Introduction to Animal Science

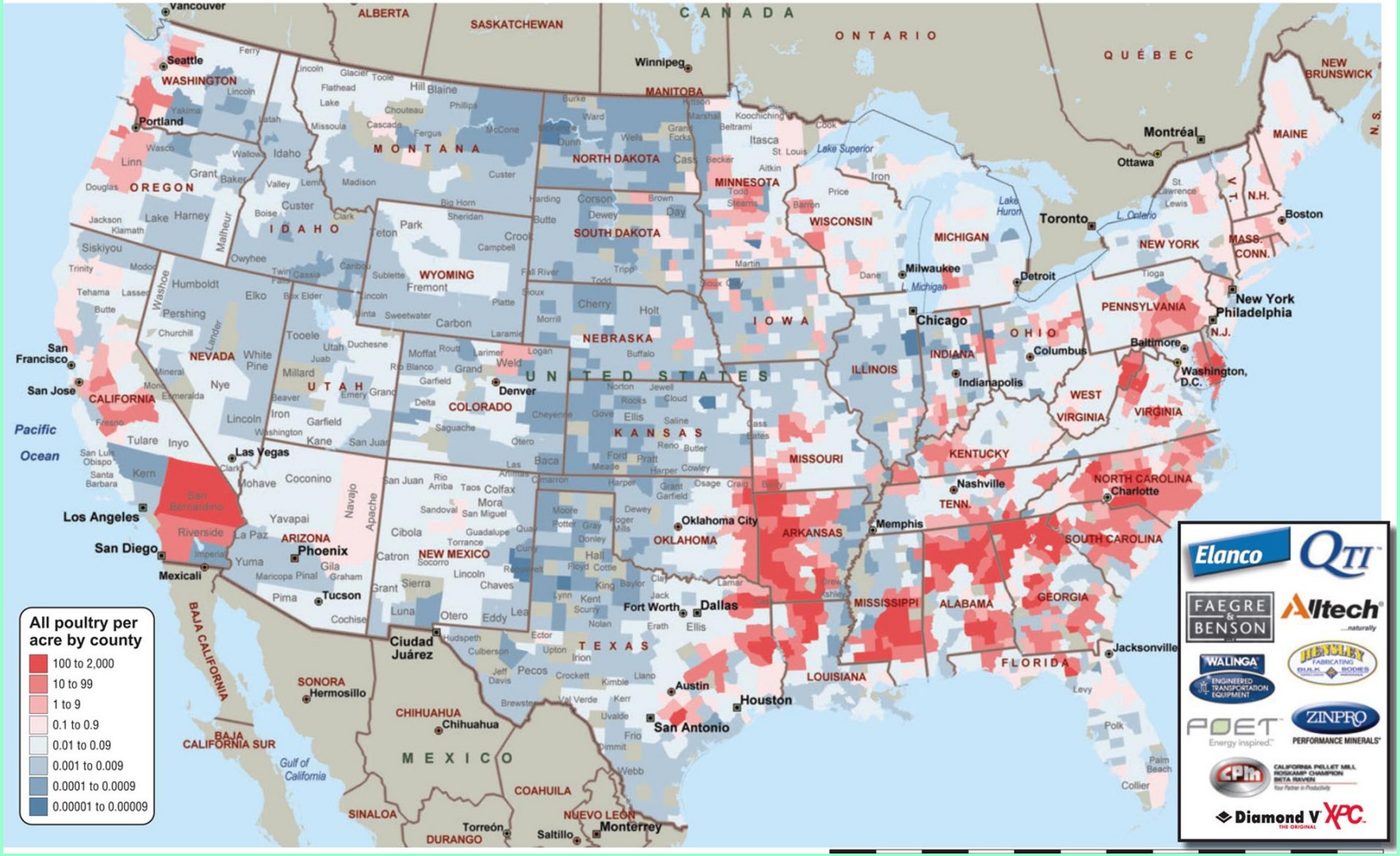
POULTRY

Lecture 1

Adapted by Tony Seykora

from a Power Point by Dr. Jacquie Jacob, Poultry Specialist at the U of MN

Poultry density by county



2007 – includes broilers, laying hens, and turkeys

POULTRY

- **Define the term ‘poultry’**

POULTRY

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  - **Singular or plural?**

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    - **Chickens, turkeys,**
    - **geese, ducks, pigeons,**
    - **pheasants, ostriches,**
    - **quail, etc.**

POULTRY

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  - **Singular or plural?**
  - **What specie(s) are considered poultry?**
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  - **What are poultry raised for?**

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  - **Singular or plural?**
  - **What specie(s) are considered poultry?**
    - **Chickens, turkeys, geese, ducks, pigeons, pheasants, ostriches, quail, etc.**
  - **What are poultry raised for?**
    - **Meat, eggs, feathers/down, livers, entertainment, work (e.g., pigeons that carry messages)**

POULTRY PHYSIOLOGY

- **How does poultry anatomy and physiology differ from mammalian anatomy and physiology?**

POULTRY VS MAMMALIAN ANATOMY AND PHYSIOLOGY

- **Integument - "The covering of the body"**
  - **Feathers - All birds have feathers and no other animals do**
- **Function of feathers:**
  - **Provide protection from the elements**
  - **Help regulate body temperature**
  - **Help streamline the body for flight**

- **Integument - "The covering of the body"**

Different types of feathers

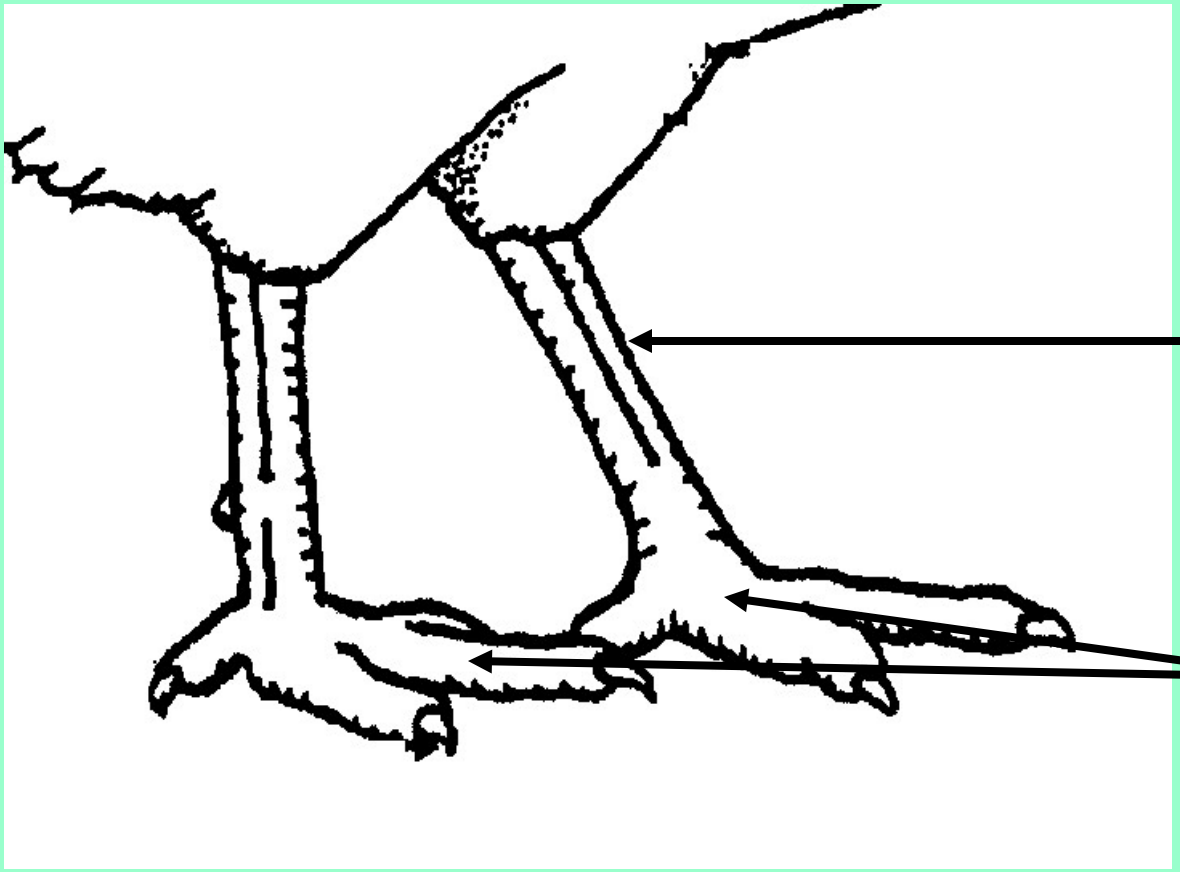
  - **Each with a specific function**
  - **Each with specific structural feathers enhancing its functional purpose**

