

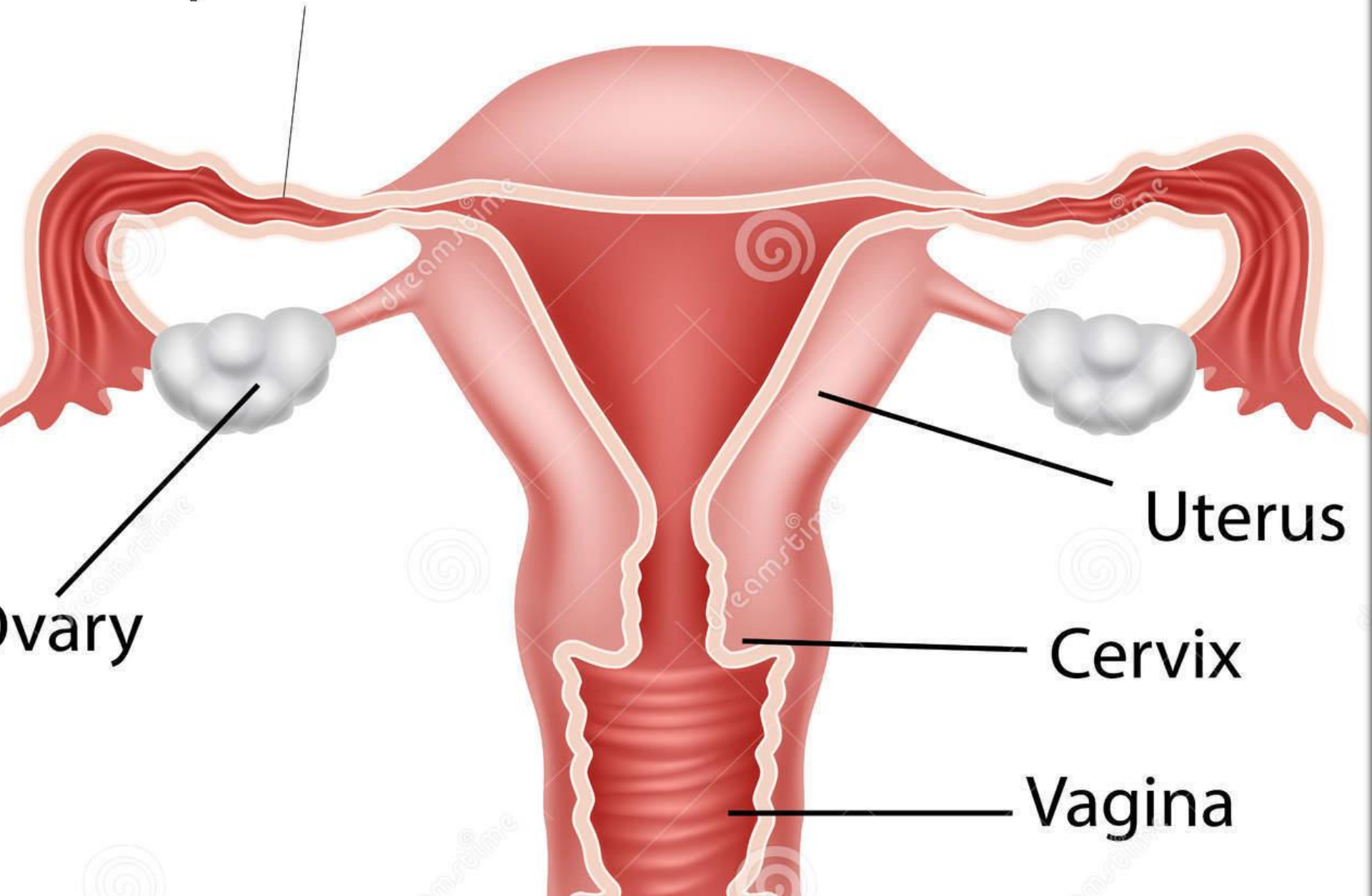
## 4. Supplementary gene action :

- The two independent dominant gene which interact in such a way that one dominant gene produces its effect. With the other dominant gene is present or not but when the second dominant gene is added to the first, a new modified character produced.
- Glume colour of millets is best example.

Phenotype	-	Purple	X	Brown
Genotype	-	PPqq	X	ppQQ
Gametes	-	(Pq)	X	(pQ)
F1 Generation	-	PpQq (Red purple)		
F1 Generation undergoes self pollination				

cont....

