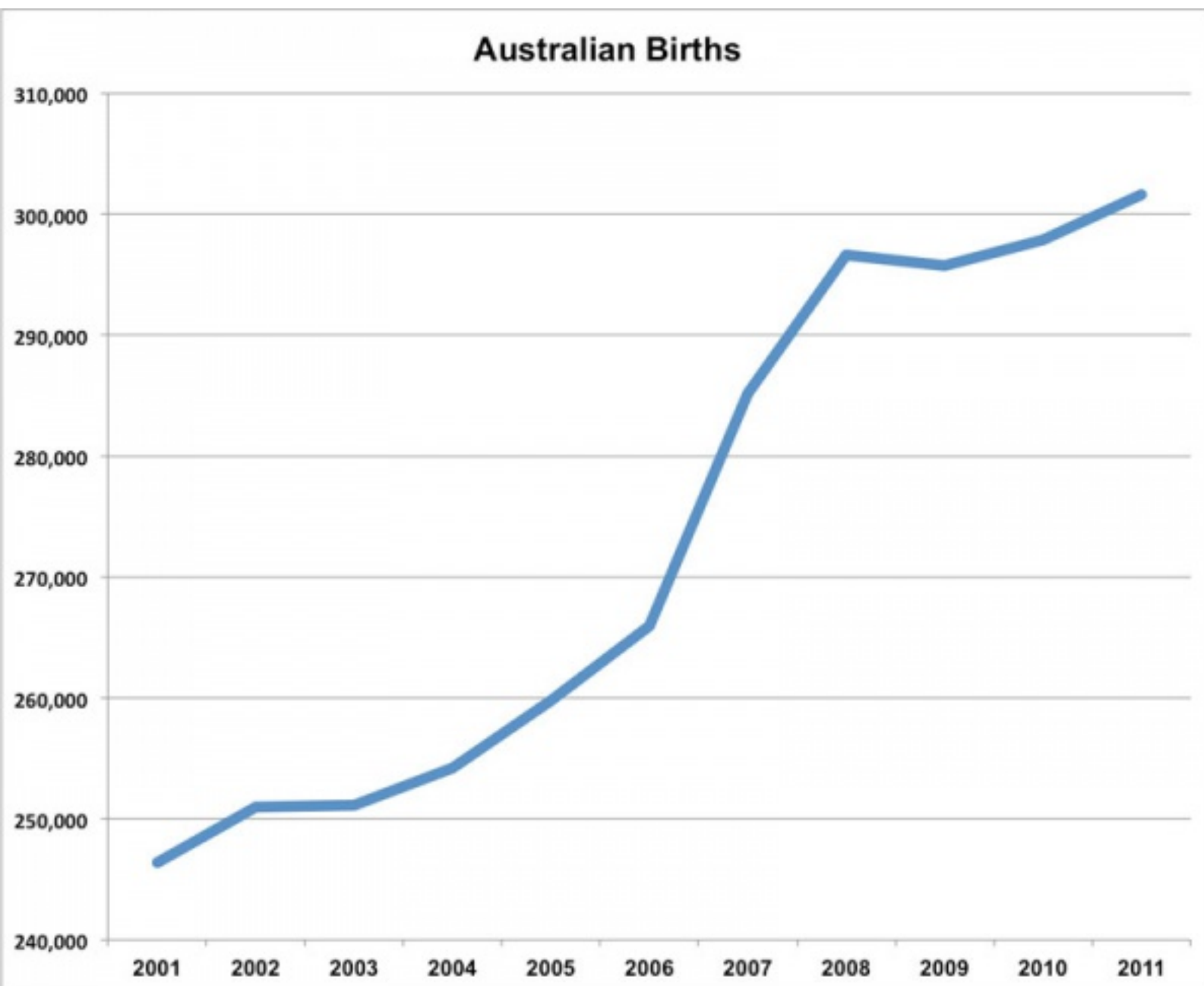
Stem Cells (1981)

Molecular Development



Australian Data

1 August 2014 at 03:53:30 PM (Canberra time), the resident population of Australia is projected to be: 23,550,233.



Australian Statistics



Australia's mothers and babies (2011)

Average maternal age in 2011 was **30.0** years, the same as 2009 but still more than the earlier years (2000, 29.0 years; 2002, 29.4 years).



Assisted reproductive technology in Australia and New Zealand (2010)

Assisted Reproductive Technology (ART) was used by **3.8%** (2009, 3.6%) of women who gave birth.

Victoria - 10 most reported birth anomalies

[Collapse]

Based upon statistics from the Victorian Perinatal Data Collection Unit in Victoria between 2003-2004.