- **Integument - "The covering of the body"**
- **Skin is thin and pliable**
  - **Doesn't need to be thick since the feathers provide a protective cover**
  - **Possess feather tracts that arrange feathers in a definite pattern**
  - **Does not contain sweat glands**
  - **Contains one major oil gland**
  - **Located at the base of the tail**
    - **Oil is removed from the gland when squeezed by the birds beak and the oil is spread over the body feathers during preening**

SKIN

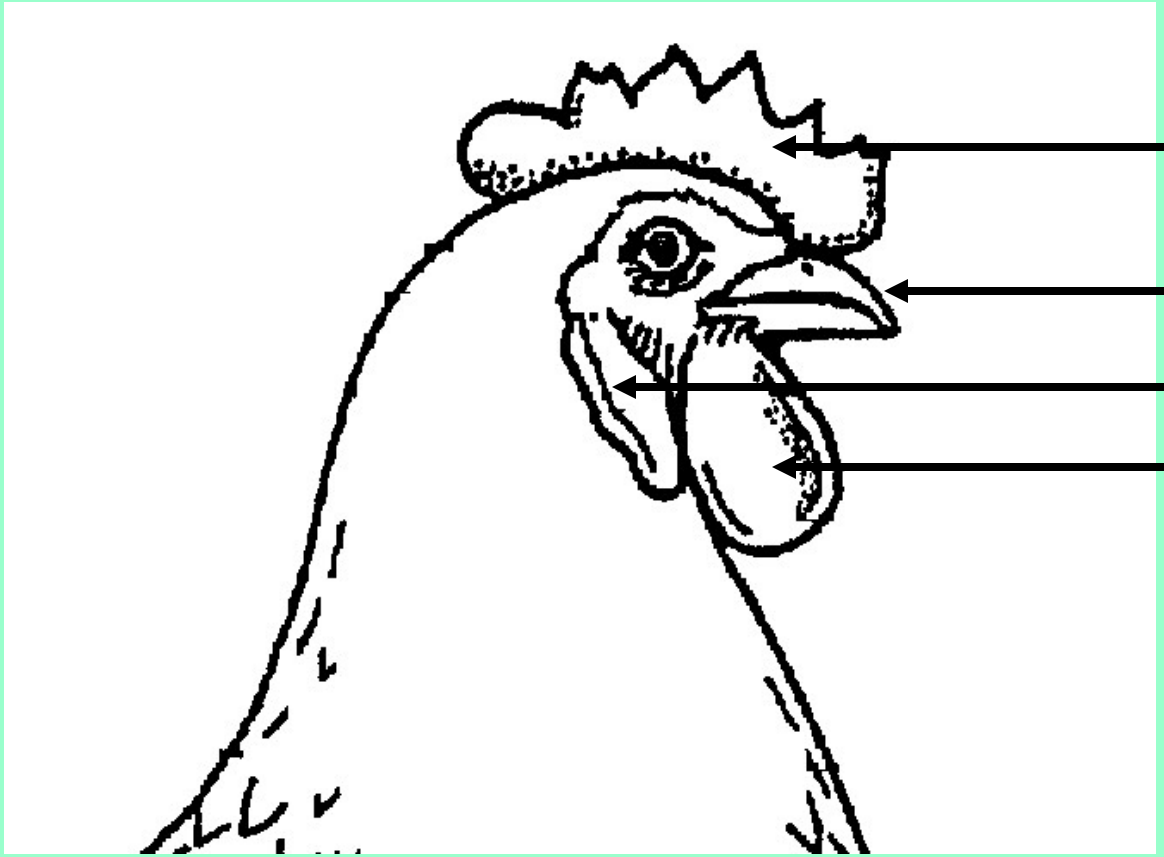
- **Specialized types of skin:**
  - **Scales of the shanks and toes**