Fallopian tube

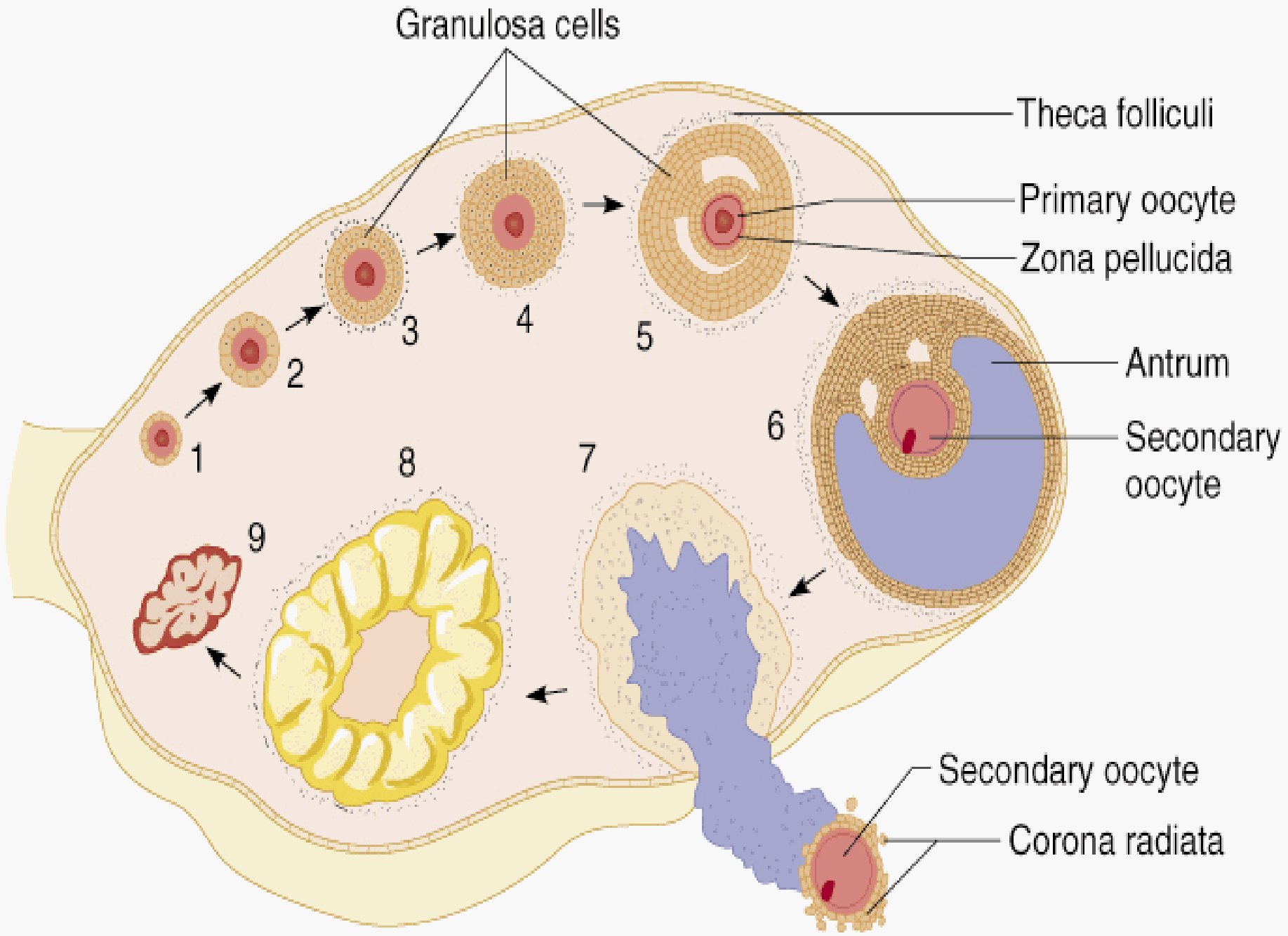


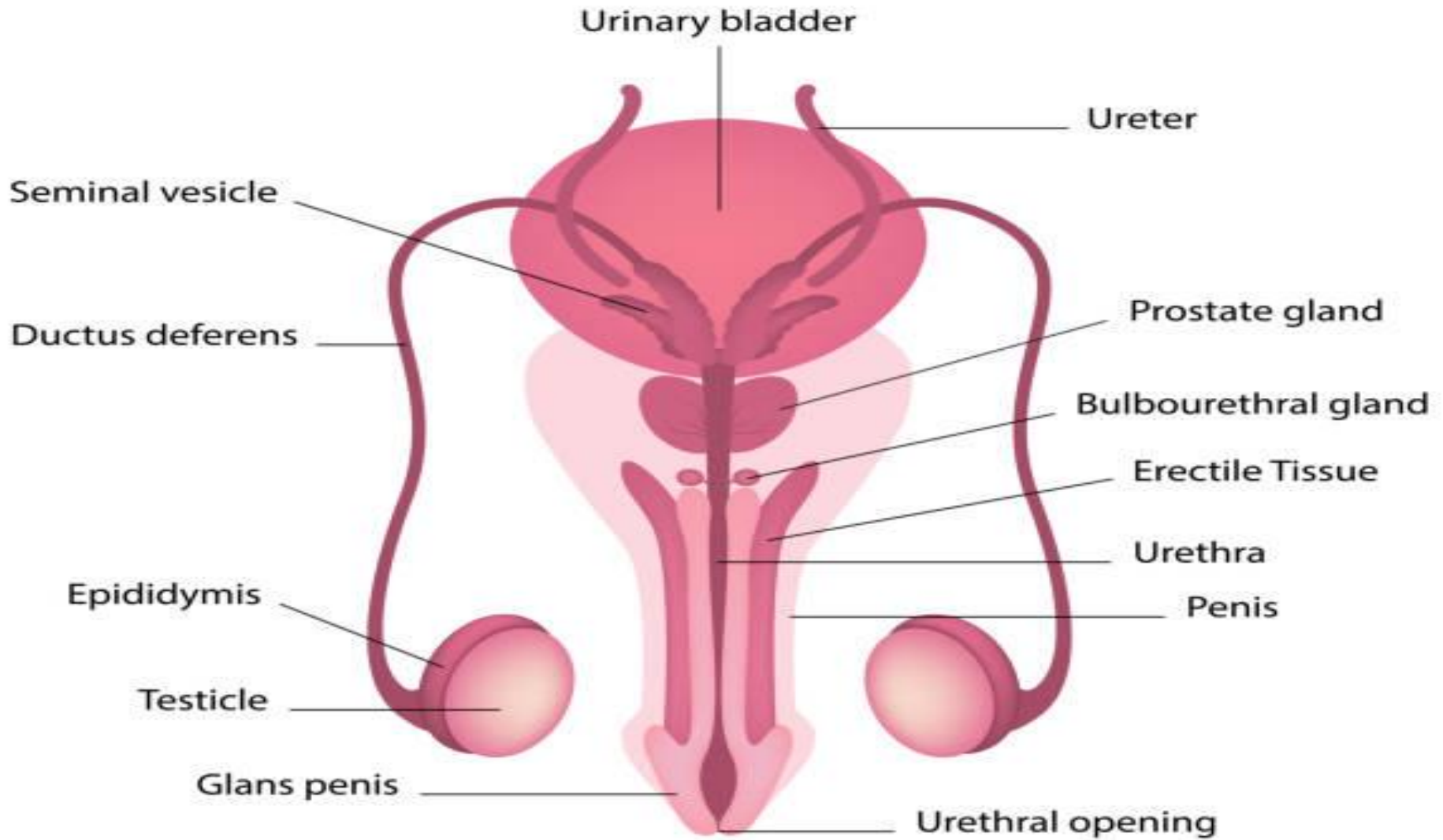
Ovary

Uterus

Cervix

Vagina





**Male reproductive system**

## **EXTRA EMBRYONIC MEMBRANES**

During amniote development, four **extraembryonic membranes** form around the embryo:

The **chorion** functions in gas exchange

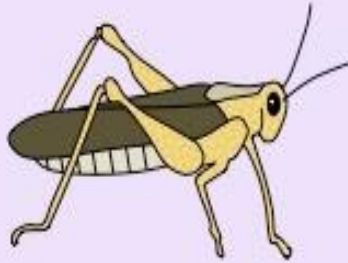
The **amnion** encloses the amniotic fluid

The **yolk sac** encloses the yolk

The **allantois** disposes of waste products and contributes to gas exchange

**The extraembryonic membranes in mammals are homologous to those of birds and other reptiles and develop in a similar way**

**X-0  
SYSTEM**



