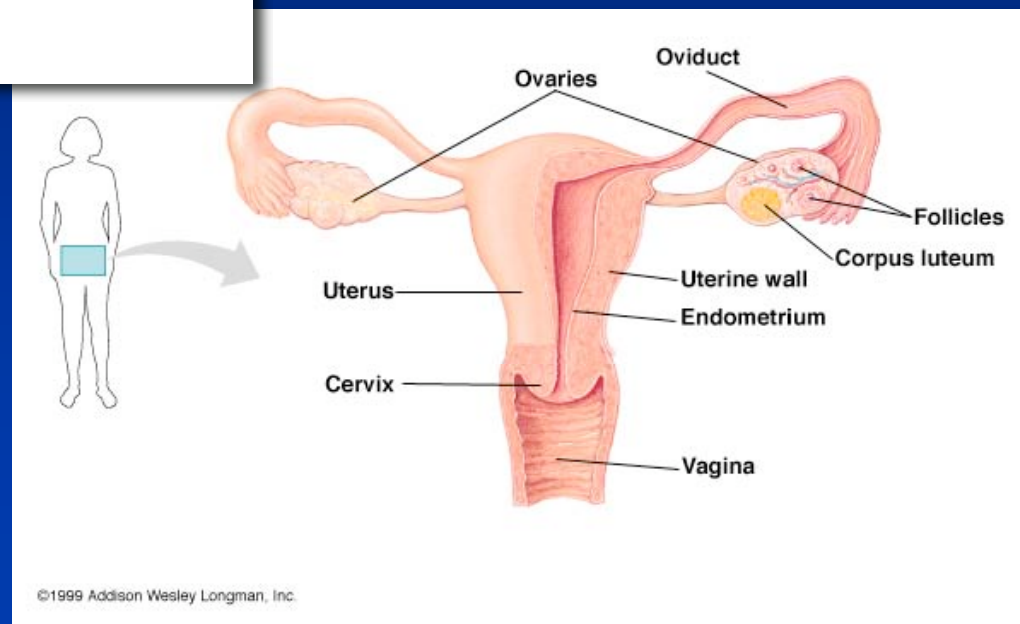
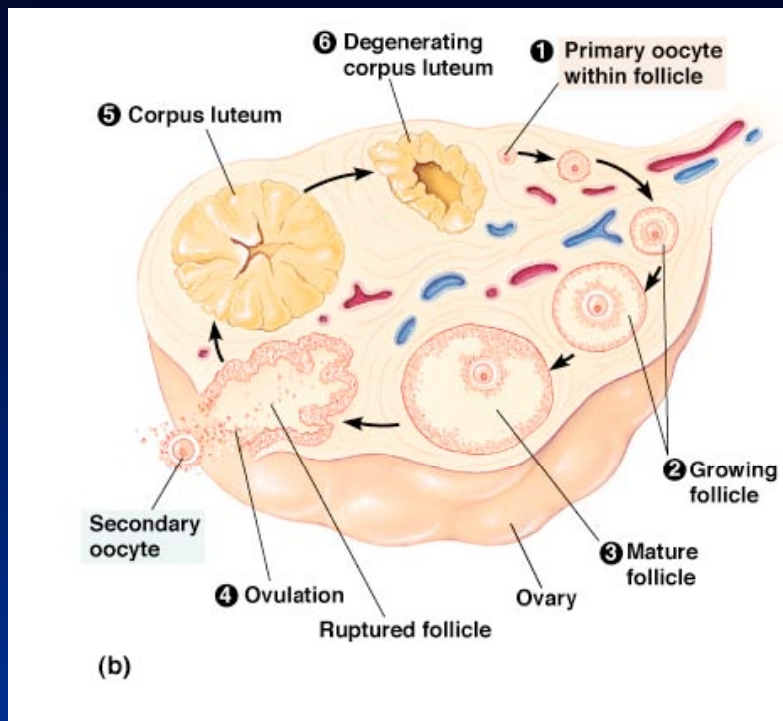


Female Reproductive Anatomy



Ovary - Primary Organ

◆ Ovary - Gross anatomy

- usually paired
- may be solid or hollow
- size can vary greatly depending on species and stage of reproductive activity

Gross Anatomy - Mammal

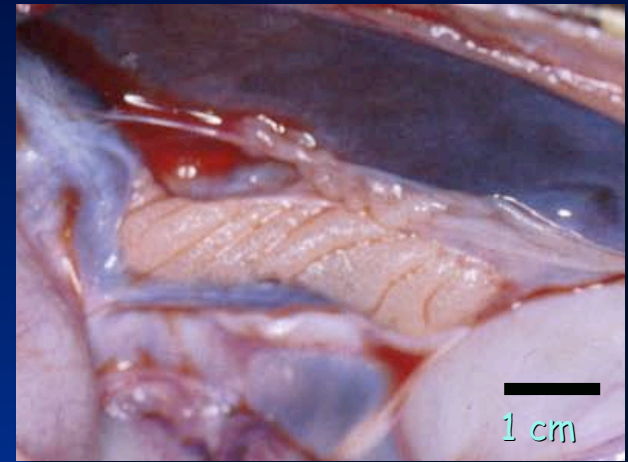


Human

- ◆ Paired, solid
- ◆ Size changes little with reproductive activity
 - 'Blisters on the surface'

Gross Anatomy - Reptile

- ◆ Paired, solid ovary
- ◆ Enlarged dramatically with reproductive activity



Alligator

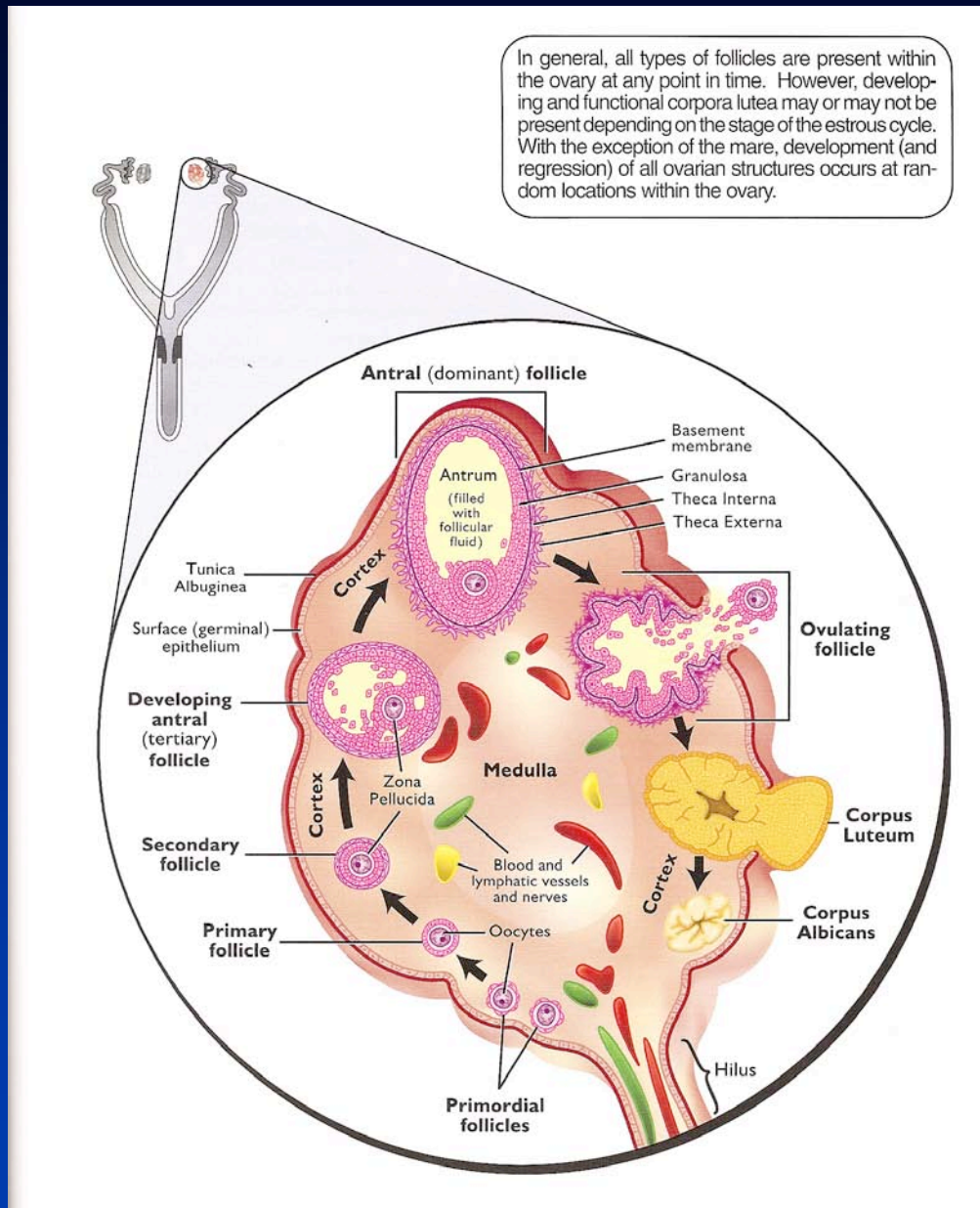
Gross Anatomy - Fish



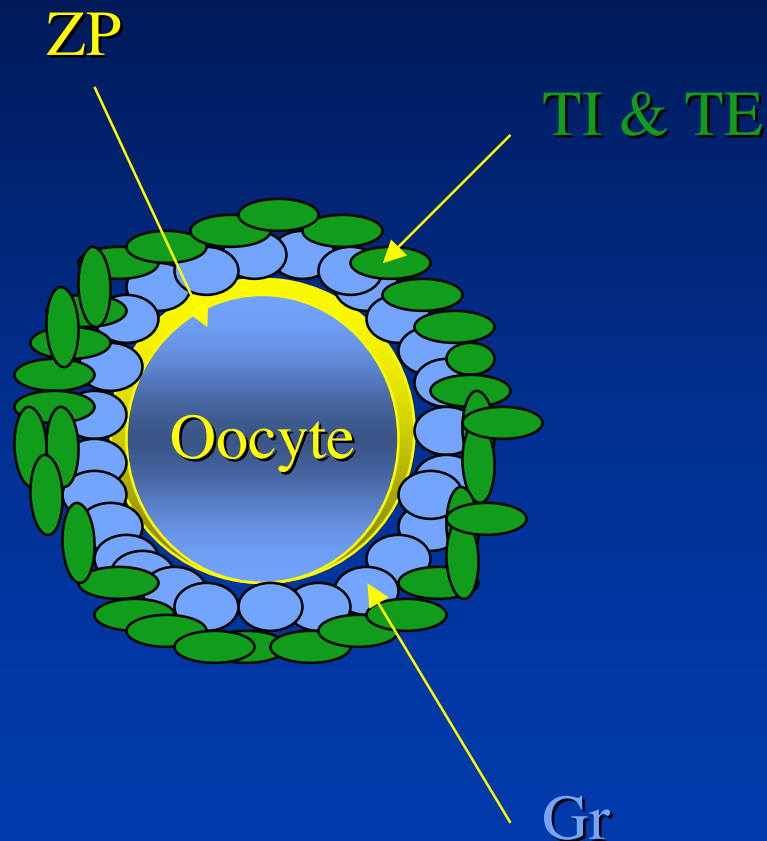
Perch

Ovarian Histology

- ◆ **serosa** - outer covering of tough connective tissue
- ◆ **germinal epithelium** - single layer of cells once thought to produce the germ cells - thus its name
- ◆ **ovarian stroma or cortex** - contains follicles and scar tissue, some blood vessels
- ◆ **ovarian hilus or medulla** - contains blood vessels, nerves, lymph

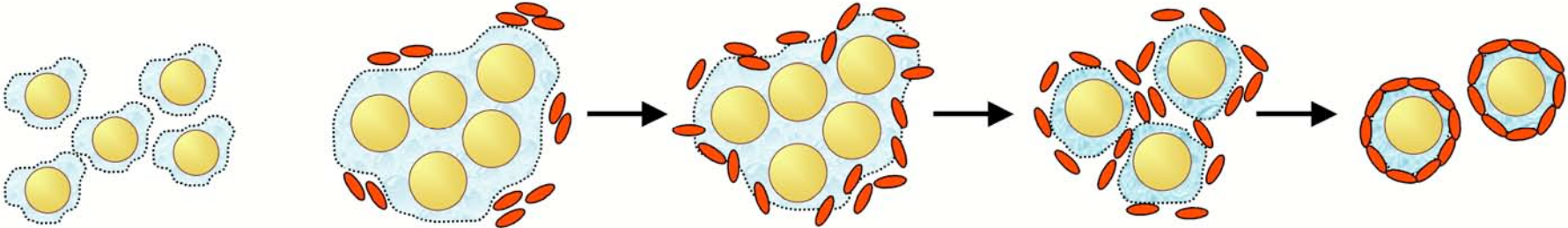


Ovarian Follicle



- ◆ **follicle** - composite structure that will produce mature oocyte
 - primordial follicle - germ cell (oocyte) with a single layer of mesodermal cells around it
 - as development of follicle progresses, oocyte will obtain a 'halo' of cells and membranes that are distinct:
 - ◆ 1. zona pellucide (ZP)
 - ◆ 2. granulosa (Gr)
 - ◆ 3. theca interna and externa (TI & TE)