Feet



SKIN

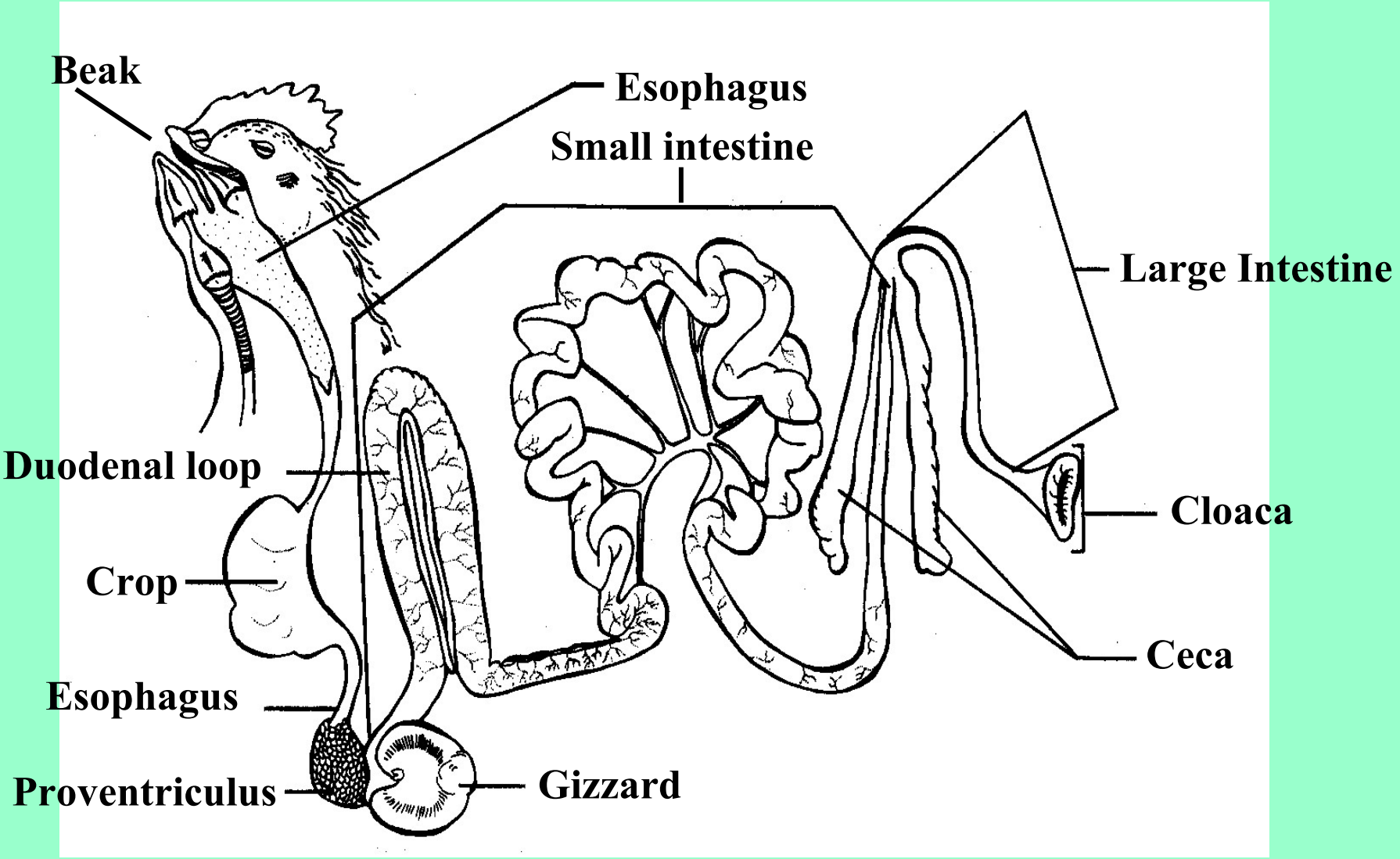
- **Specialized types of skin:**
  - **Scales of the shanks and toes**
  - **Comb and wattles**
  - **The beak is covered by a thin layer of skin**
  - **Ear lobes**


Comb
Beak
Ear lobe
Wattle

POULTRY VS MAMMALIAN ANATOMY AND PHYSIOLOGY

- **Digestive system**
  - **Differences ?**

CHICKEN DIGESTIVE TRACT



Avian digestive system

- Classified as: Non-ruminant / Monogastric
- How does it differ from other non-ruminants?
- Birds don't have teeth or lips
- Food swallowed in gulps with no chewing

Grasping and particle-size reduction functions assumed by the beak, tongue and gizzard

Permits the weight associated with heavy jaws, teeth and muscles to be moved more centrally to accommodate flight

Crop - Temporary storage

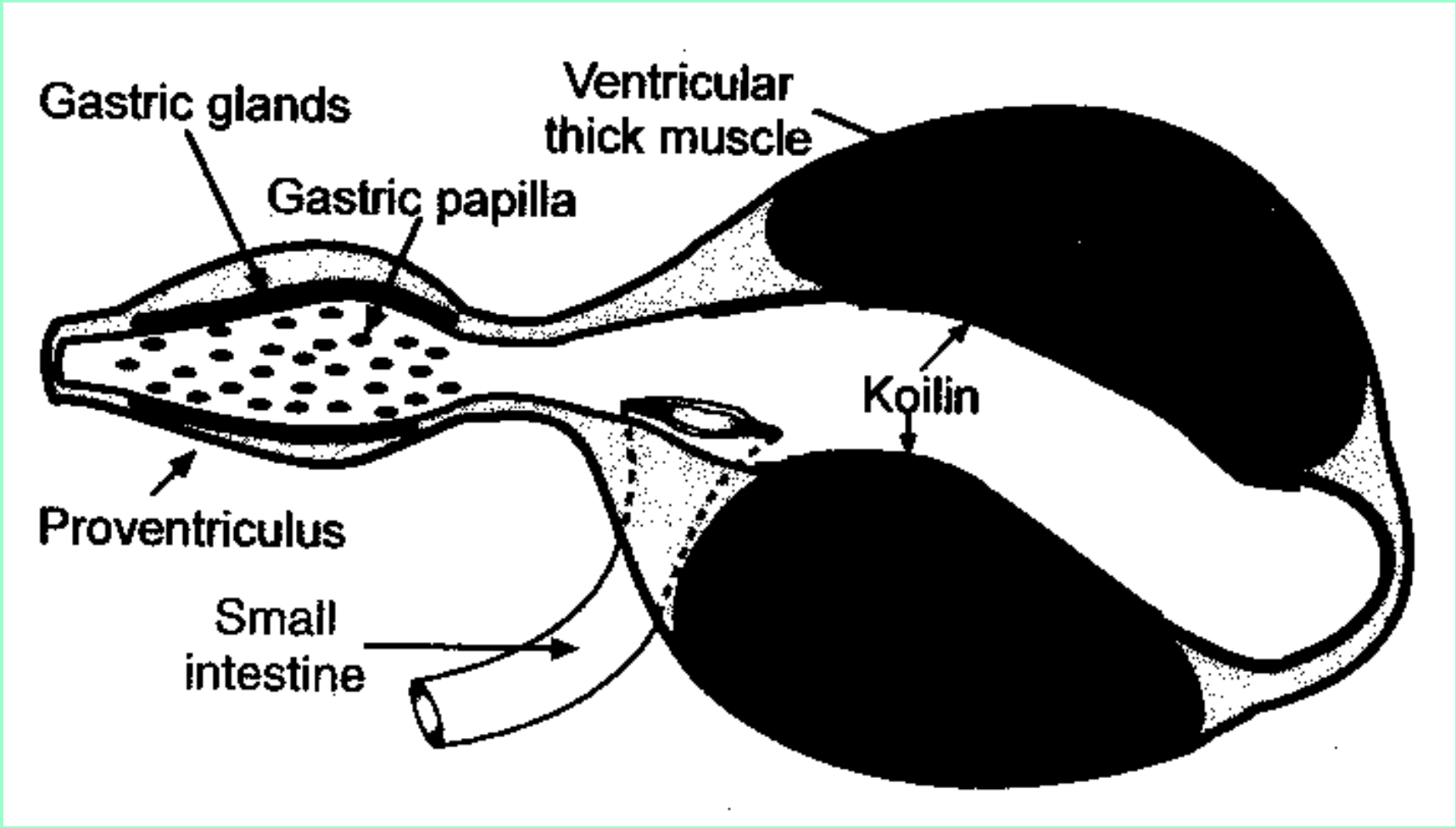
Permits a bird to forage for large amounts of food rapidly and then fly off to digest the meal in safety

Permits binging in the evening so that food can be slowly released to supply nutrients during the night time