**Z-W  
SYSTEM**



**HAPLO-DIPLOID  
SYSTEM**



**FEMALE**

22 +  
XX

76 +  
ZW

32  
diploid

**MALE**

22 +  
X

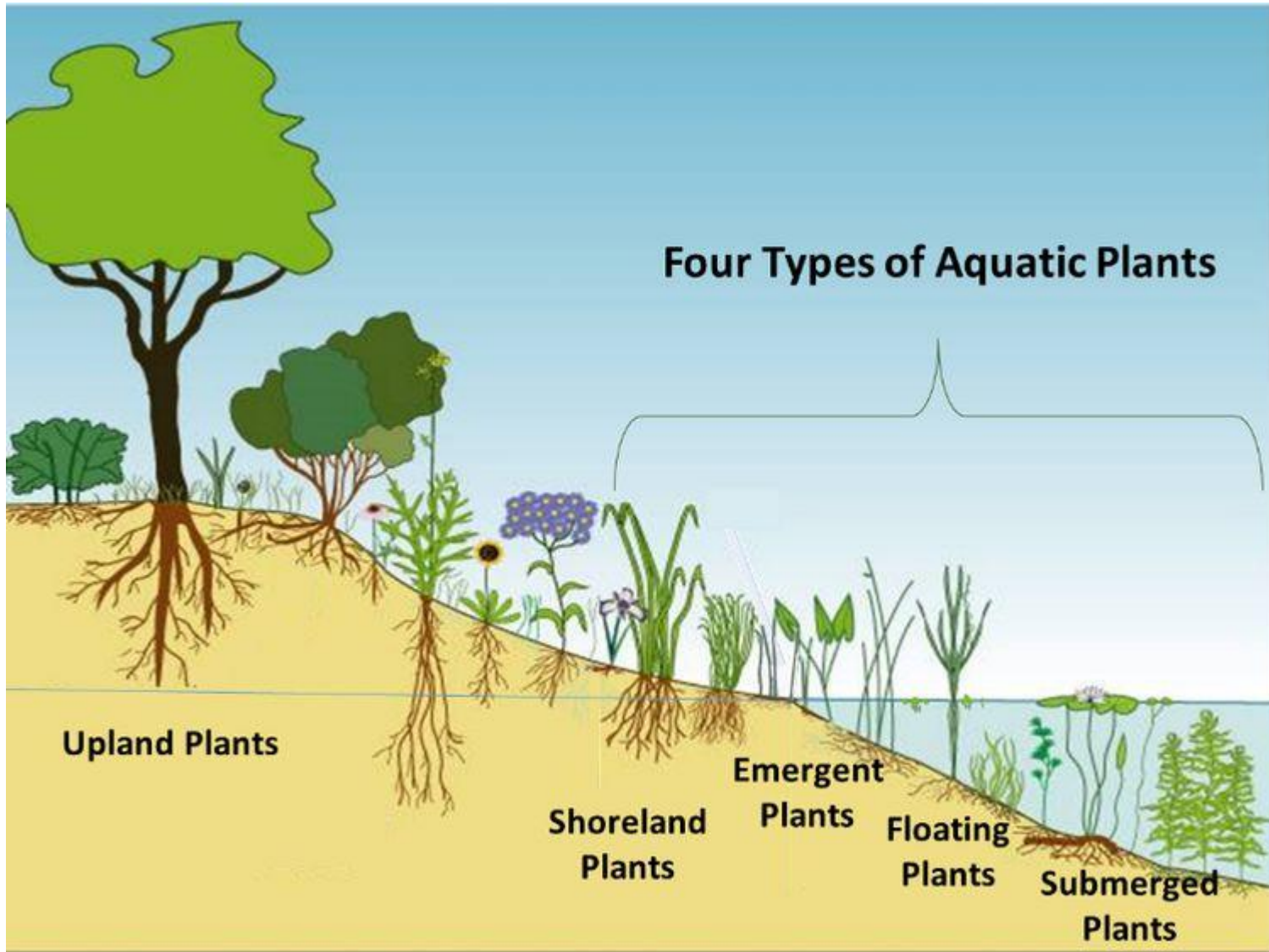
76 +  
ZZ

16  
haploid

# Classification of Weeds

- **Classification of Weeds**
- 1. Floating weeds : Eichornia, Pistia, Azolla, Lenpa, etc.
- 2. Marginal weeds : Colecasia, Typha, Cyperus, Marsilia, etc.
- 3. Emergent weeds : Nymphae, Myriophyllum, Nelumbo, etc.
- 4. Submerged weeds: Hydrilla, Valisnaria, Chara,, Ceretophyllum, etc.
- 5. Algal weeds : Spirogyra, Microcystis, Oscillatoria, Dinoflagellates, etc.,