Germ Cells Division and Follicle Formation



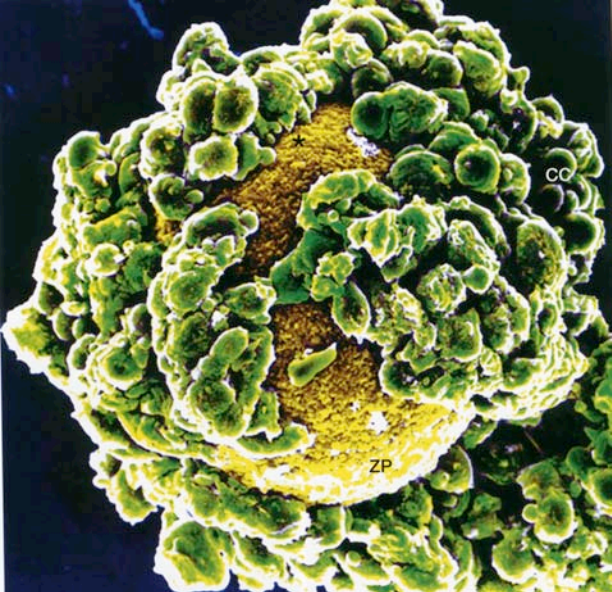
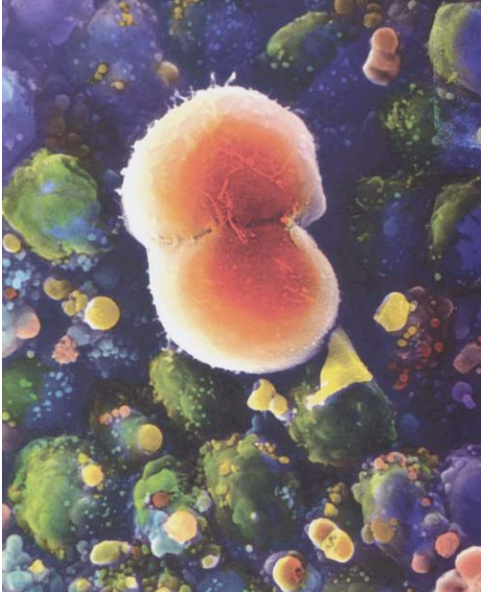
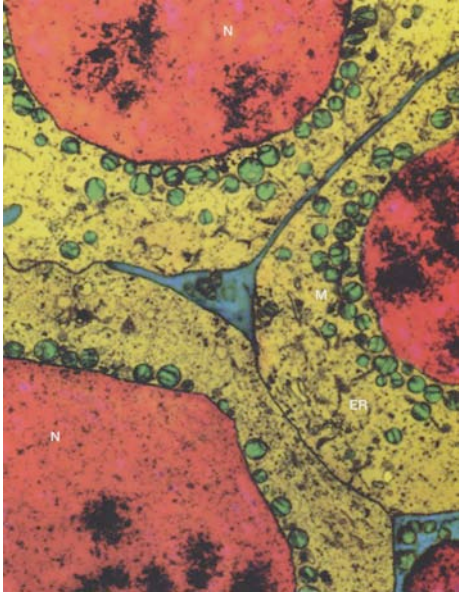
Primordial Germ Cell Arrival at the Gonad

Germ Cell Syncytium (Oocyte Cyst)

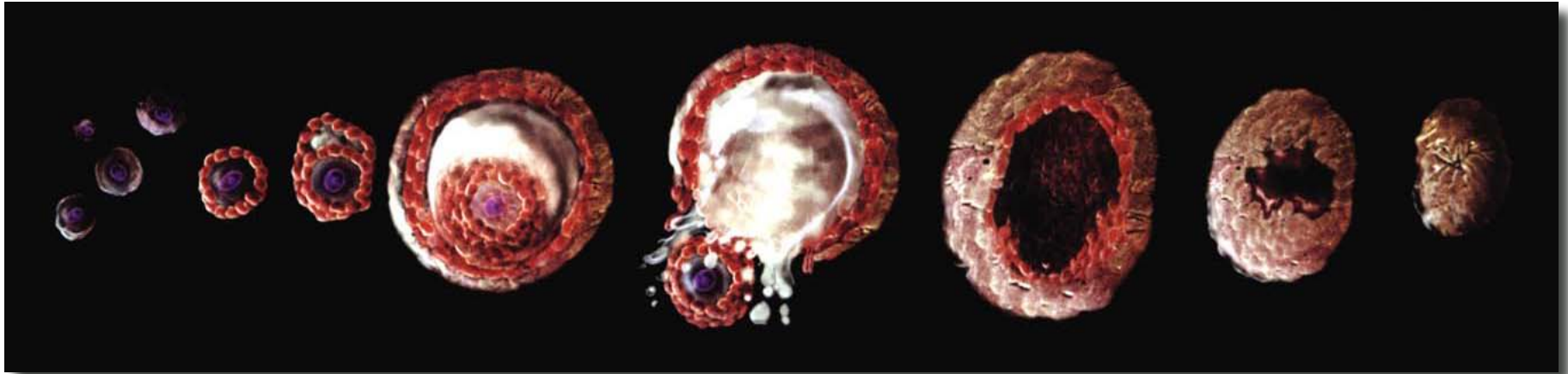
Invasion by Pre-Granulosa Somatic Cells

Encapsulation of Oocyte by Pre-Granulosa Cells

Primordial Follicles



from Makabe and van Blerkom, 2006



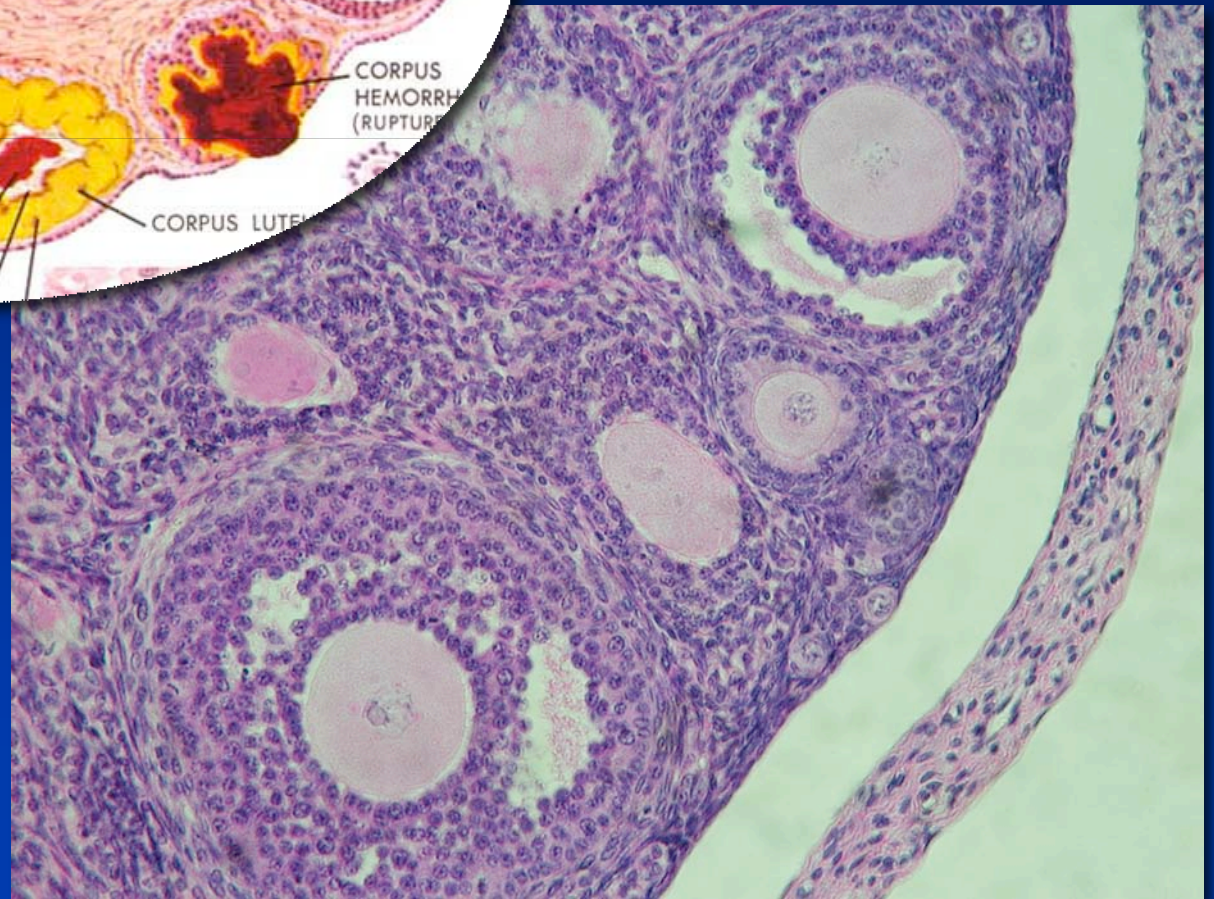
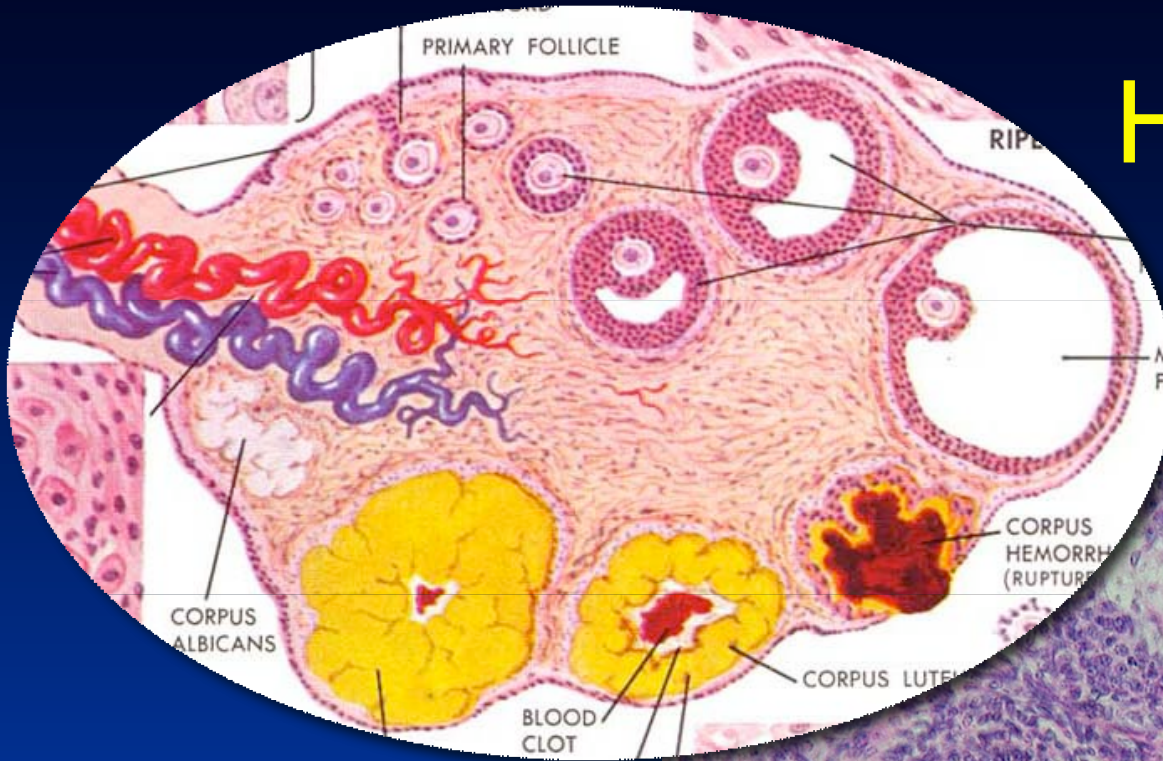
Summary:

The **follicle** is the functional unit of the ovary.

One female gamete, the **oocyte** is contained in each follicle.

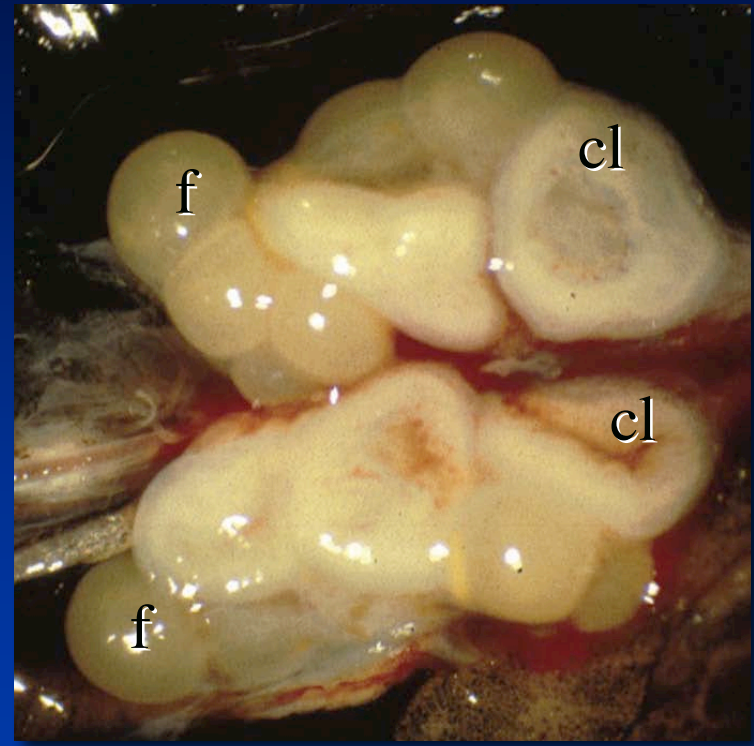
The **granulosa cells** produce hormones (estrogen and inhibin) that provide 'status' signals to the pituitary and brain about follicle development.