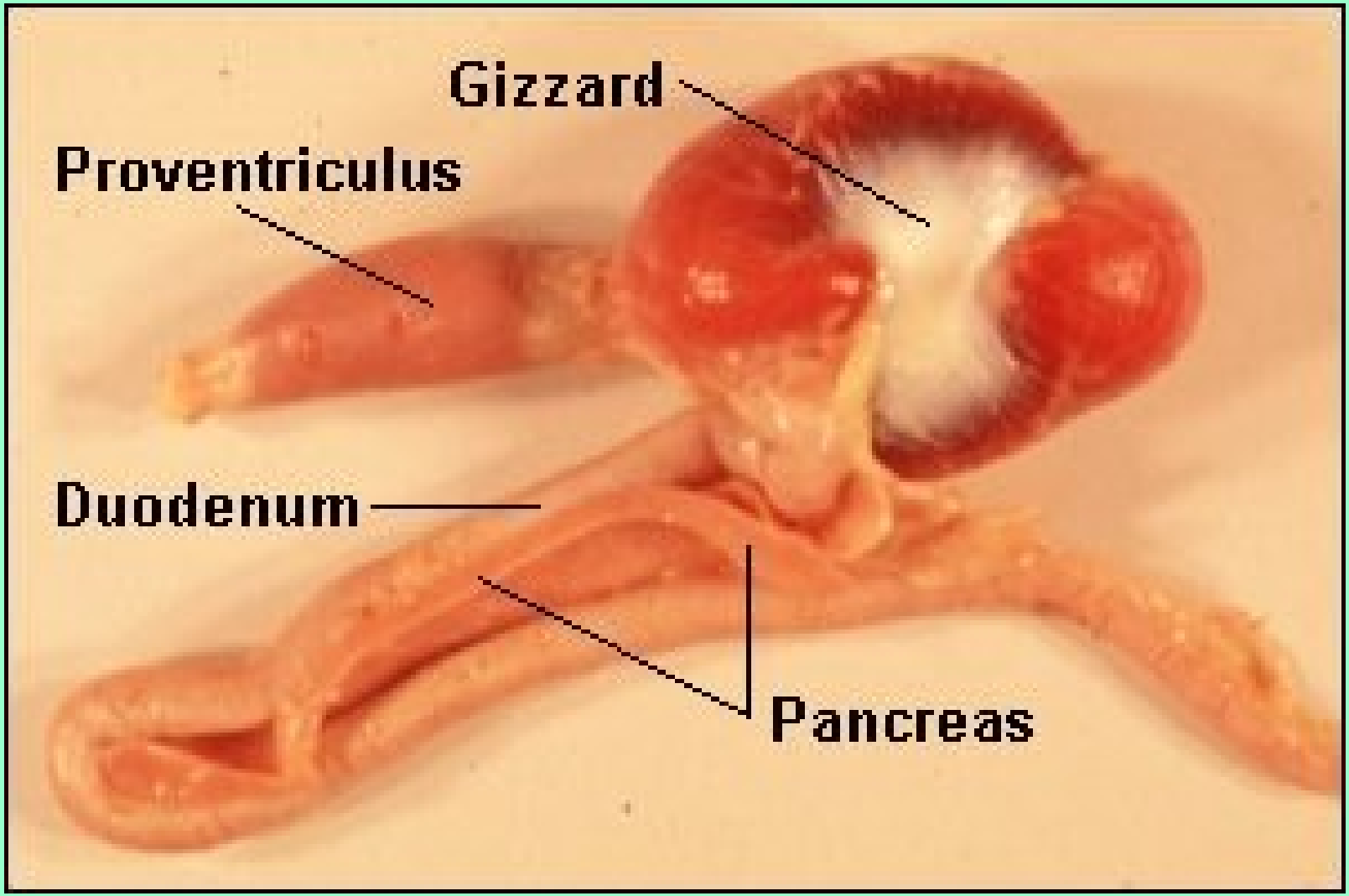
In chickens, food stored during an evening feeding supplies 75% of the nocturnal energy needs
In some species, supplies a moist environment where food begins to soften

But, in chickens mucous glands only present near the entrance of the crop so dependent on consumed water