## Four Types of Aquatic Plants







Catla Fish



Rohu Fish



Common Carp



Mrigal Fish



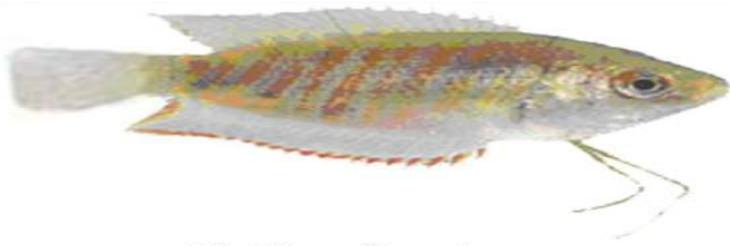
Silver Carp



Grass Carp

# Common predatory fishes are:

- **Common predatory fishes are:**
- *Channa spp., Clarias batrachus, Heteropneustes fossilis, Pangsius, Mystus sp. Ompok spp., Wallage attu and Glossogobius giuris* etc.
- **Weed Fishes**
- These are uneconomical, small sized, naturally occurring or introduced accidentally in ponds along with fish seeds.
- They compete for food, space and dissolved oxygen.
- They have high fecundity and breed well before major carps breed.
- Many of them breed throughout the year.
- Therefore, fish seeds from wild contain seeds of weed fishes.
- **Common weed fishes are:**
- *Puntius sp., Oxygaster sp., Ambassis sp., Amblypharyngodon mala. Colisa sp., Rasbora sp., Aplocheilus sp., Laubuca sp., Esomus danricus,* etc.



*Colisa fasciatus*



*Oreochromis mossambica*



*Oryzias melastigma*



*Danio (B) rerio*



*Esomus danricus*



*Puntius ticto*



*Puntius sophore*



*Rasbora daniconius*



*Rasbora elegans*



*Aplocheilichthys panchax*

## LARVIVOROUS FISH(CONTD)

- Useful in ornamental tanks, wells, Garden ponds, fountains, swimming pools, large water collection.
- Approximately 5 fish per sq.m of water surface.

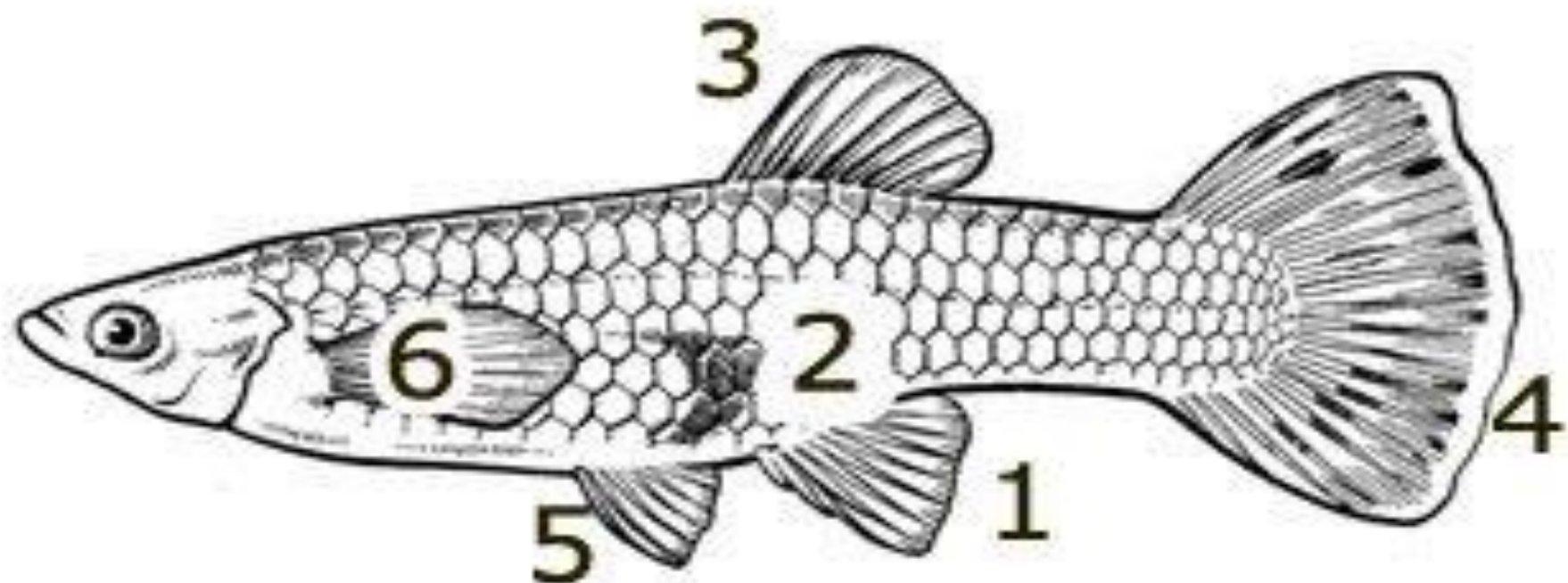
### Advantages

- a. Long term effective control measure.
- b. Cost effective.
- c. Environmentally safe.
- d. Controls variety of mosquito species.