Human Ovary



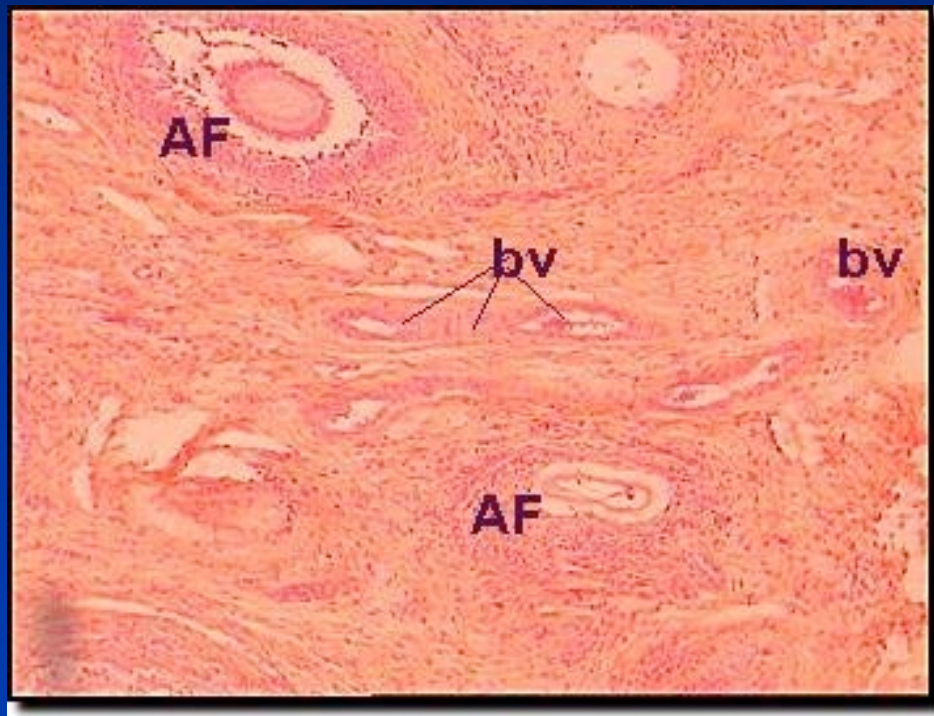
Corpora Lutea (CL)

- ◆ remnant of ovulated follicle
 - following ovulation theca and granulosa cells remain in ovary
 - these cells luteinize and produce progesterone
 - will remain 'active' for a species specific period of time and then undergo luteolysis - luteal death



Atresia

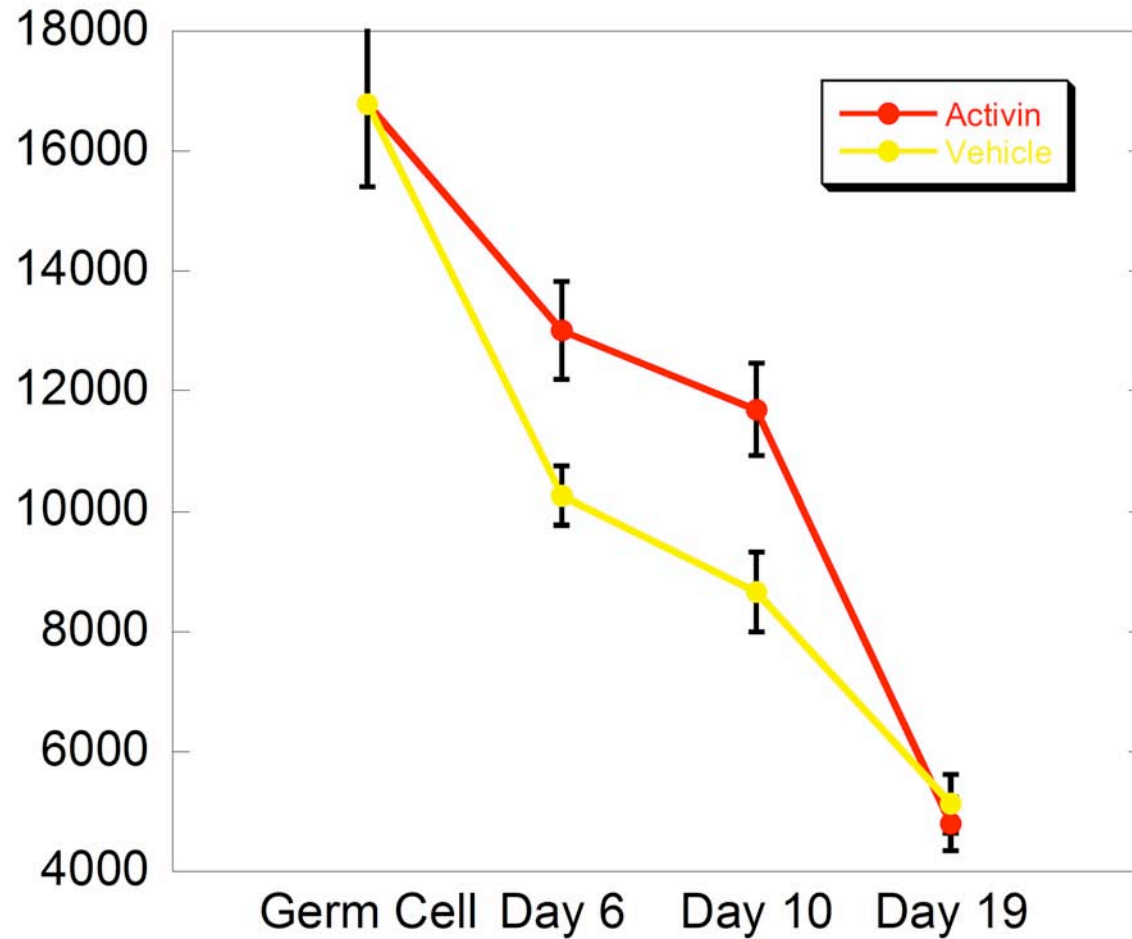
- ◆ Atretic follicles - follicles undergoing death = atresia



Human Ovary

- ◆ at 5 months in utero - ovary has >3,500,000 germ cells
 - they then begin to die - atresia
- ◆ at birth each ovary has 400,000 germ cells
 - all she will have for rest of life
- ◆ at puberty = 83,000/ovary
- ◆ at 35 yrs = 30,000 follicles

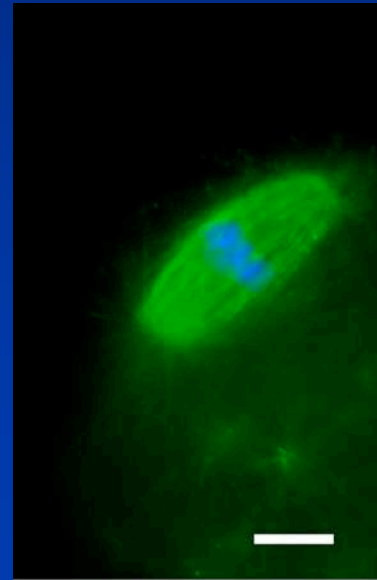
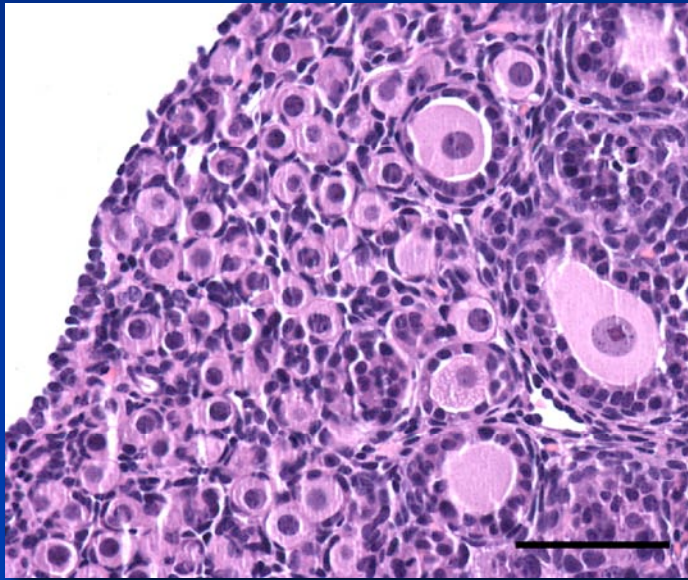
Mouse - Follicle Number



Oogonial Nests

◆ Oogonial Nests

- some species (adults) retain clumps of oogonia that undergo mitosis to generate new follicles.
- Not found in mammals or birds