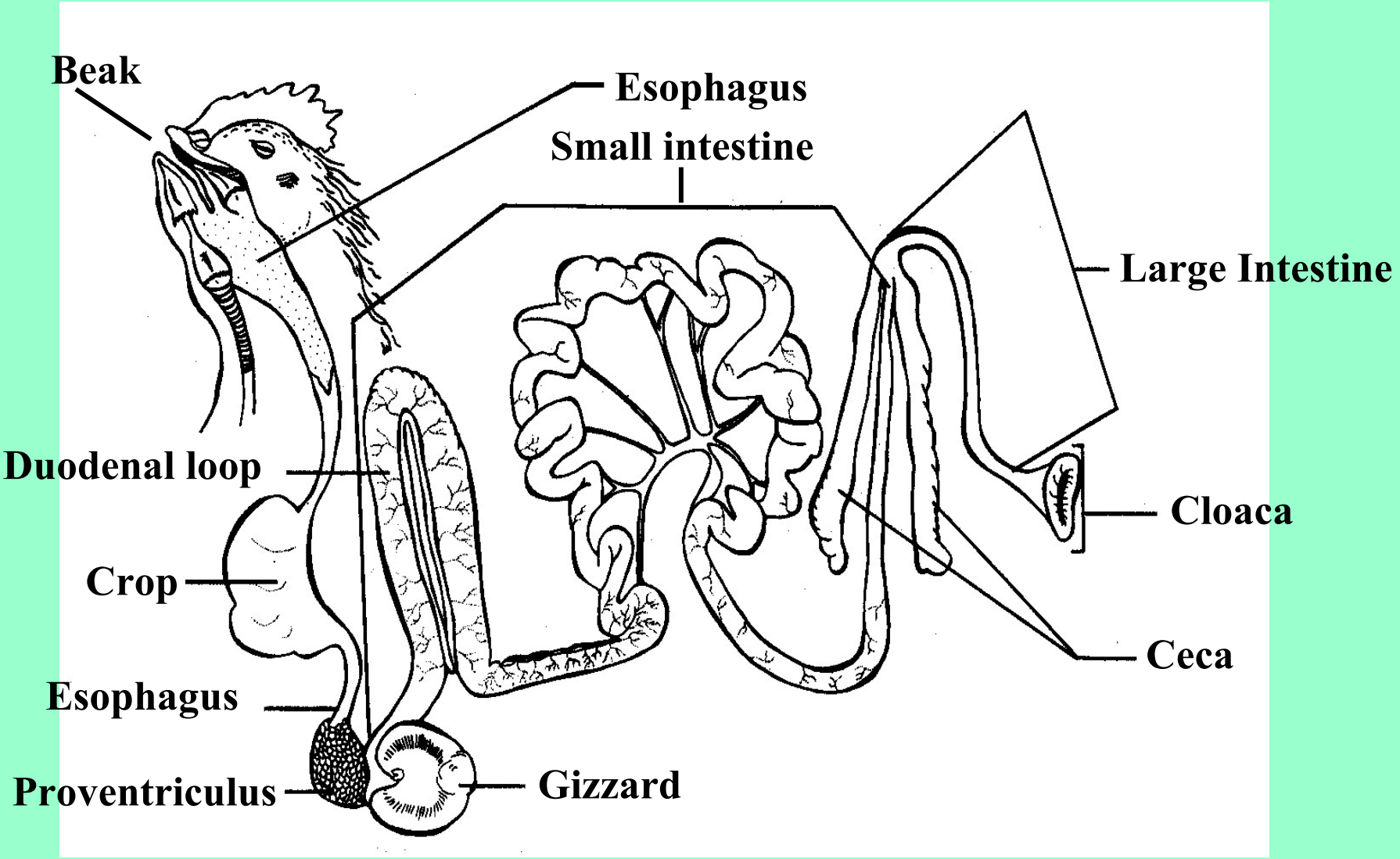
No enzymes secreted into the crop

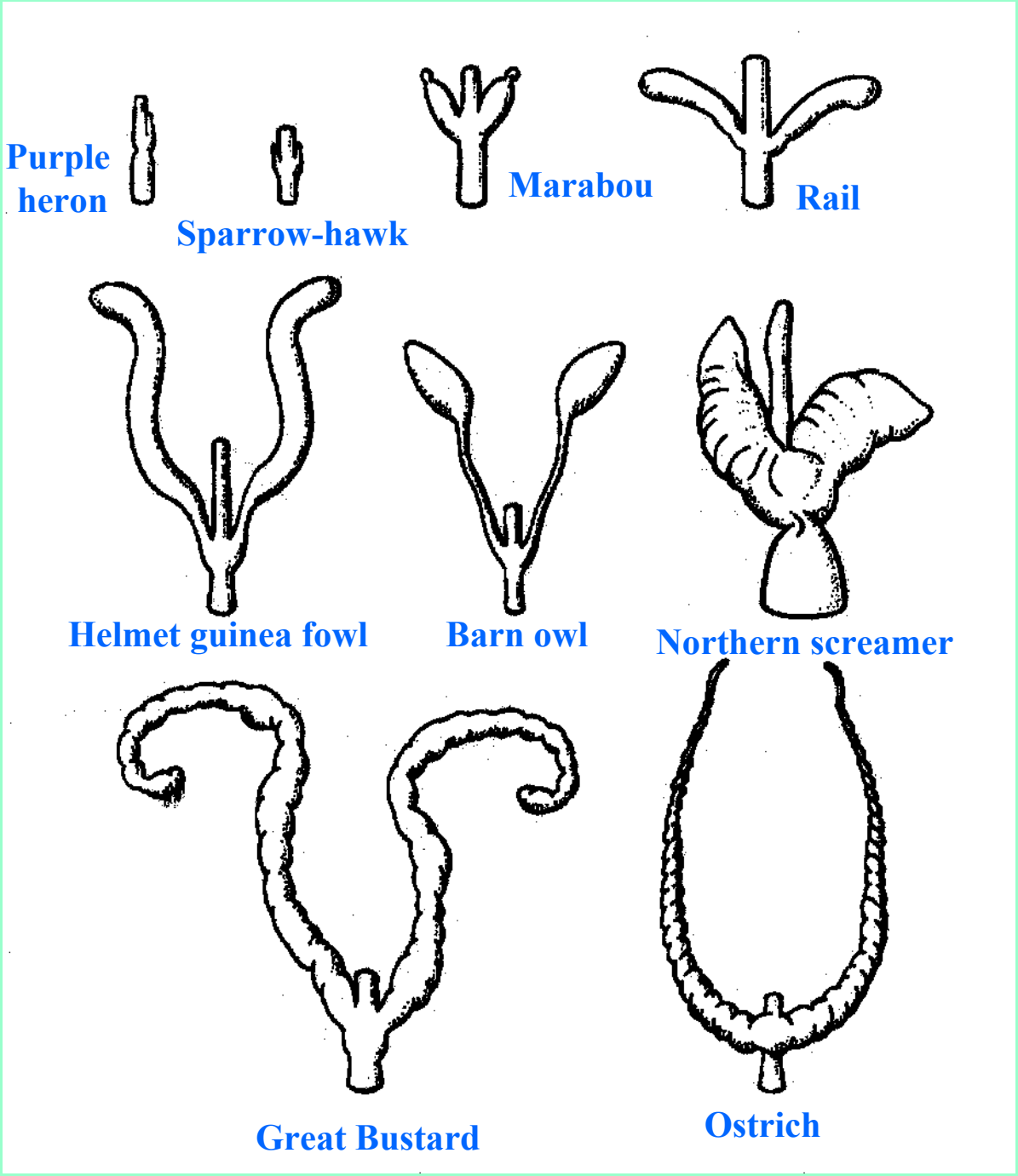


- **Koilin -** a tough layer made of a carbohydrate-protein complex to protect the muscles in the gizzard and to aid in digestion