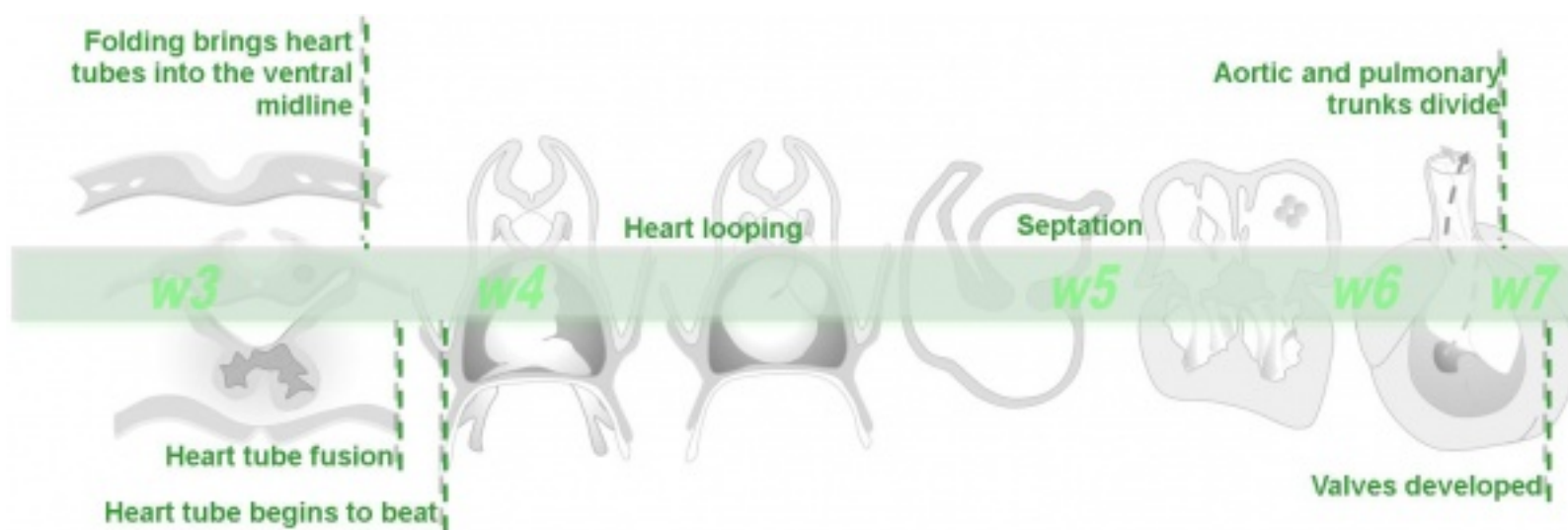
Hypospadias (More? Development Animation - Genital Male External | Genital Abnormalities - Hypospadias)

Obstructive Defects of the Renal Pelvis (obstructive defects of the renal pelvis, uteropelvic junction obstruction, pelvo-uterero junction obstruction) Term describing a developmental renal abnormality due to partial or complete blockage of the drainage of the kidney pelvis requiring surgical correction. The blockage can also have several causes including: unusual ureter twisting or bending, ureter compression by a blood vessel, malformations of the muscular wall. The blockage leads to an accumulation of urine in the affected region, with several potential effects: nephron damage from compression (hydronephrosis); decreased urine output leading to lack of amniotic fluid (oligohydramnios); respiratory development effects due to the lack of amniotic fluid.

- The most common type of obstruction is at the uteropelvic junction (UPJ), between the junction of the ureter and the kidney.
- Blockage lower as the ureter enters the bladder, the ureterovesicular junction (UVJ), usually involves only one kidney and the back flow enlarges the affected ureter (megaureter).

(More? Renal System - Abnormalities | Renal System Development)

Ventricular Septal Defect (More? Cardiovascular Abnormalities - Ventricular Septal Defect)



Heart Development Timeline (see Basic Cardiac Embryology)

Congenital Dislocated Hip (More? Musculoskeletal Abnormalities - Congenital Dislocation of the Hip (CDH))

(DHH, congenital dislocated hip, congenital hip dislocation, congenital hip dysplasia) Term describes a spectrum of musculoskeletal disorders of hip instability due either to the femoral head being able to move outside the acetabulum (luxation or dislocation), or abnormally within the acetabulum (subluxation or partial dislocation). This includes presentation following a normal examination of the hips in the newborn period (Ortolani and Barlow tests). When detected can be managed with splinting (Denis-Browne splint) allows the hip joint to develop normally and does not require surgery. If undetected and left untreated, the hip joint develops abnormally and surgical reduction is required. (More? Musculoskeletal System Development)

Trisomy 21 or Down syndrome - (More? Trisomy 21)

Hydrocephalus (More? Neural Abnormalities - Hydrocephalus | NINDS - Hydrocephalus Fact Sheet (http://www.ninds.nih.gov/disorders/hydrocephalus/detail_hydrocephalus.htm) | Hydrocephalus Support Association (<http://www.hydrocephalus.org.au>) | USA National Hydrocephalus Foundation (<http://nhfonline.org/treatment.php>))

Cleft Palate (More? Development Animation - Palate 1 | Development Animation - Palate 2 | Cleft Palate)

Trisomy 18 or Edward Syndrome - multiple abnormalities of the heart, diaphragm, lungs, kidneys, ureters and palate
86% discontinued (More? Trisomy 18)