### Disadvantages

- a. Effective when large numbers eventually establish themselves.
  - b. takes 1-2 months; not suitable - quick anti larval measures are needed.
- needed.

# FEMALE GUPPY



1. ANAL FIN - fan shaped in a female
2. GRAVID SPOT - holds eggs
3. DORSAL FIN - females have smaller dorsal fins
4. CAUDAL FIN - less fancy, and smaller in females
5. PECTORAL FIN
6. PELVIC FIN - same location in males.

# Normal Human Karyotype



1



2



3



4



5



6



7



8



9



10



11



12



13



14



15



16



17



18



19



20



21



22

Autosomes



or



XX (female) XY (male)

Sex Chromosomes

# Monosomy - Turner Syndrome



Autosomes



Sex Chromosomes

# Main Points of Darwin's Theory of Natural Selection

## **1. Over production.**

Most organisms produce more offspring than can survive.

## **2. Competition.**

Organisms compete for food and resources.

## **3. Variation.**

There is variation among individuals of a species.

## **4. Adaptation.**

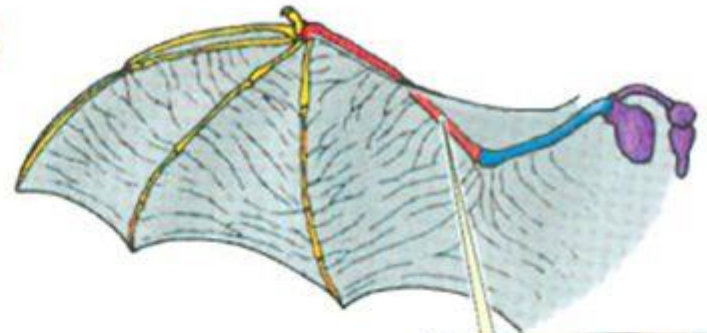
Individuals with traits best suited to the environment will survive.



\* Examples of analogous structures:

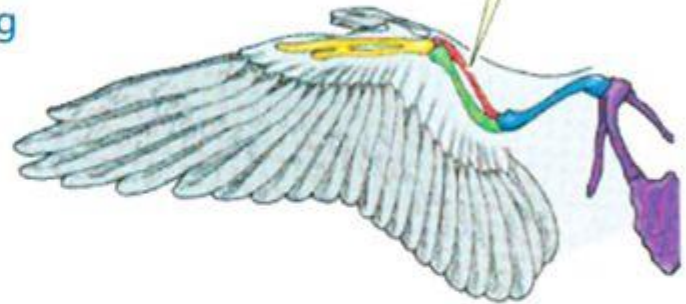
- insect's wing
- bird's wing
- bat's wing

Bat wing

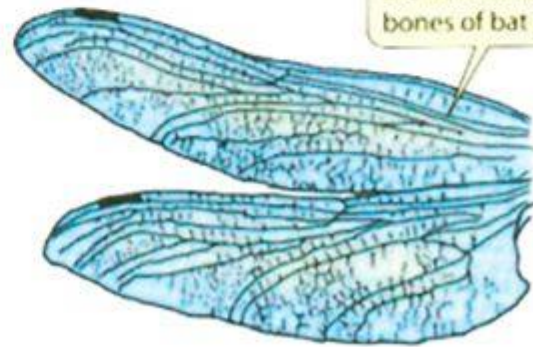


Bones shown in the same color are homologous.