Fish Ovary - Histology



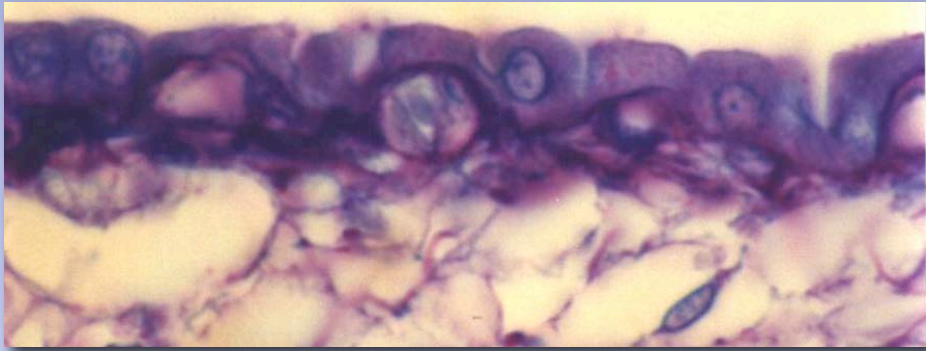
P. gracilis

- Hollow, fused
- Ovulation toward the central cavity



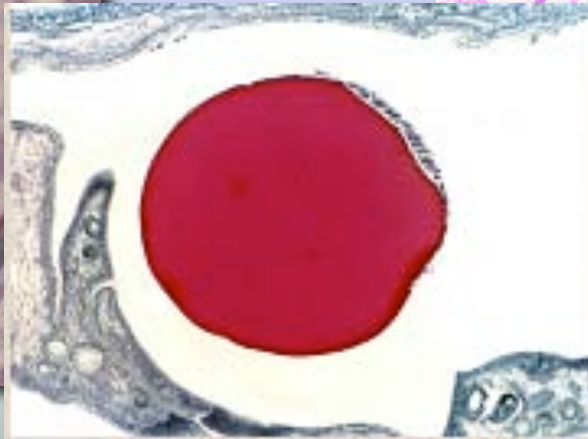
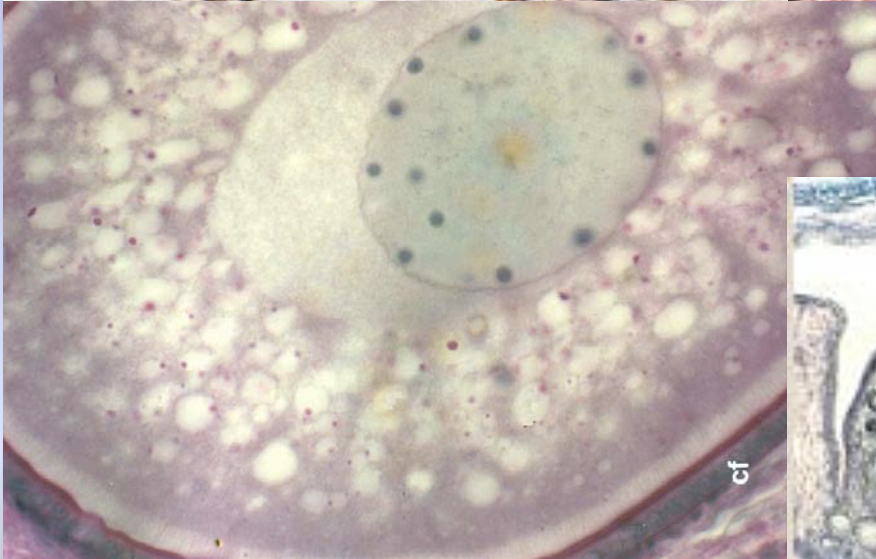
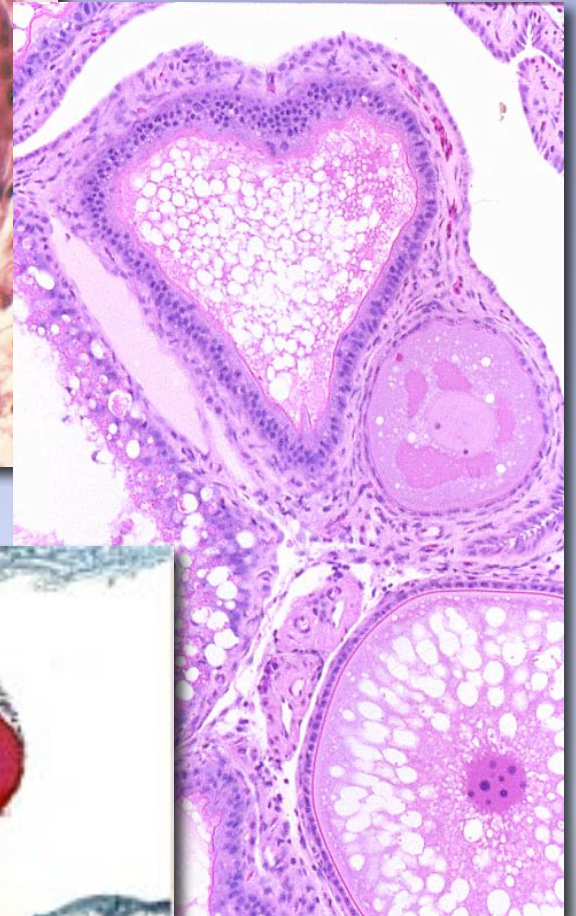
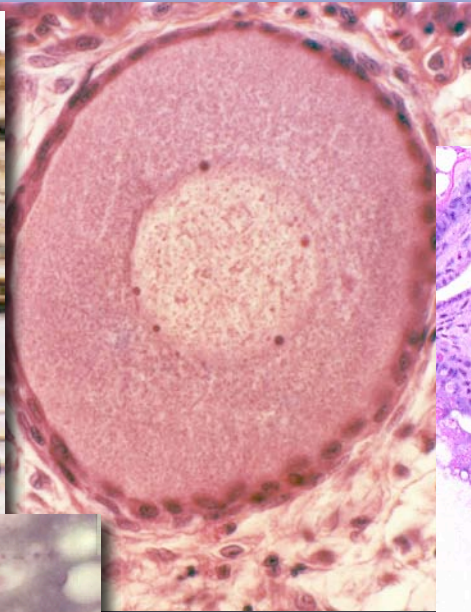
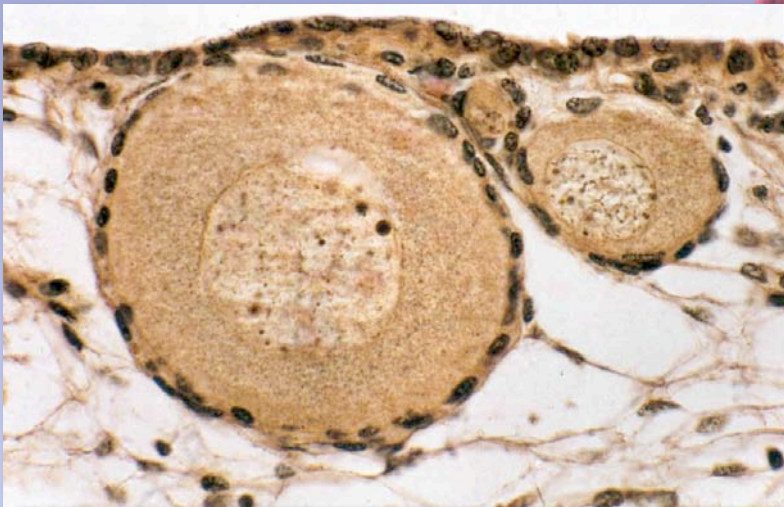
I. whitei

Fish Ovary - Germinal Epithelium



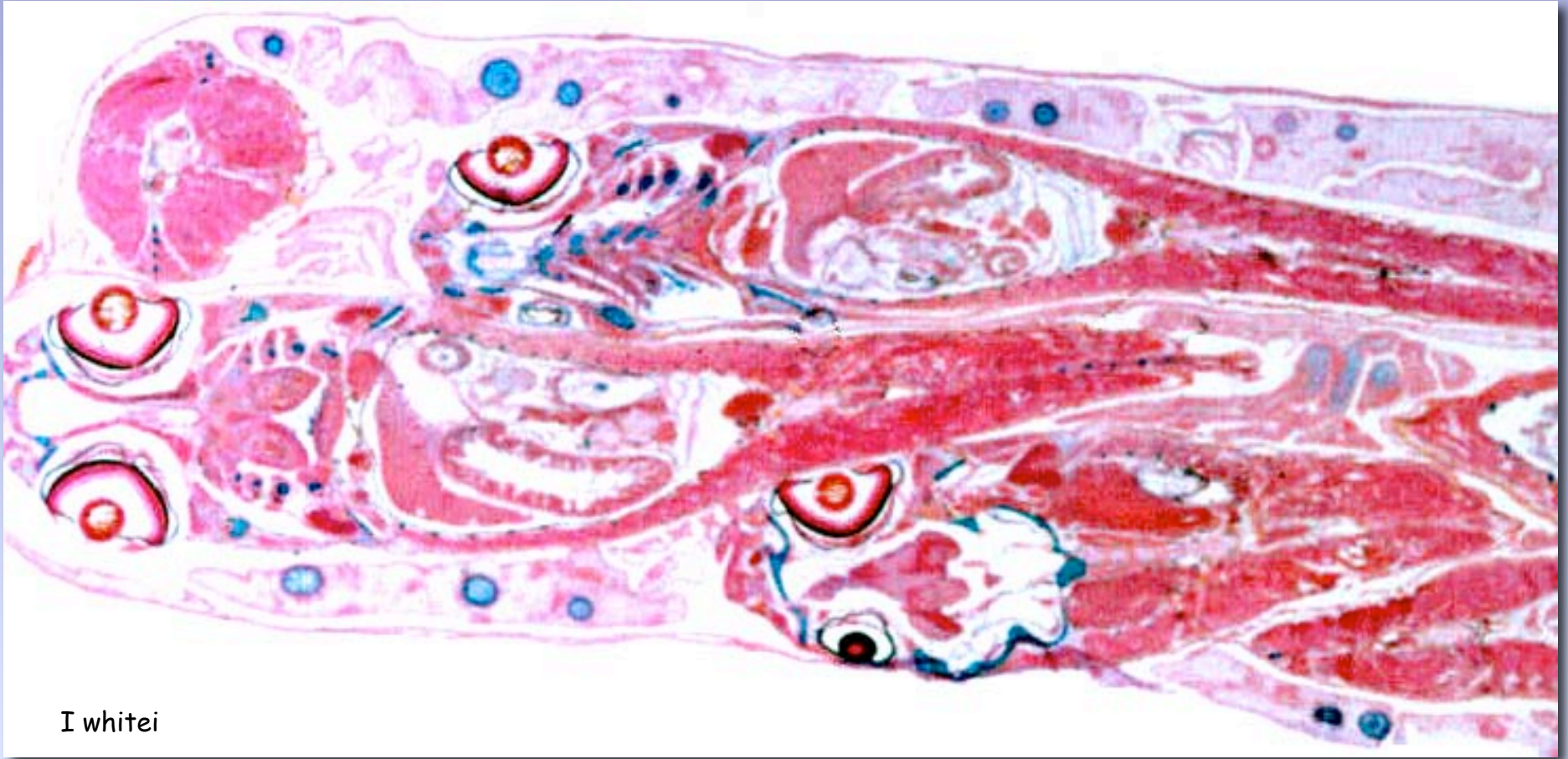
- Germ cells (oogonia) lie below surface of ovarian epithelium

Follicles at various stages



cf

What is this?



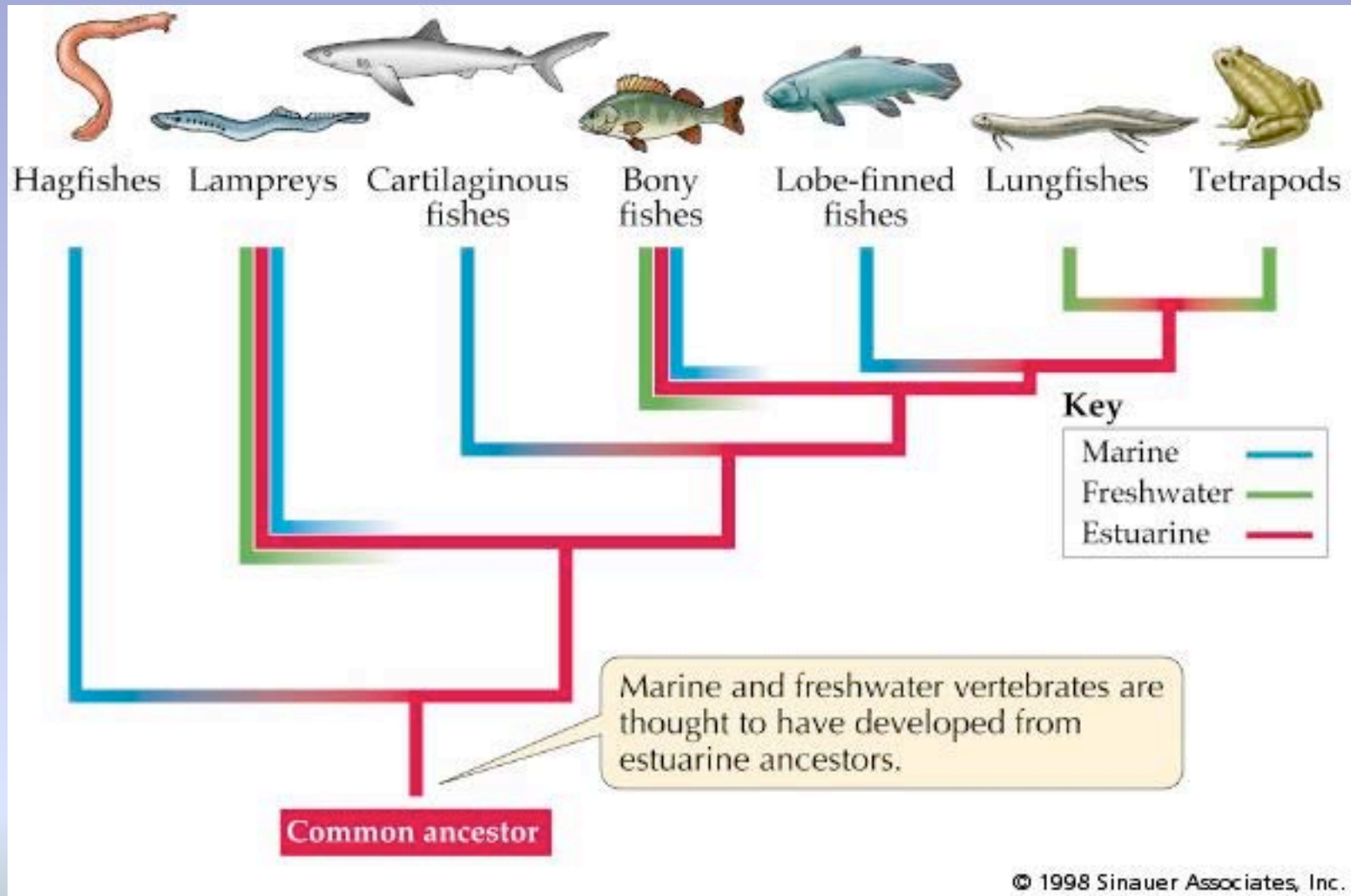
I whitei

Ovary of viviparous fish with developing embryos in it!