Gizzard
Proventriculus
Duodenum
Pancreas

CHICKEN DIGESTIVE TRACT





Different types of avian ceca

Source: Jozefiak et al., 2002

Considerable variation in size

Ranges from voluminous pairs, to a single cecum to complete absence

Highly developed in herbivores and omnivores

Site for microbial fermentation of complex carbohydrates

Large intestine

More accurately referred to as the rectum or colon

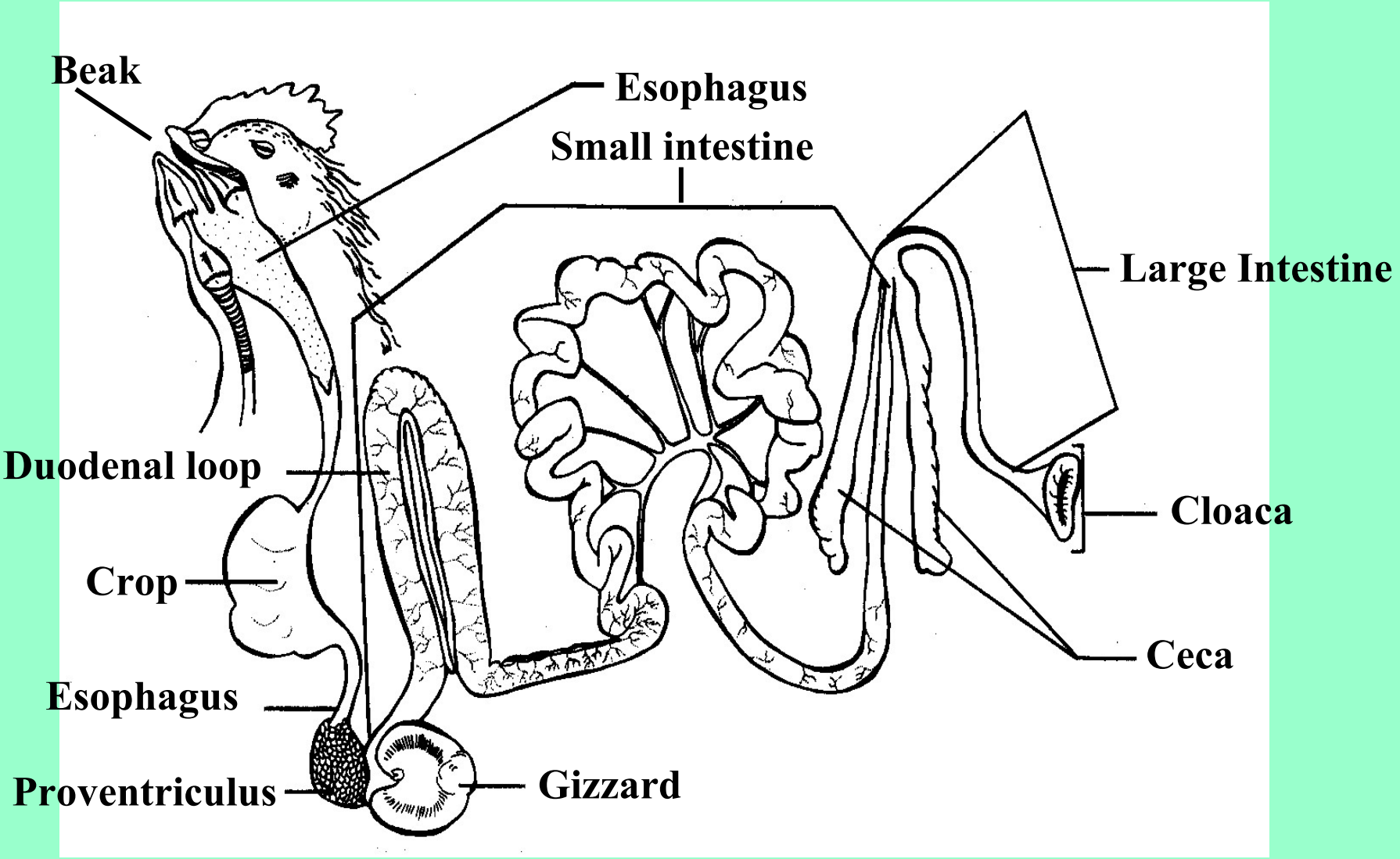
Typically very short and small in diameter

Exception is the ostrich where it is >50% of total intestinal length and is sacculated - divided into a series of pouches.

CLOACA

- **Serves as a storage area for urine and feces**
- **Receives the exit ducts of the digestive, reproductive, and urinary systems**

CHICKEN DIGESTIVE TRACT



- **Liver**
  - **Predominant bile salt produced varies among species**
- **Gall bladder**
  - **Absent in some avian species: ostrich, hummingbirds, doves, pigeons, parrots**
- **Pancreas**
  - **Supplies digestive enzymes**
  - **Also produces insulin (hormone that regulates carbohydrate metabolism)**

Taste

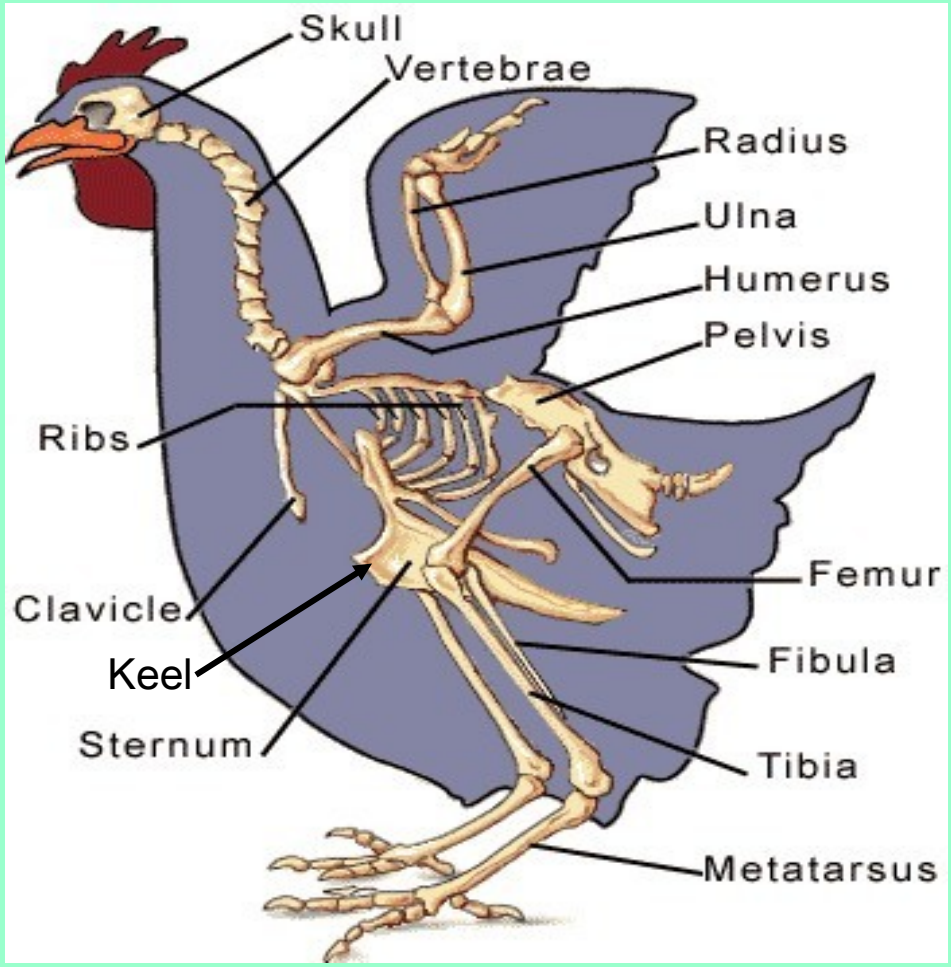
- Taste acuity <u>poorer</u> than for mammals
  - Taste receptors
    - Humans: 9,000
    - Rabbits: 17,000
    - Chicken: 250-350
    - Pigeon: 37-75
    - Japanese quail: 62
    - Ducks: 375
    - Parrots: 300-400