Bird wing

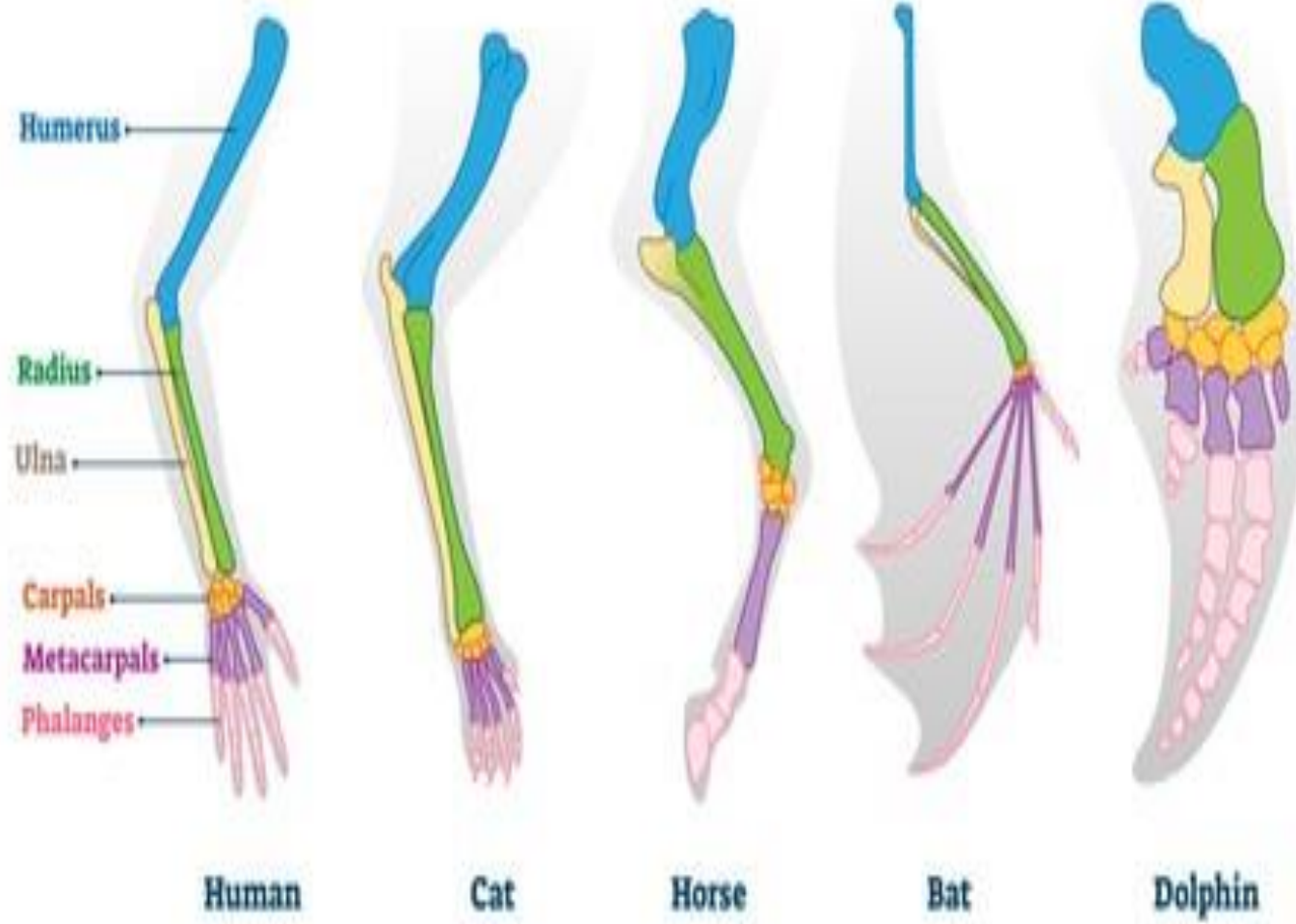


Insect wing

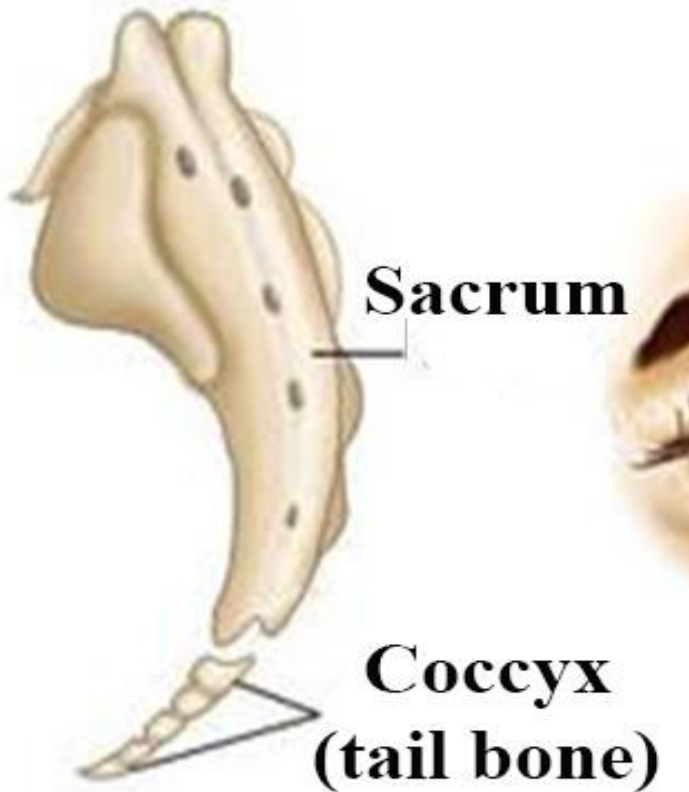


The supports for insect wings are not homologous with the bones of bat and bird wings.