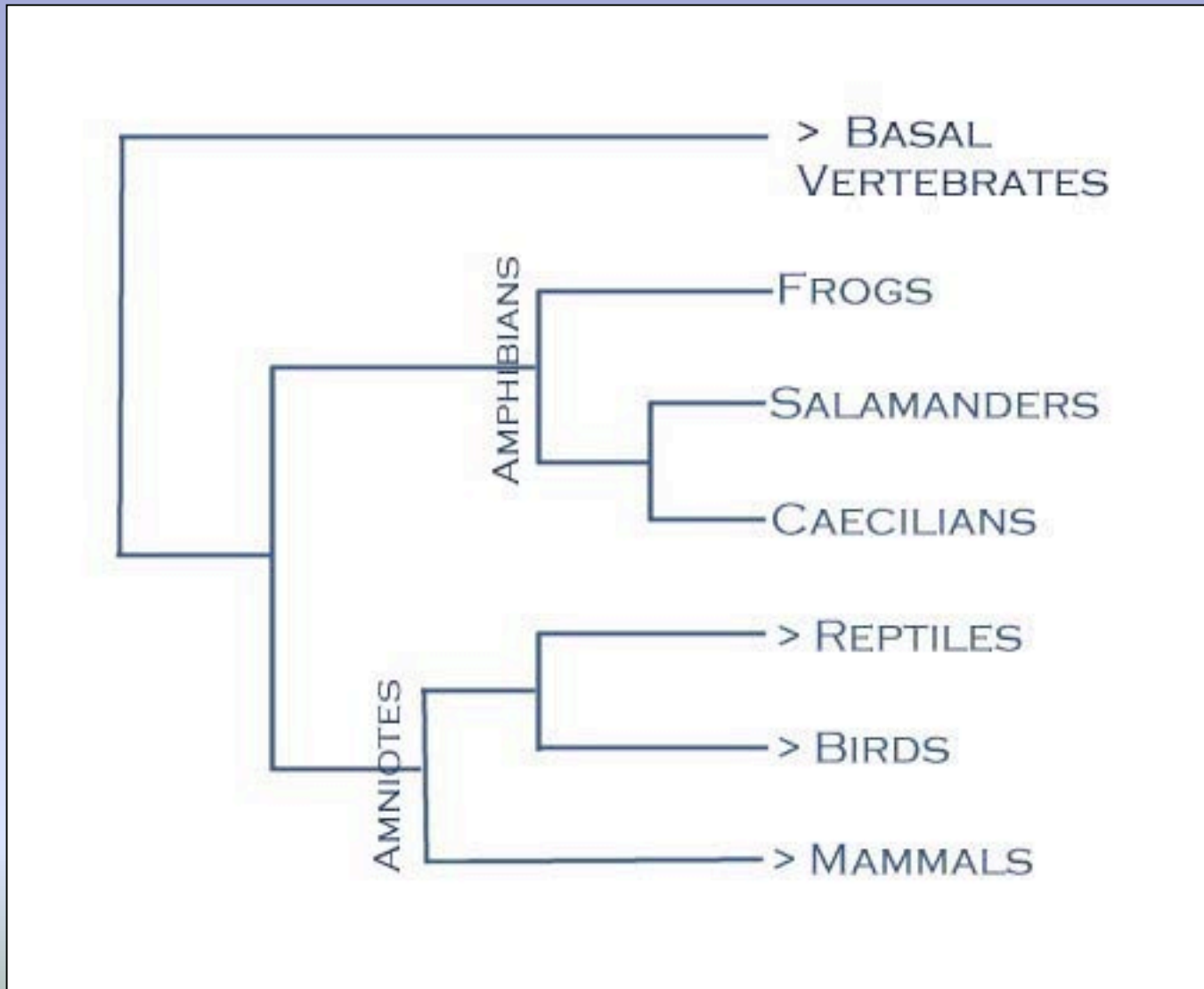
Summary - Ovary

- Chondrichthyes- - paired, fused, solid
- Osteichthyes
 - Teleosts - paired, fused, hollow
 - Holostean - paired, separate, solid
- Amphibians - paired, separate, solid
- Reptiles - paired, separate, solid (some ribbon)
- Birds - paired, separate, solid
- Mammals - paired, separate, solid

Vertebrate Tree



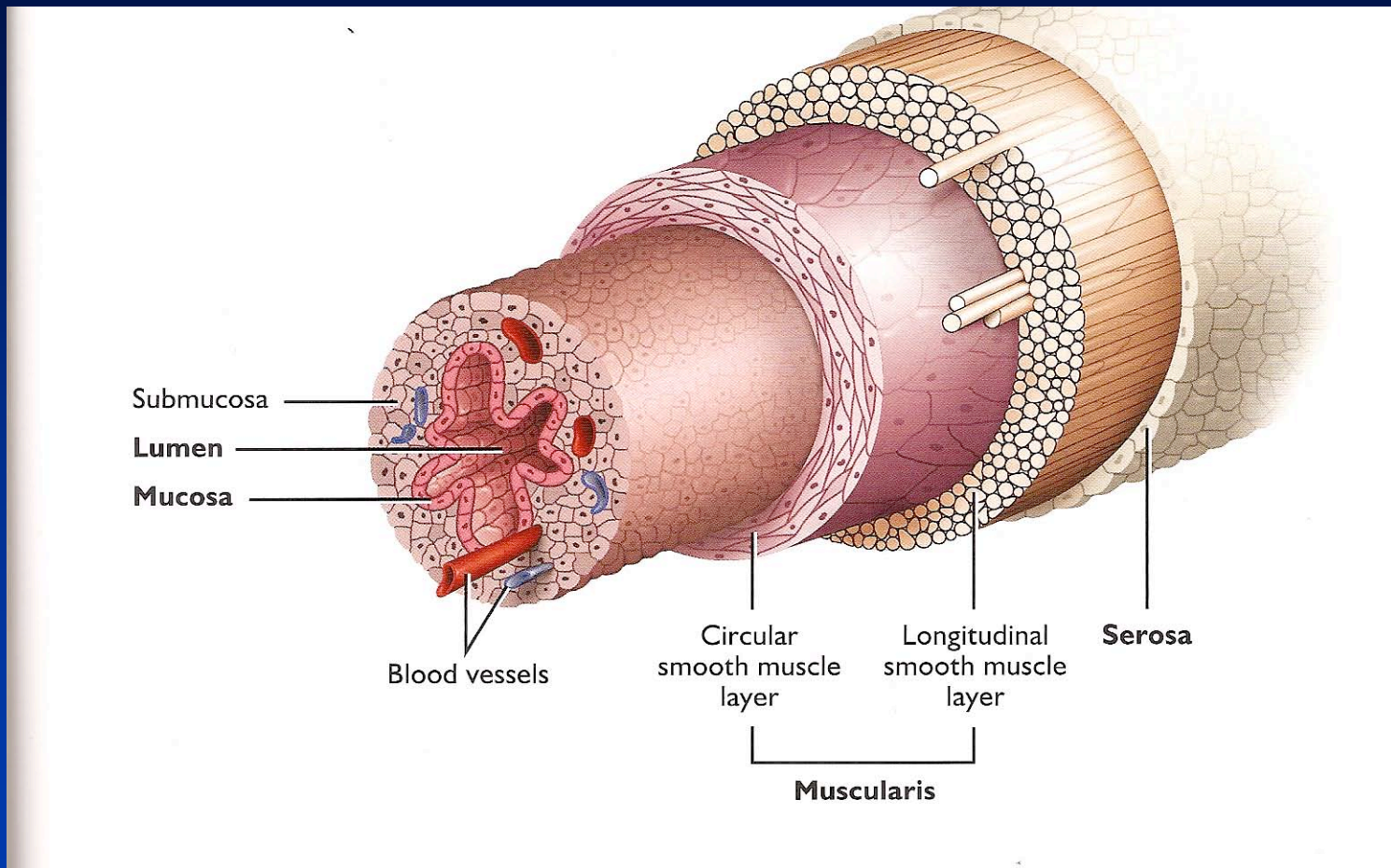
Tetrapod Tree



Duct system

- ◆ all derived from the embryonic Müllerian duct
- ◆ whole duct is termed oviduct in comparative biology
 - in mammals - oviduct usually refers to Fallopian tube

Female Tubular Structures



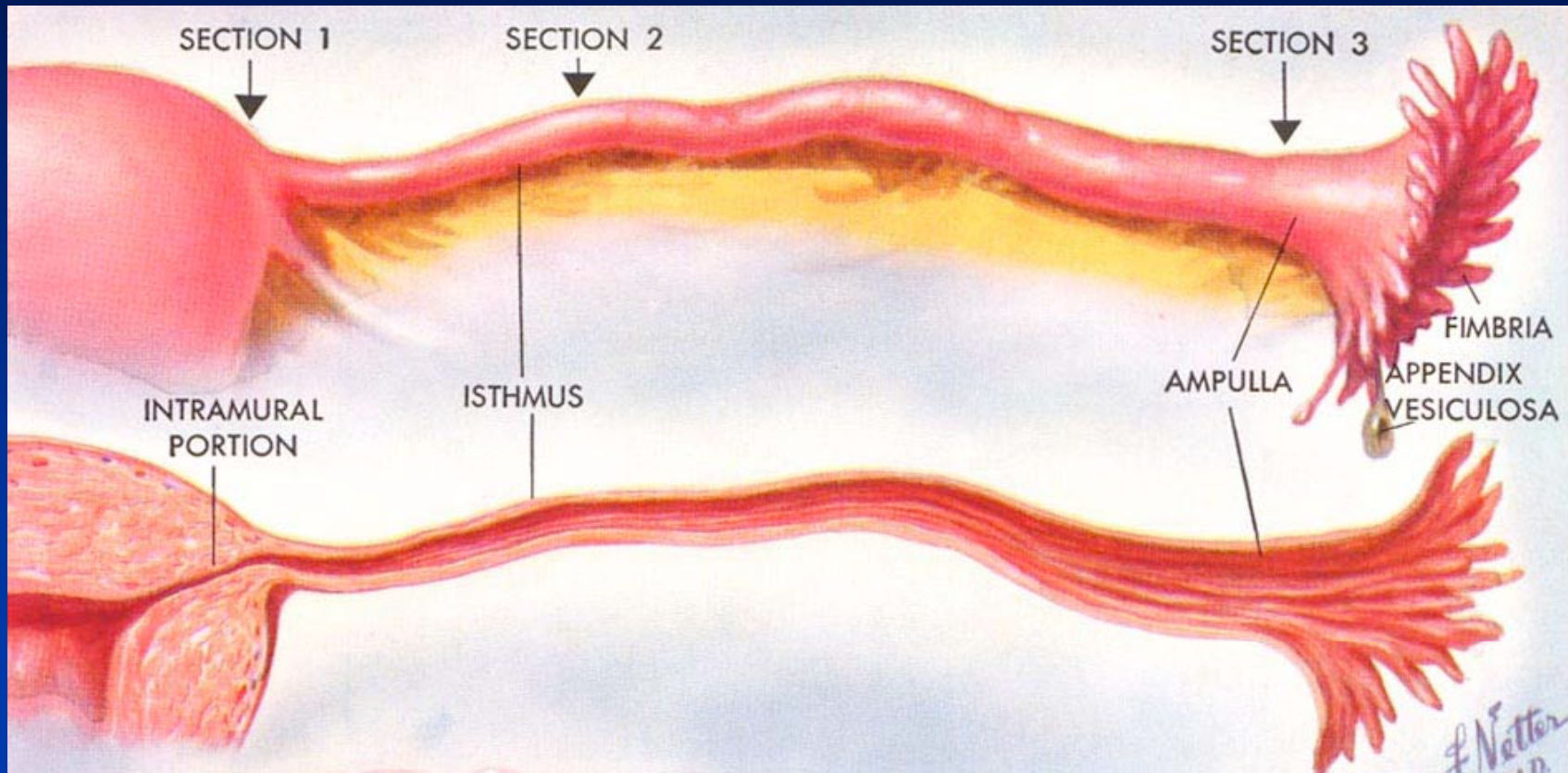
Fallopian tube

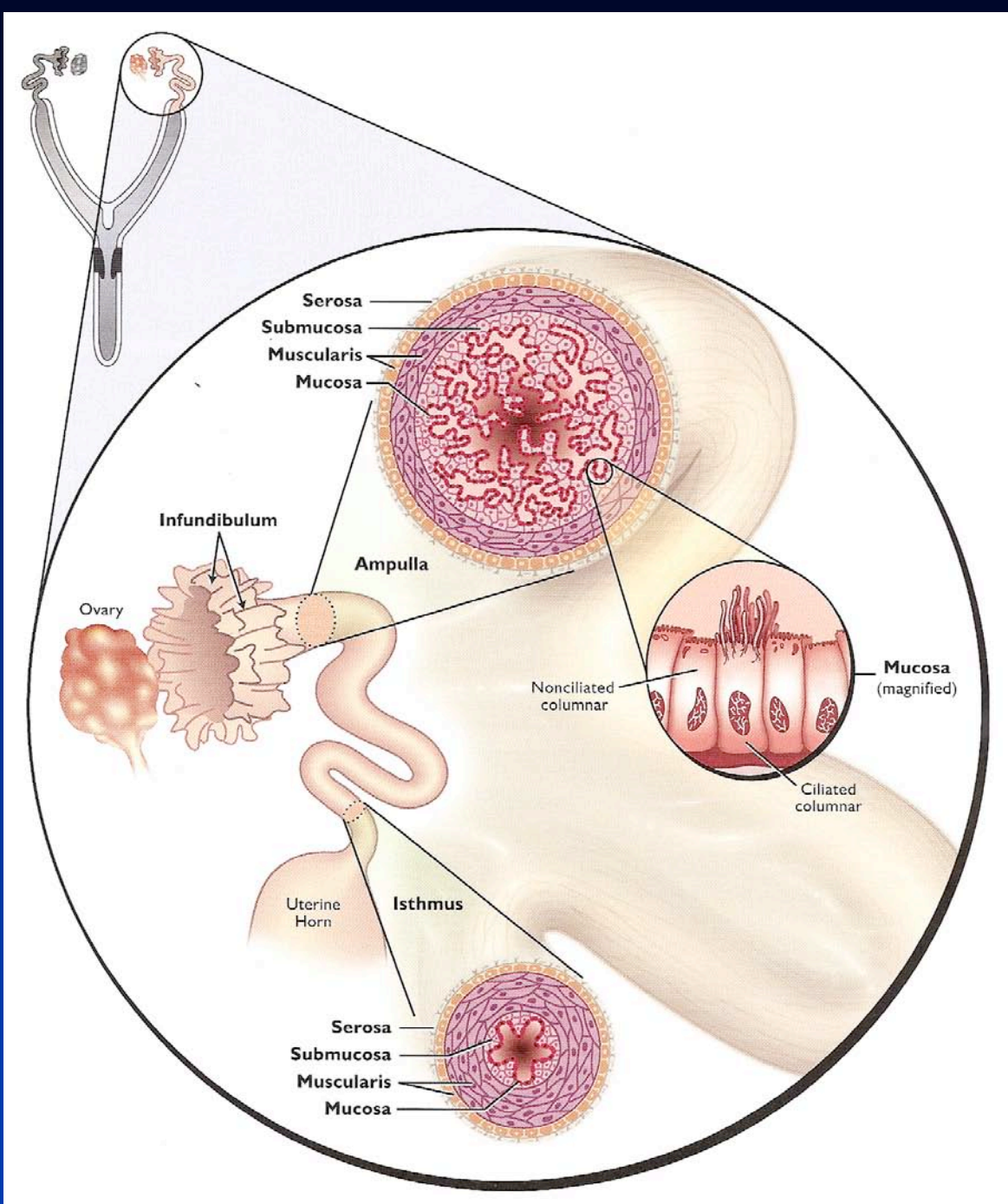
- ◆ after Fallopius
- ◆ three regions
 - infundibulum, ampulla, isthmus (& intramural region)
- ◆ **infundibulum** - top thin walled region that receives the egg
 - opening is **ostium**
 - finger-like projections are **fimbria**
- ◆ **ampulla** - ciliated for sperm and ova transport
 - region where egg is fertilized in many species
 - egg 'white' or albumen is secreted
- ◆ **isthmus** - junction with uterus
 - usually aglandular
 - **Intramural region** - region thru wall of uterus (mammals)