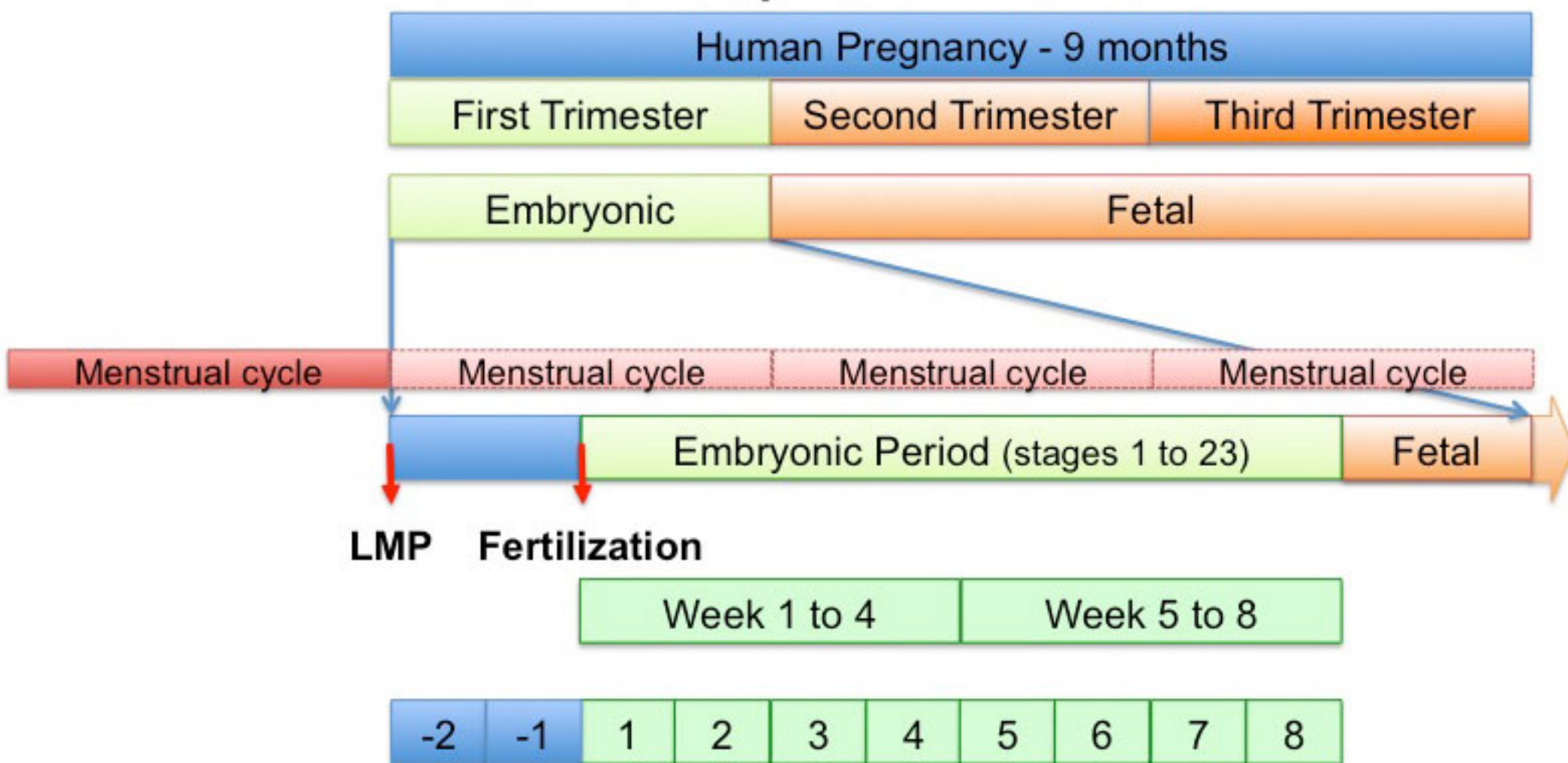
Renal Agenesis/Dysgenesis - reduction in neonatal death and stillbirth since 1993 may be due to the more severe cases being identified in utero and being represented amongst the increased proportion of terminations (approximately 31%).
(More? Renal Abnormalities - Renal Agenesis)

Cleft Lip and Palate - occur with another defect in 33.7% of cases. (More? Cleft Lip)



Human Development

Human Development Timeline



2014 Course: Week 2 Lecture 1 Lecture 2 Lab 1 | **Week 3** Lecture 3 Lecture 4 Lab 2 | **Week 4** Lecture 5 Lecture 6 Lab 3 | **Week 5** Lecture 7 Lecture 8 Lab 4 | **Week 6** Lecture 9 Lecture 10 Lab 5 | **Week 7** Lecture 11 Lecture 12 Lab 6 | **Week 8** Lecture 13 Lecture 14 | Lab 7 | **Week 9** Lecture 15 Lecture 16 Lab 8 | **Week 10** Lecture 17 Lecture 18 Lab 9 | **Week 11** Lecture 19 Lecture 20 Lab 10 | **Week 12** Lecture 21 Lecture 22 Lab 11 | **Week 13** Lecture 23 Lecture 24 Lab 12

Glossary Links

A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | Numbers | Symbols

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