# HOMOLOGOUS STRUCTURES



# Vestigeal Organs



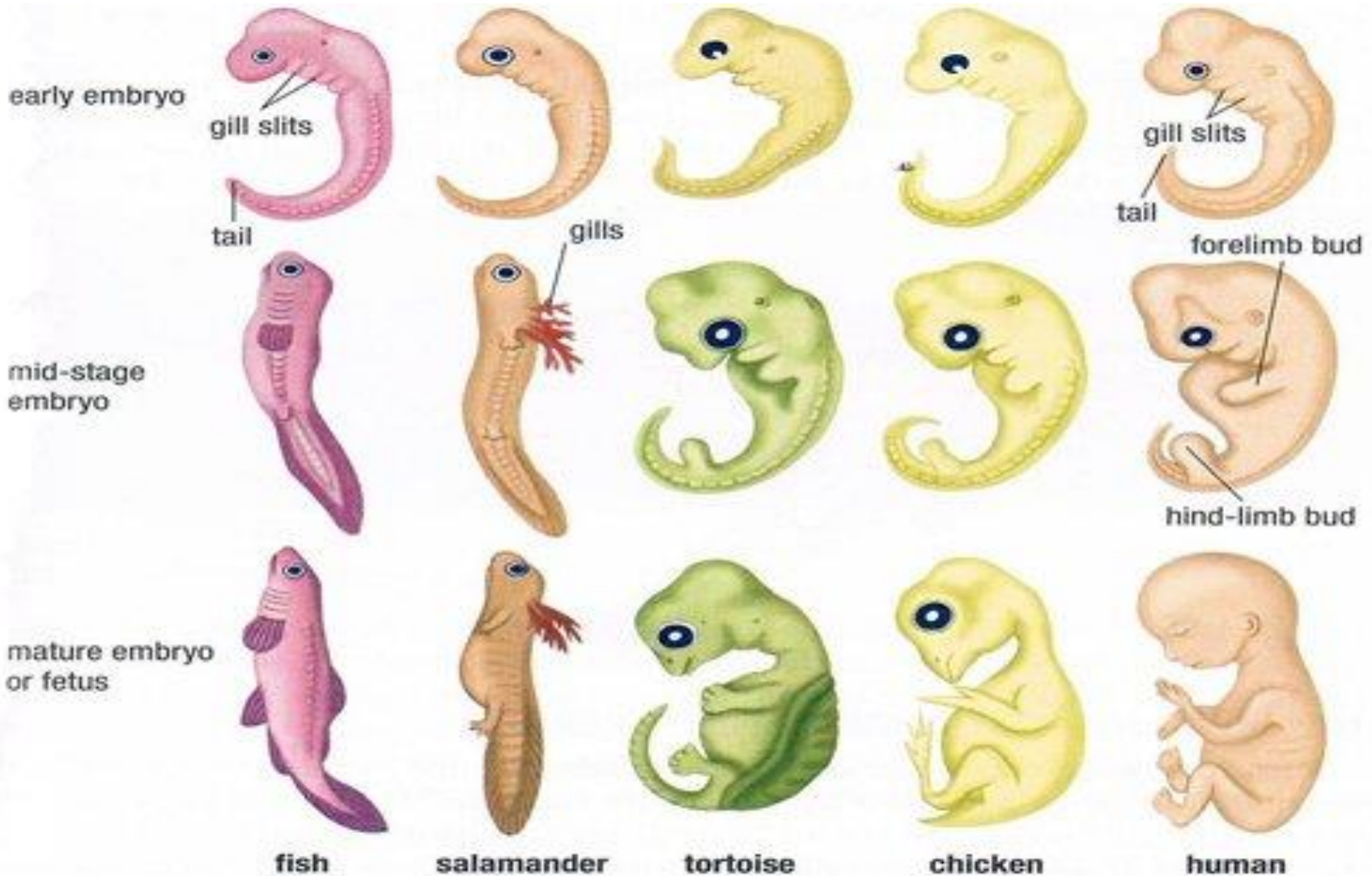
**Tail bone in human  
being**



**Nictitating membrane  
in the eyes of man  
(Left) and ape (Right)**

# Embryological Evidence

## Biogenetic law



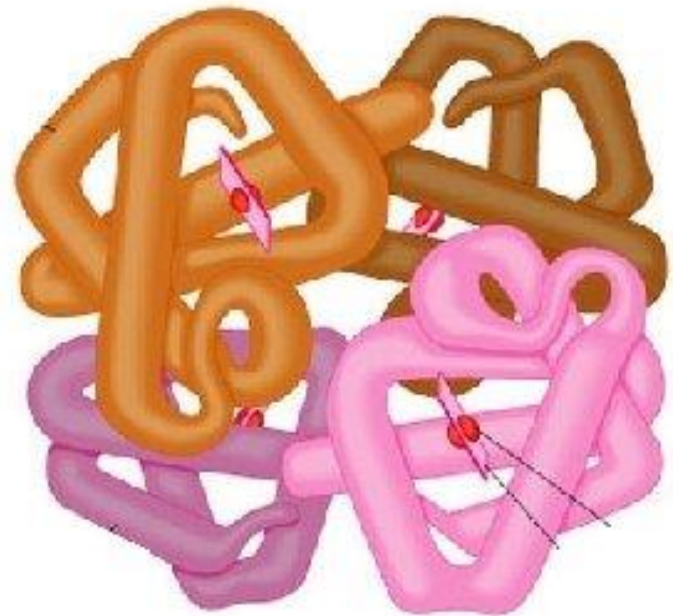
# Biochemical Evidence for Evolution

## Studying Proteins

= Over time, similar proteins in different species become increasingly different... suggesting the molecules are undergoing an evolution

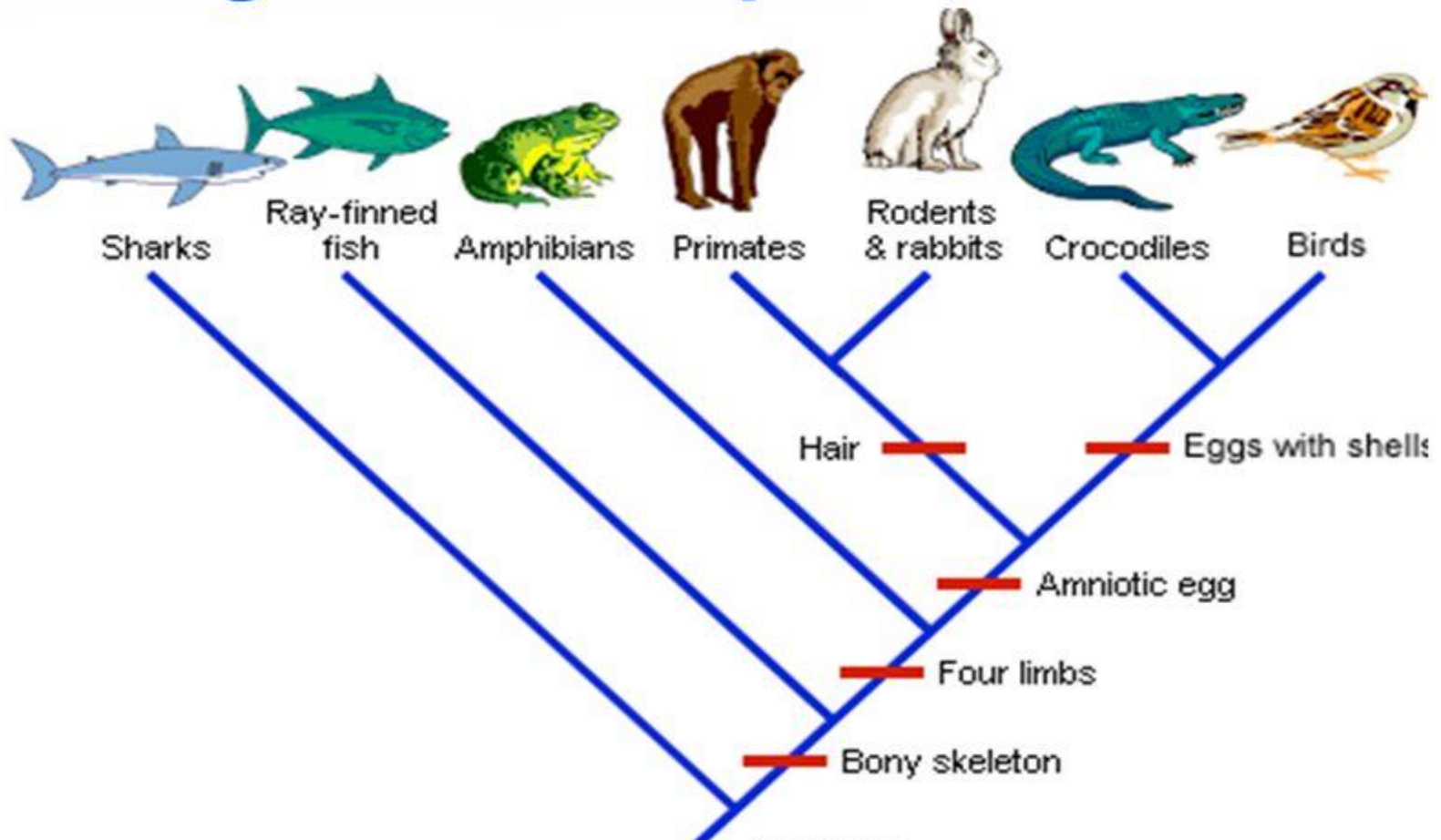
### Example:

