CONCEPTION, IMPLANTATION, DEVELOPMENT, FETAL CIRCULATION

5/9/79, 5/25/82, 31 May 1994, rvsd 6/3/97 rvsd 2 June 98, 30 May 2000, 22 May 2002, 28 May 2003, 19 May 04, 2 May 04, 23 May 05, 2June08, 3June09
S&M p 794-, Case 2nd, pp471-482, MM 17th: 2016-2017,2035-2036, Martini's 6th: 1095-1114, 7th: 1075-1096, 8th 768, 1089-1097

FERTILIZATION: (p 1089) ovum good for only 24 hrs, sperm for 48. Sperm take only few minutes to reach fallopian tubes.
sperm not capable of fertilization until in female tract for some time: **capacitation**.
Need many sperm for fert, **hyaluronidase** in combined acrosomes. Hyaluronic acid is component of **zona pellucida**
Penetration of ovum by sperm **triggers completion of meiosis.**

After fertilization, fate of zygote: has large amt of cytoplasm, cleavage distributes it to cells.

CLEAVAGE: (p 1092) division without growth during **3 days to uterus**,

blastocyst forms:	**trophoblast**	outer layer of cells, will nourish the embryo
	inner cell mass	becomes embryo proper.
	blastocoel	cavity in mass of cells called
Embryo entering uterus:	**morula**	

seven days after fertilization (3-4 in uterus), implantation.

IMPLANTATION (p 1093), trophoblastic cells invade endometrium: nutrition for 2 months due to endometrial erosion

Human Chorionic Gonadotropin maintains corpus luteum until placenta forms. Can cause nausea

EMBRYONIC MEMBRANES (p 1083):

amniotic cavity	forms above cell mass endoderm, then mesoderm spreads around inside of **blastocoel**. Blood forms first here
yolk sac	forms under, penetrates umbilical stalk
allantois	[sausage like]: extends fr lower gut out pocket forms in endoderm near base of yolk sac, surrounded by mesoderm, forms bladder
chorion	mesoderm spreads around blastocyst, combines with trophoblast to
amnion	ectoderm splits, lines superior cavity, becomes covered with mesoderm form chorion

In mammalian embryo, early cells do not have fixed fate: Environment determines fate of cells. Position, not particular cells.

Ontogeny recapitulates phylogeny.

SECOND WEEK: inner cell mass forms a **plate with two layers**:
ectoderm and endoderm: together form germinal disc.
Organogenesis, Differentiation, Induction: processes of specification of form and function
Induction: process whereby embryonic tissues are induced to develop into differentiated tissues.
zB: brain forms three out pockets: fore, mid, hind. out pocket from fore touches ectoderm, induces lens

THIRD WEEK:

GASTRULATION (p 1094) forms mesoderm by primitive streak, cells migrate down and between original two layers. others migrate to head end, forming **notochord** first.

somites segmented structures (mesoderm) lining either side of nerve cord, leading to vertebrae, sets of muscles, enervation, limb buds, lining of coelum, kidneys, gonads, muscles and bones

Organs derived from embryonic tissues:

Ectoderm:	nervous system, skin, enamel of teeth, some glands (anterior pituitary, mammary glands)
Mesoderm:	muscle, skeleton, kidneys, gonads, spleen, adrenal cortex, membranes lining body cavities. Circulatory sys
Endoderm:	lining of GI tract, lungs, lining of bladder, urethra. **glands:** liver, pancreas, thymus, thyroid, parathyroid.

NEURULATION (p 1088): neural tube begins to form wk. Neural plate thickens, neural groove sinks, neural crests close.

Neural Crest cells fate: sensory ganglia along spine, Schwann cells, sympathetic NS, adrenal medulla, pigment cells, tooth forming cell, meninges, cartilage contributing to bony structure of jaws and face, cranium.

FIFTH WEEK: **gill pouches** form, develop into tiny bones of middle ear, eustachian tube, tonsils, thymus, parathyroid.
heart begins to beat
leg and arm buds form
induction of **eyes and ears** as brain grows out, touches ectoderm,
Dev of kidney: pronephros, then mesonephros along somites, later adult kidney.

organ formation completed by the 12th week except for CNS.

Teratogenic effects strongest in first 12 weeks, avoid all drugs, attention to good nutrition.
Smoking: reduced birth wt, incr abortion, stillbirth, heart defects, orofacial defect, SIDS, lower IQ
Alcohol: leading teratogen, 2x sp abort, decr birthwt, F.A.S: growth retard, joint, CV, lead cause ment retrd

3RD MONTH **Placenta** (p 1097) functioning, makes estrogen and progesterone. **Embryo become fetus.**
chorion forms **villi**, surrounded by pools of maternal blood. Surface area of placenta: 16 square meters
umbilical cord forms from combination of yolk sac and allantois

FETAL CIRCULATION (p 768):

circ:	1) two umbilical arteries	**flow to placenta**	branch off of the R & L common iliac arteries
	2) umbilical vein	**flows from placenta**	carries oxygenated blood, nutrients
heart:	3) ductus venosus	**bypass around fetal liver**	(for umbilical vein), empties into inferior vena cava
	4) foramen ovale	**bypass pulmonary circuit**	hole between R and L atria,
	5) ductus arteriosus	**bypass lungs**	pulmonary trunk empties into descending aorta