Fallopian Tube

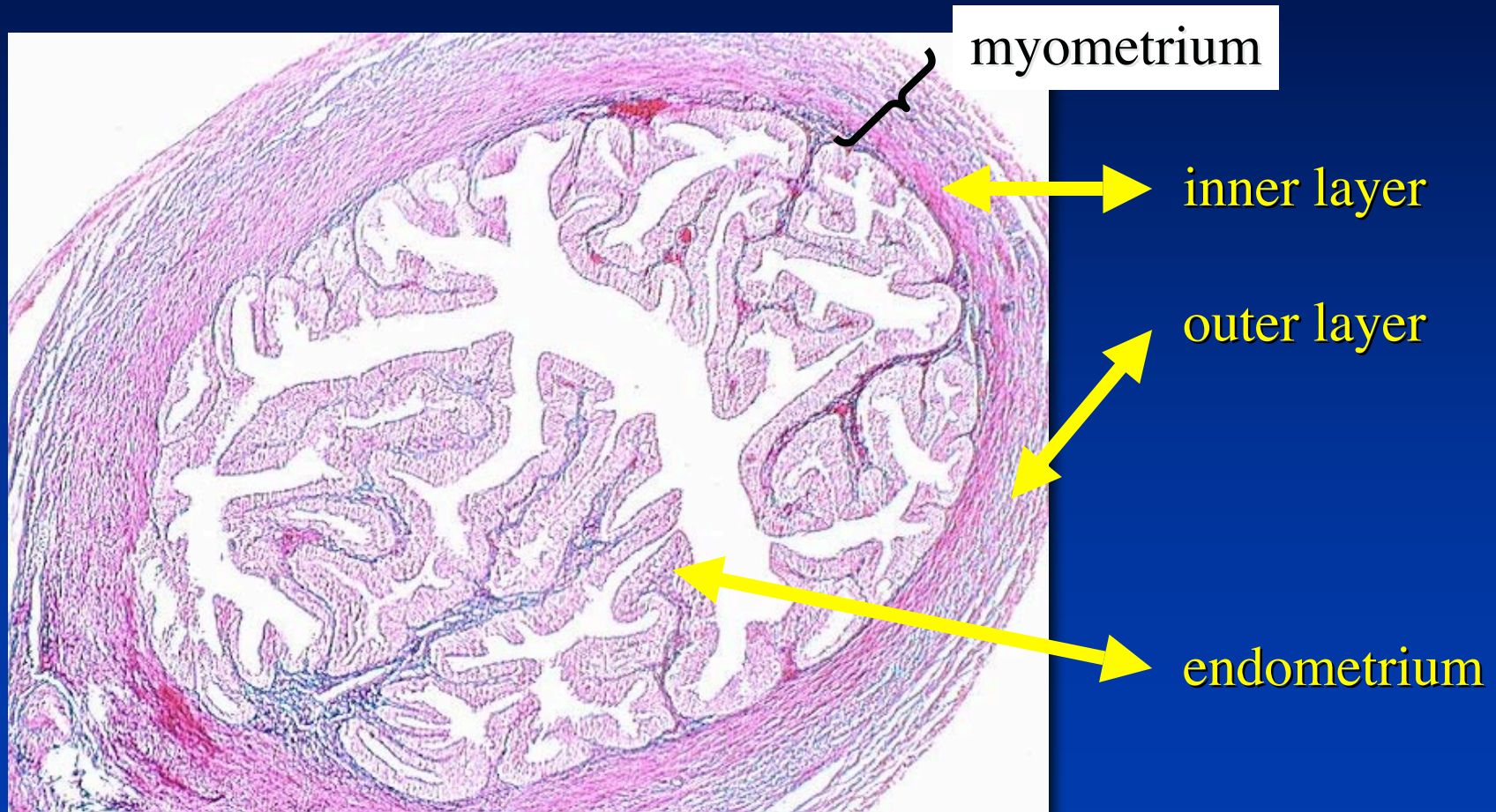
- ◆ thin walled muscular tube
- ◆ three layers
 - Serosa - outer connective tissue covering
 - Myometrium - thin layers of smooth muscle
 - ✦ Inner layer - circular
 - ✦ Outer layer - longitudinal
 - Endometrium - layer(s) of epithelial cells
 - ✦ Can be 'thrown into folds'

Mammalian Fallopian tube anatomy

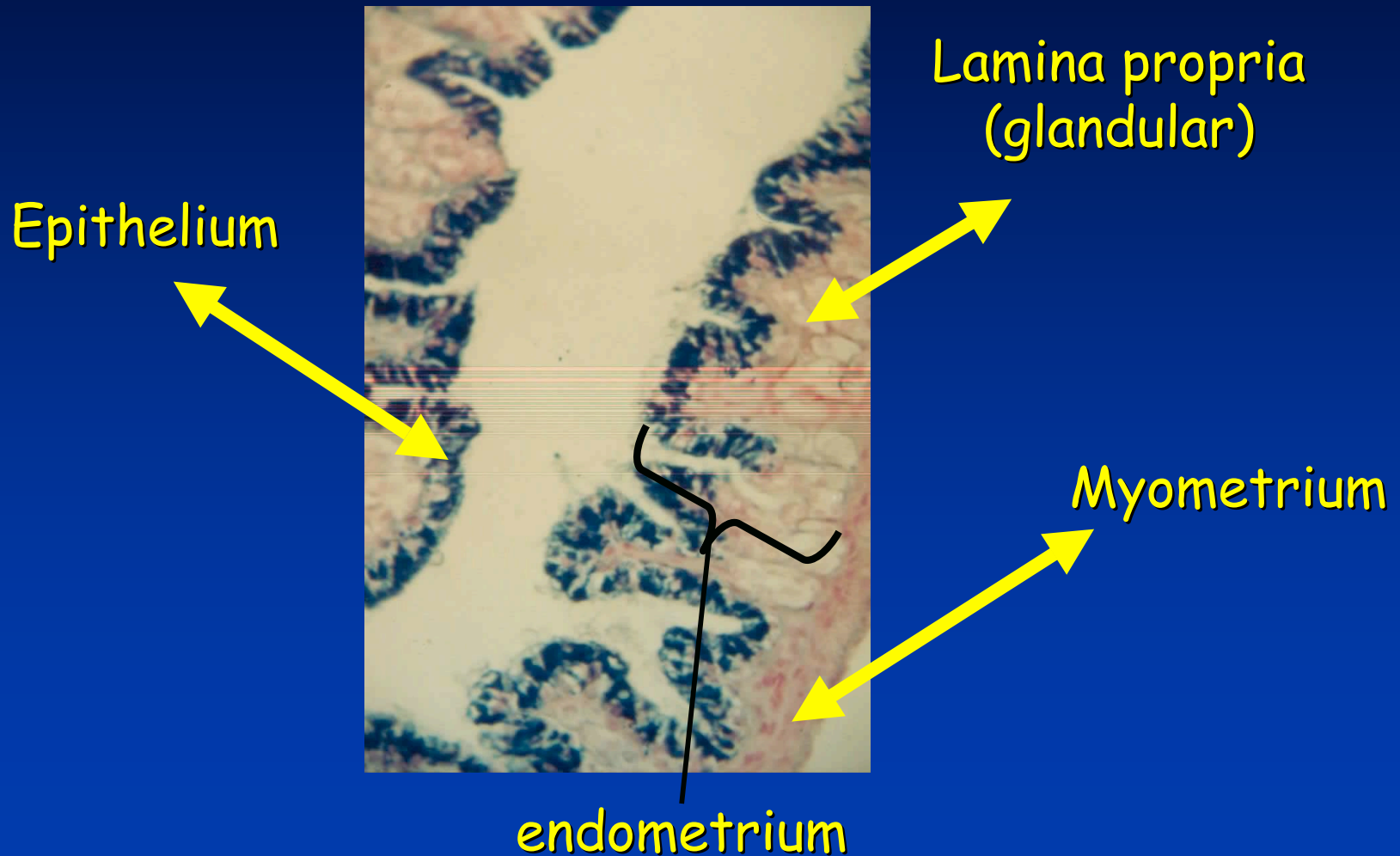




Mammalian Tube - Isthmus



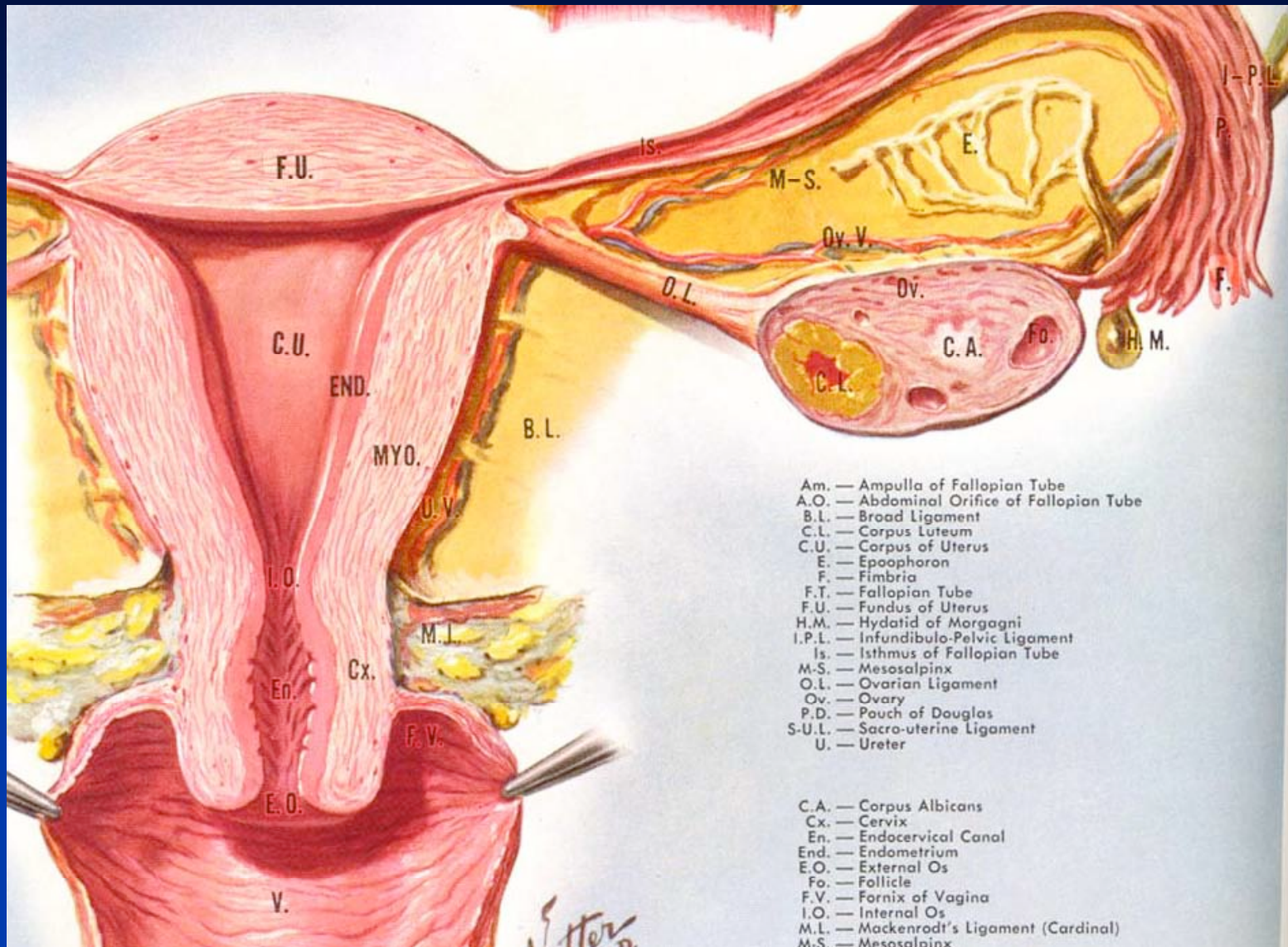
Reptilian Tube - Isthmus



Uterus

- ◆ thick walled muscular tube
- ◆ three layers
 - serosa, myometrium, endometrium
- ◆ region for egg / embryo development in viviparous species
- ◆ egg shell protein and calcium secreted in oviparous species
- ◆ structure and shape variable depending on species and stage of reproductive activity