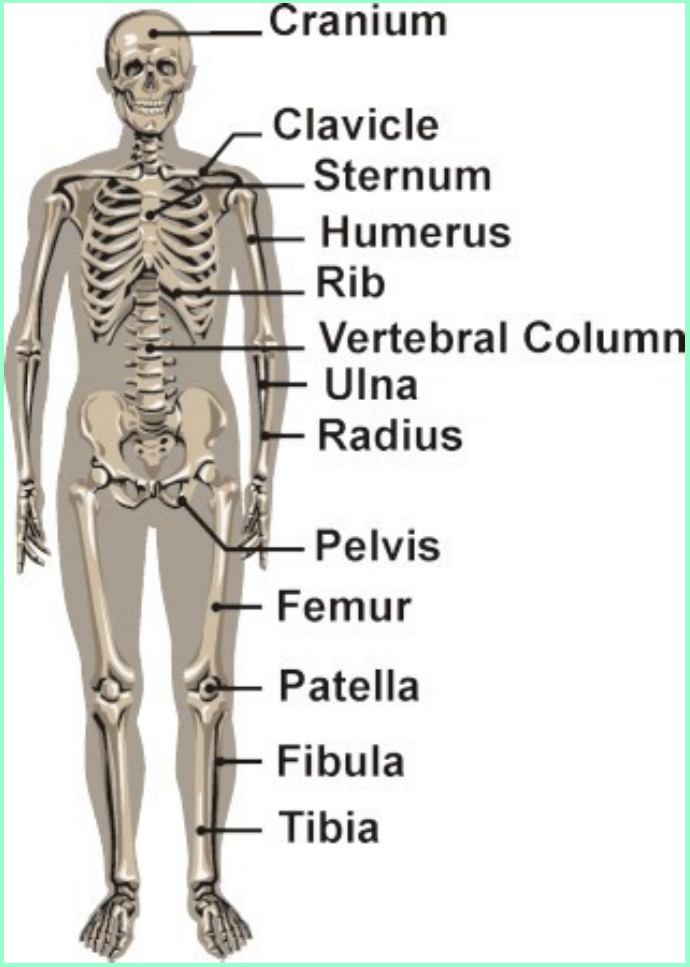
- Birds can taste the same four primary flavors (sour, sweet, bitter, salty) but with <u>less</u> acuity

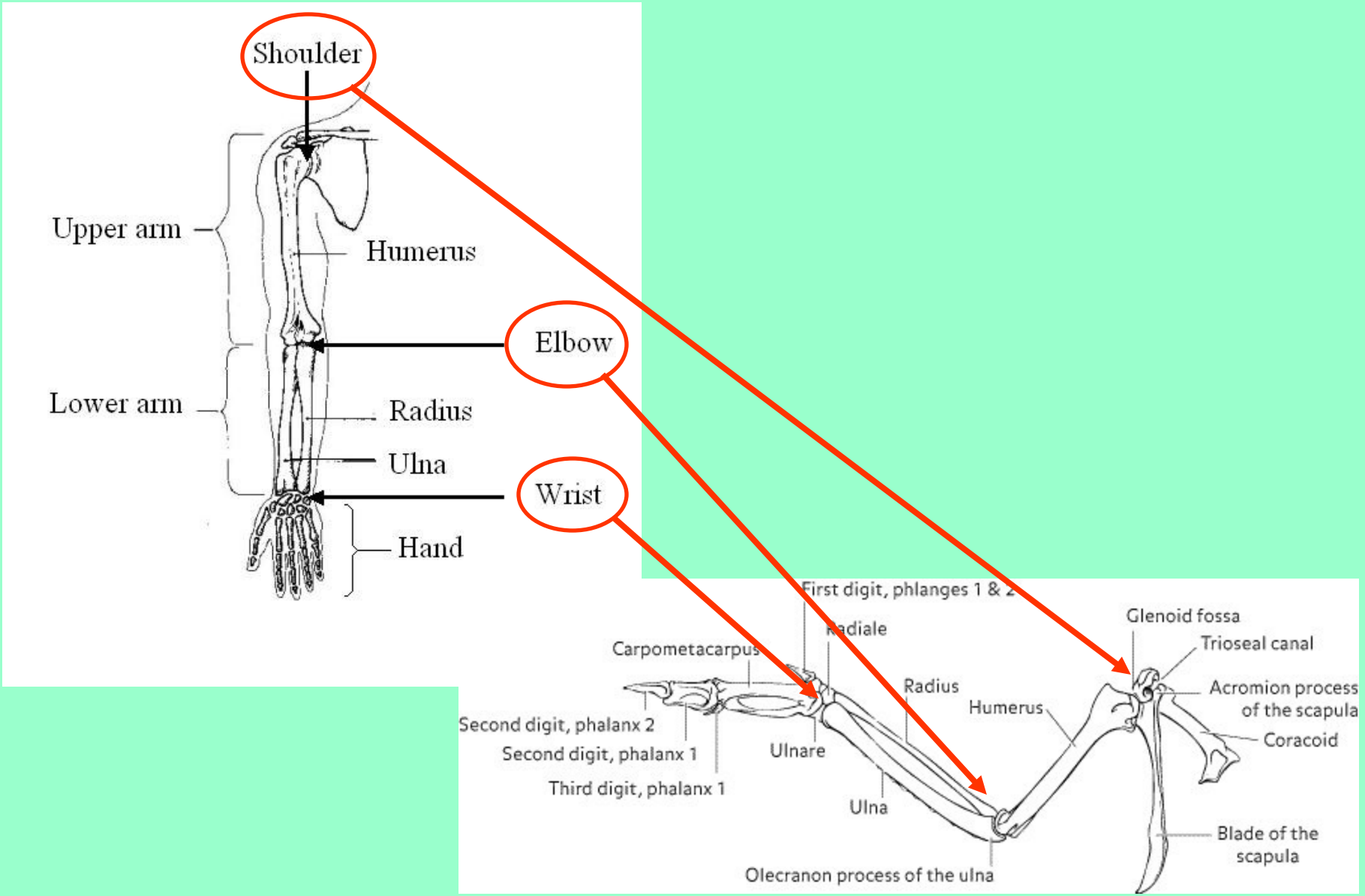
Smell

- **Sense of smell not well developed in birds**
  - **Exceptions: Kiwi, some vultures and seabirds**
  - **Flowers and fruits that rely on birds for pollination and seed dispersal - would it be beneficial to the plants to be scented?**