Amino acid sequence differences among Hemoglobin molecules

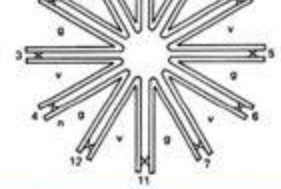


# Phylogenetic Tree

## Cladogram Example:



# Hugo de Vries



*Oenothera* ring chromosomes

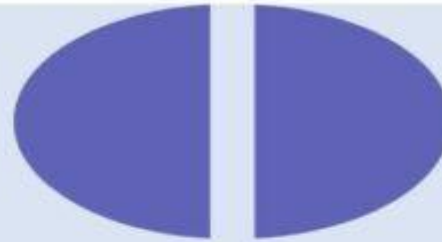


- De Vries studied plant hybrids, with particular emphasis on the evening primrose, *Oenothera lamarckiana*
- de Vries noted distinct traits which bred true which he believed indicated that species arose through sudden spontaneous mutations causing significant morphological changes
- He was wrong! Not in the data, but in the mechanism.

# ALLOPATRIC SPECIATION: STEPS



**ORIGINAL  
POPULATION**



**INITIAL STEP OF  
SPECIATION**

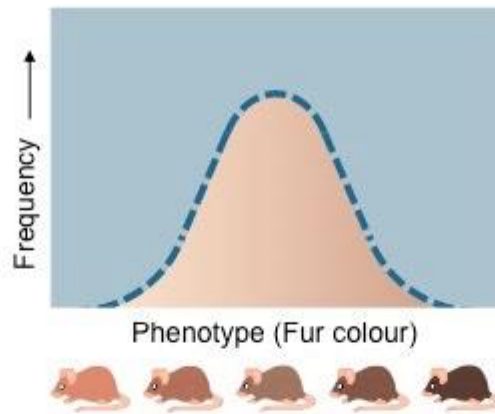


**EVOLUTION OF  
REPRODUCTIVE  
ISOLATION**

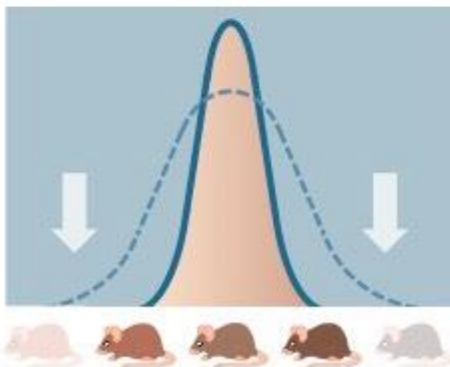


**NEW DISTINCT  
SPECIES APPEAR**

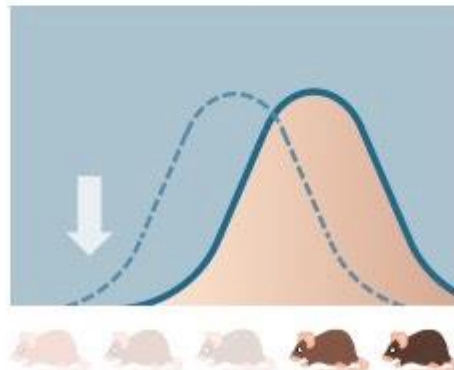




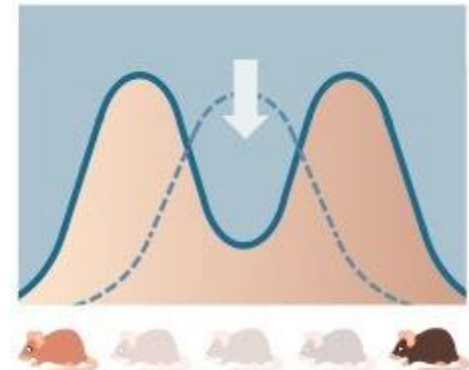
**Normal Distribution**  
Gaussian (bell-shaped) trend



**Stabilising Selection**  
Culls extreme variations  
Narrows width of distribution



**Directional Selection**  
Favours one extreme  
Shifts distribution left / right



**Disruptive Selection**  
Favours both extremes  
Creates bimodal distribution