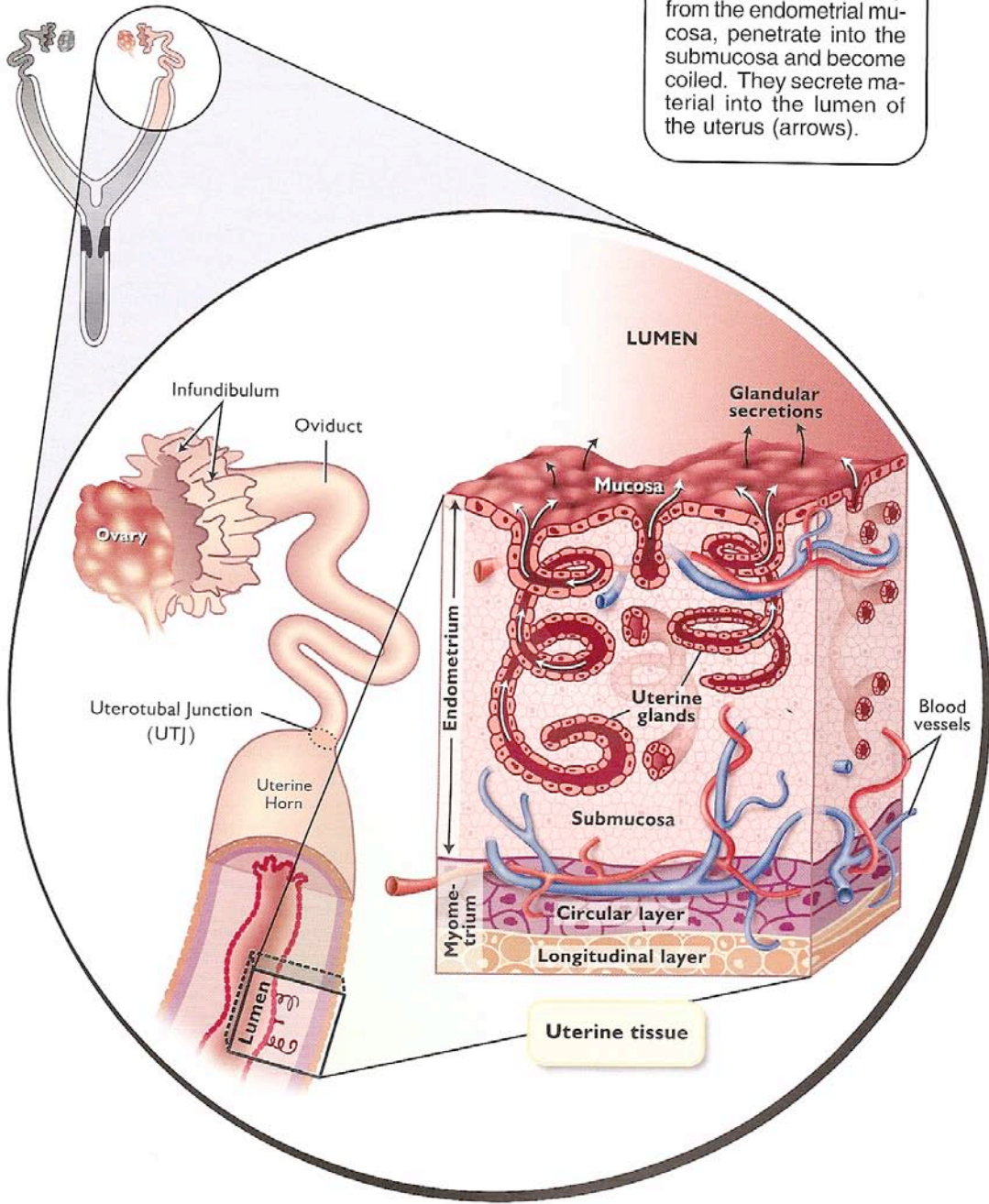
Human Uterine Anatomy



- Am. — Ampulla of Fallopian Tube
- A.O. — Abdominal Orifice of Fallopian Tube
- B.L. — Broad Ligament
- C.L. — Corpus Luteum
- C.U. — Corpus of Uterus
- E. — Epoothoron
- F. — Fimbria
- F.T. — Fallopian Tube
- F.U. — Fundus of Uterus
- H.M. — Hydatid of Morgagni
- I.P.L. — Infundibulo-Pelvic Ligament
- Is. — Isthmus of Fallopian Tube
- M-S. — Mesosalpinx
- O.L. — Ovarian Ligament
- Ov. — Ovary
- P.D. — Pouch of Douglas
- S-U.L. — Sacro-uterine Ligament
- U. — Ureter

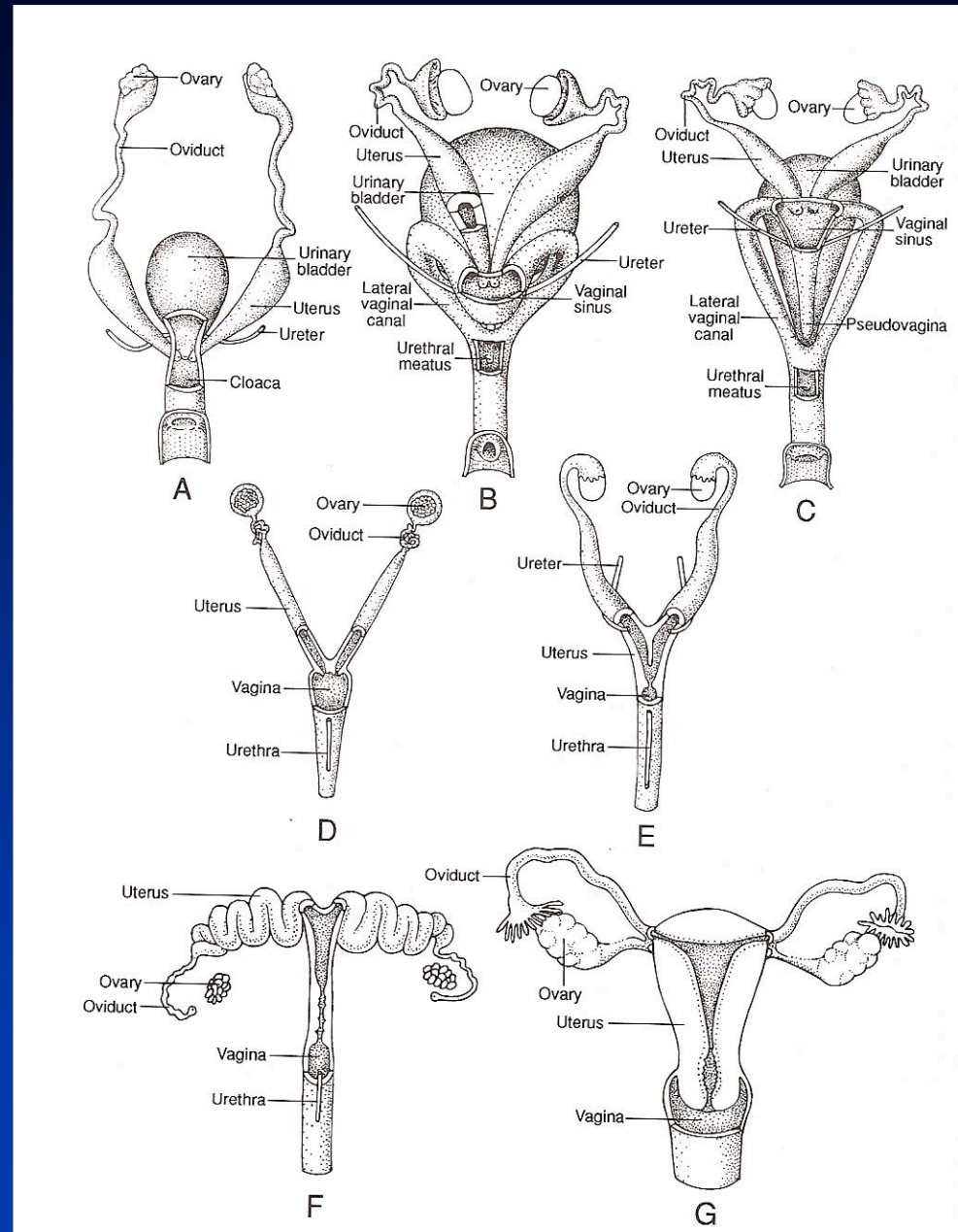
- C.A. — Corpus Albicans
- Cx. — Cervix
- En. — Endocervical Canal
- End. — Endometrium
- E.O. — External Os
- Fo. — Follicle
- F.V. — Fornix of Vagina
- I.O. — Internal Os
- M.L. — Mackenrodt's Ligament (Cardinal)
- M-S. — Mesosalpinx

Uterine glands develop from the endometrial mucosa, penetrate into the submucosa and become coiled. They secrete material into the lumen of the uterus (arrows).

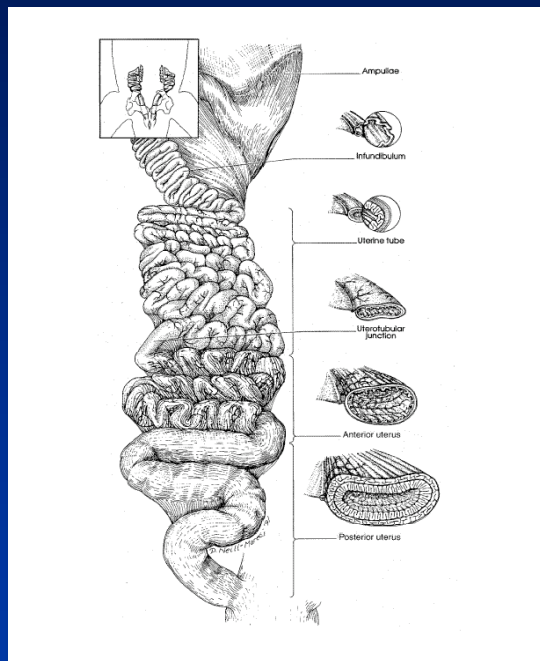


Mammalian Uteri

- ◆ A = Monotreme (Echidna)
- ◆ B = Marsupial (Opossum)
- ◆ C = Marsupial (Kangaroo)
- ◆ D = Eutherian (Rat)
- ◆ E = Eutherian (Cat)
- ◆ F = Eutherian (Pig)
- ◆ G = Eutherian (Woman)



Comparative Duct Systems

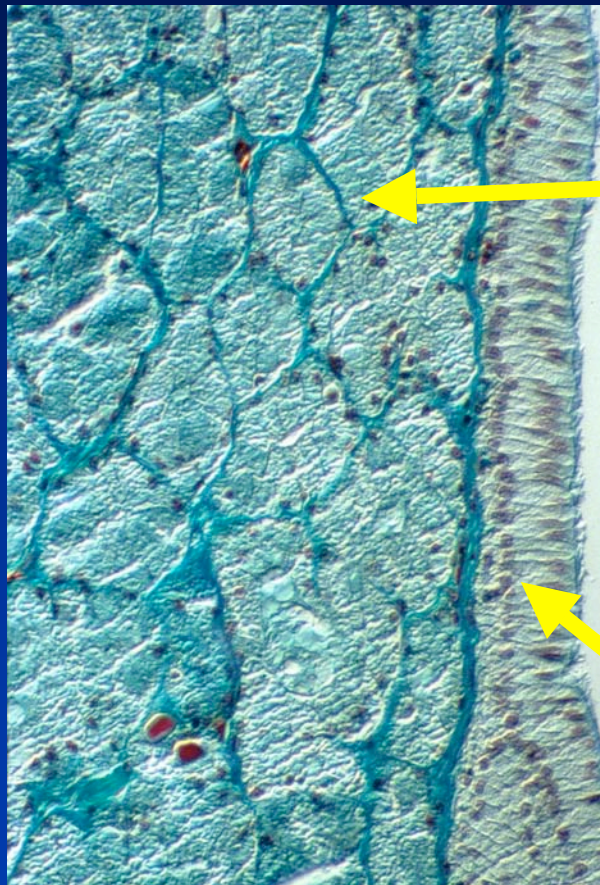


- ◆ Derived from Mullerian duct
- ◆ May have one or two 'horns'
 - Most birds have one
- ◆ Functions
 - Sperm transport
 - Egg shell/jelly production
 - Growth factor synthesis

Alligator Uterus - Isthmus

Fiber Region

Calcium Region

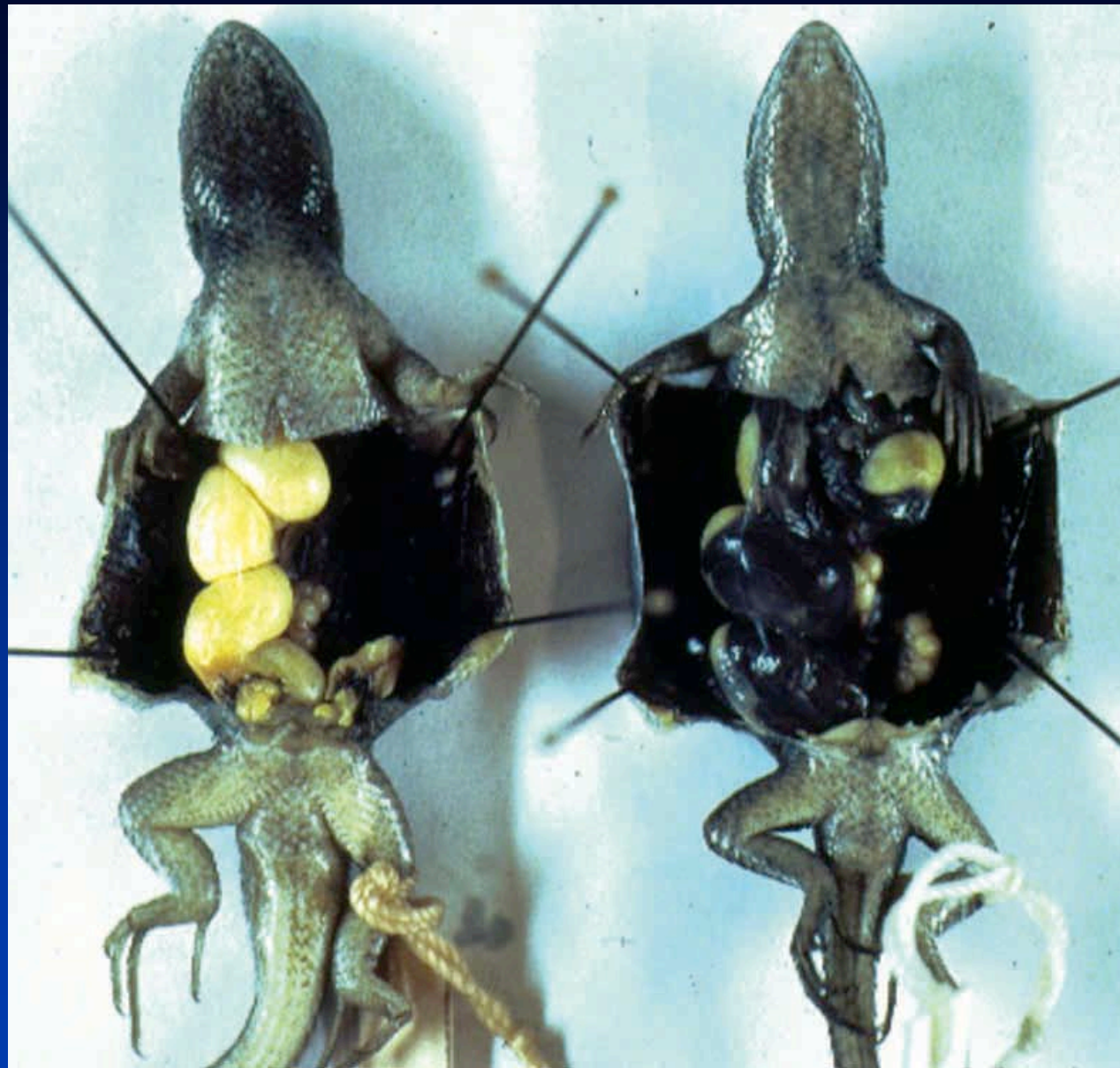


Lamina propria
(glandular)

Epithelium

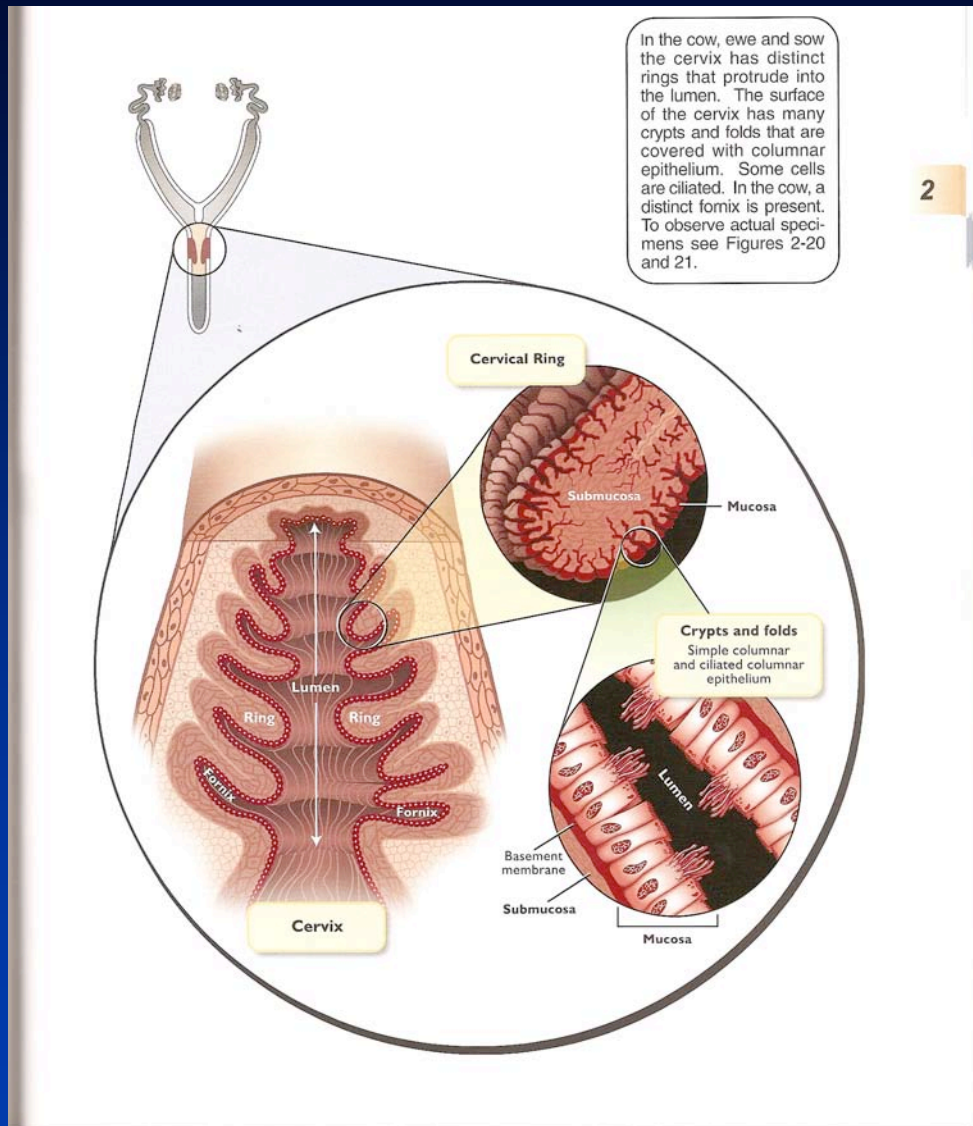
endometrium

endometrium



Cervix

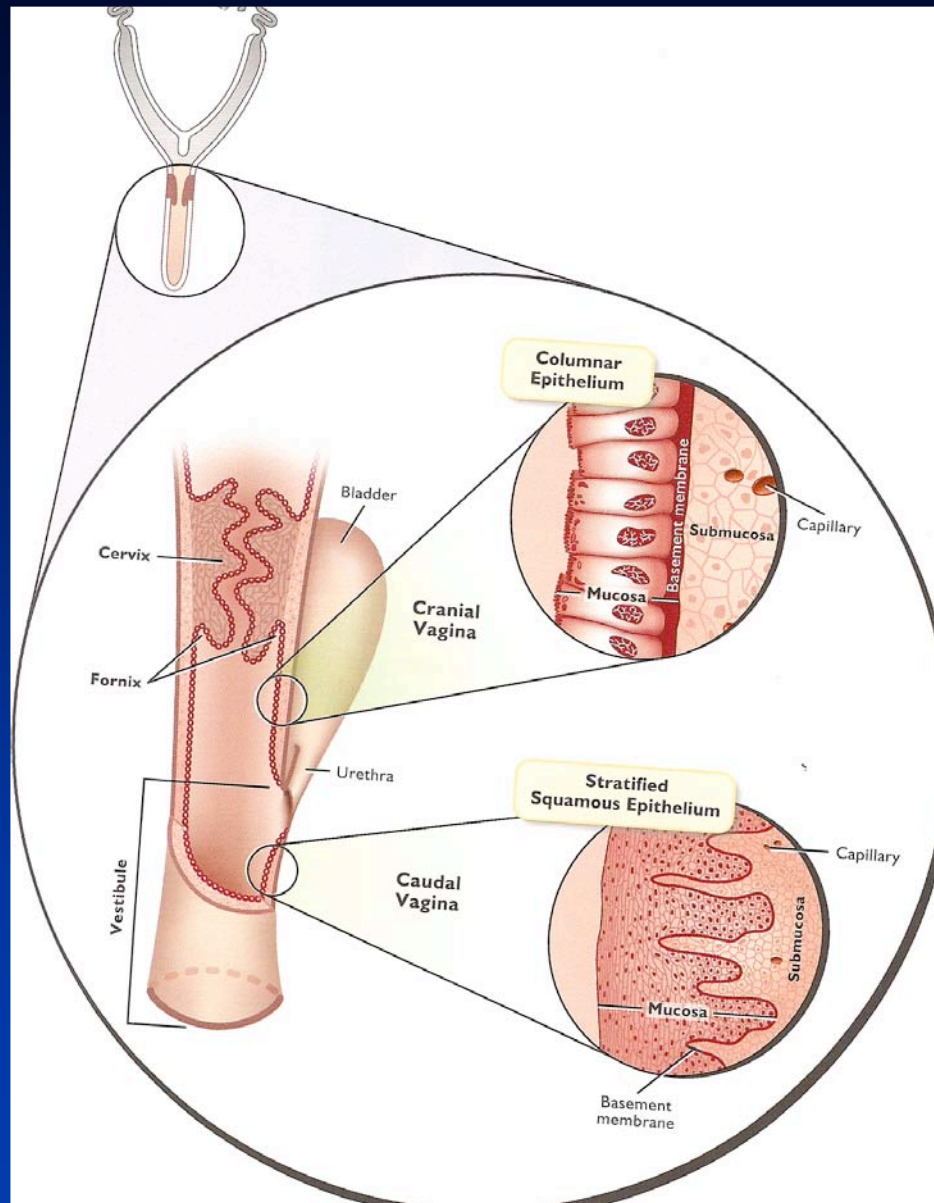
- ◆ Highly muscular walls
- ◆ Barrier to sperm
- ◆ Functions to retain egg in uterus



Vagina/Cloaca

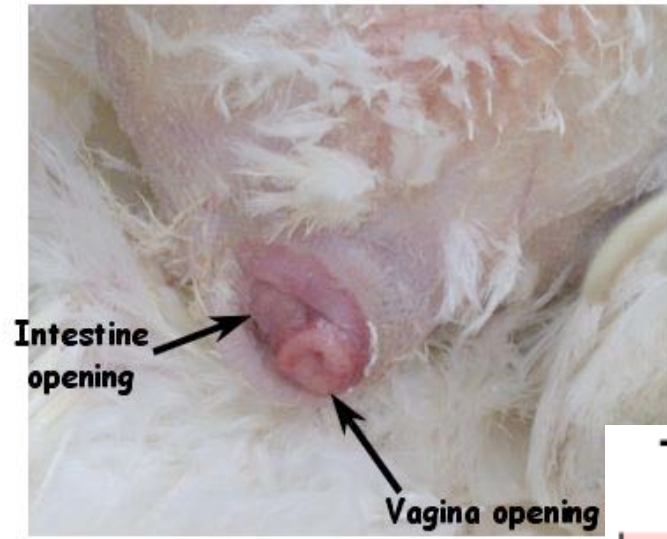
- ◆ communicates with outside and connects uterus via cervix
- ◆ receives sperm in internal fertilizers
- ◆ in some - connects to **cloaca** - common vestibule for urinary, digestive and reproductive systems

Vagina



- ◆ Thick muscular walls
- ◆ Sperm transport and selection
- ◆ Embryologically from two origins
 - Mullerian duct
 - External genitalia

Cloaca of Chicken



Cloaca

- ◆ Common region into which the vagina and intestine open
- ◆ Latin for 'sewer'
- ◆ Common in birds, reptiles

Typical Cloaca