SKELETAL SYSTEMS



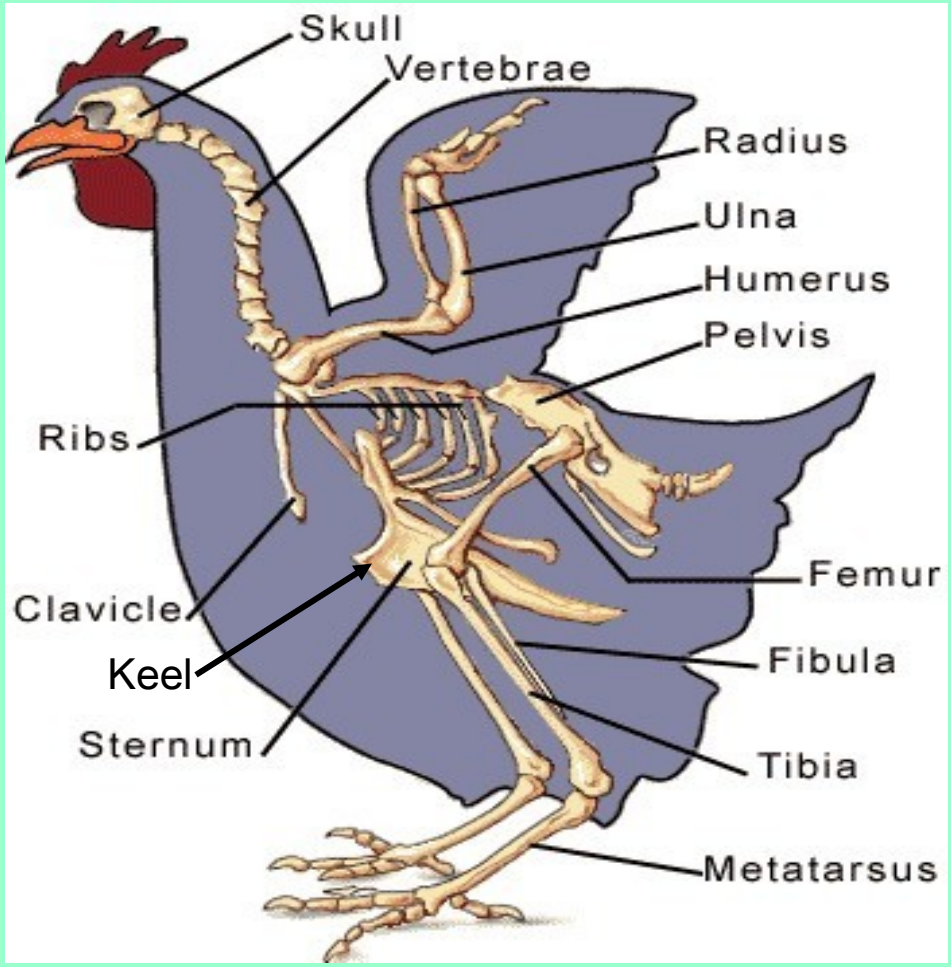


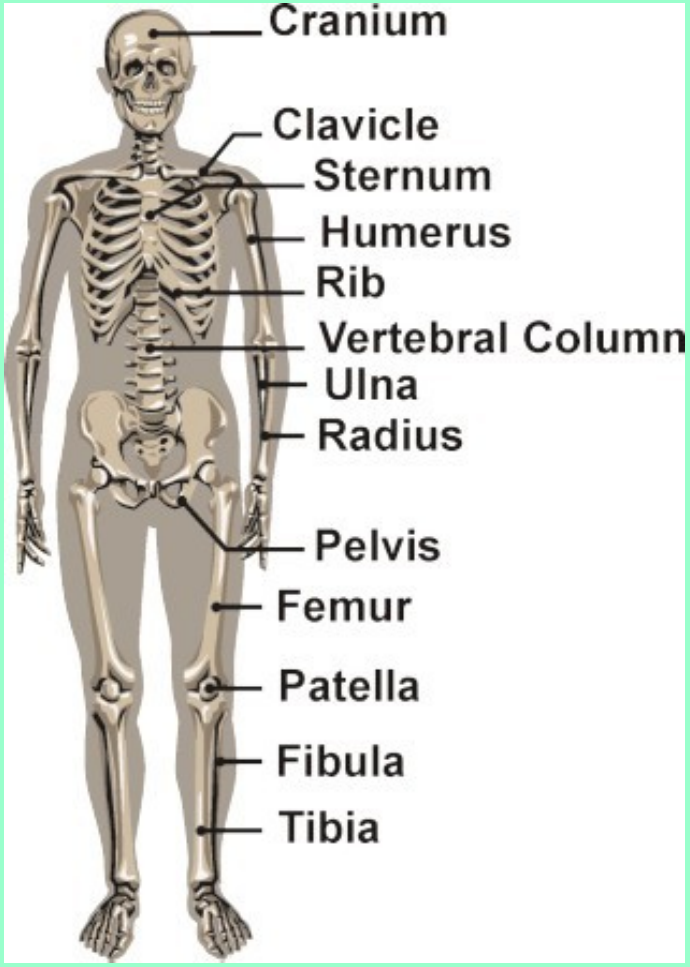

Shoulder
Upper arm
Humerus
Elbow
Lower arm
Radius
Ulna
Wrist
Hand
First digit, phlanges 1 & 2
Radiale
Carpometacarpus
Second digit, phalanx 2
Second digit, phalanx 1
Third digit, phalanx 1
Ulnare
Ulna
Radius
Humerus
Olecranon process of the ulna
Glenoid fossa
Trioseal canal
Acromion process of the scapula
Coracoid
Blade of the scapula

POULTRY VS MAMMALIAN ANATOMY AND PHYSIOLOGY

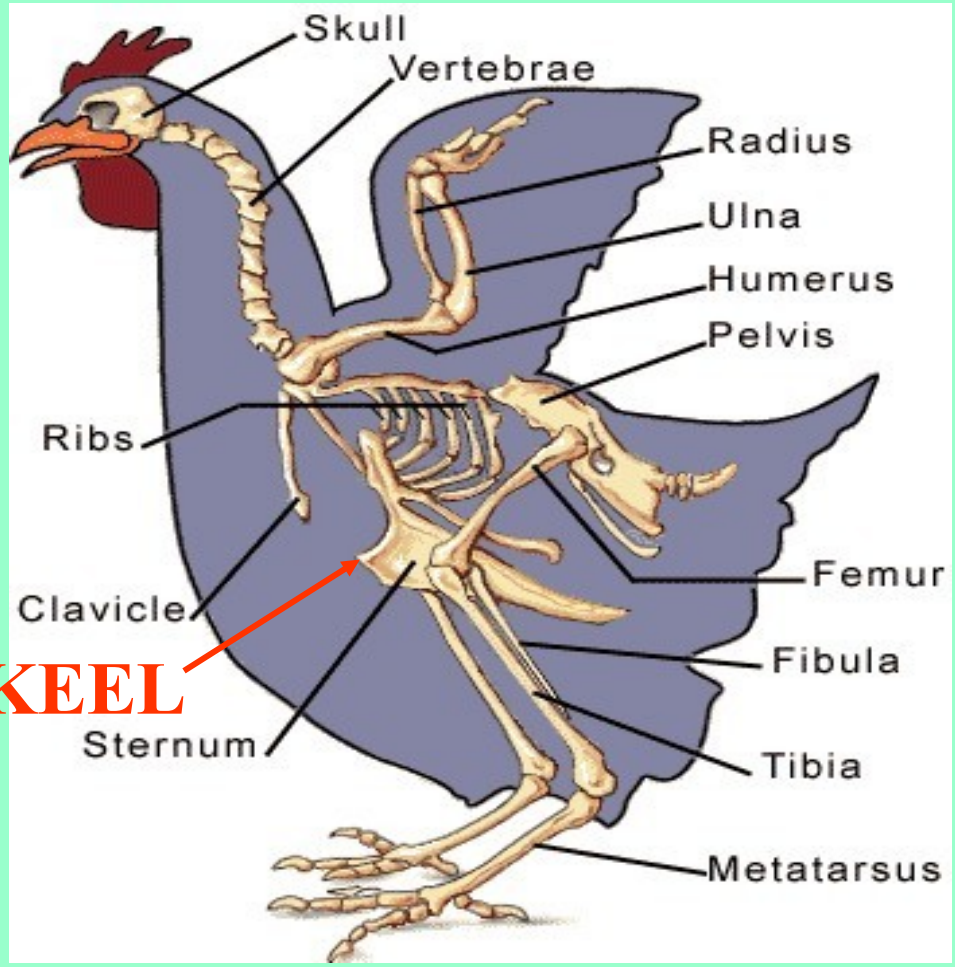
- **Skeletal system**
  - **Differences ?**

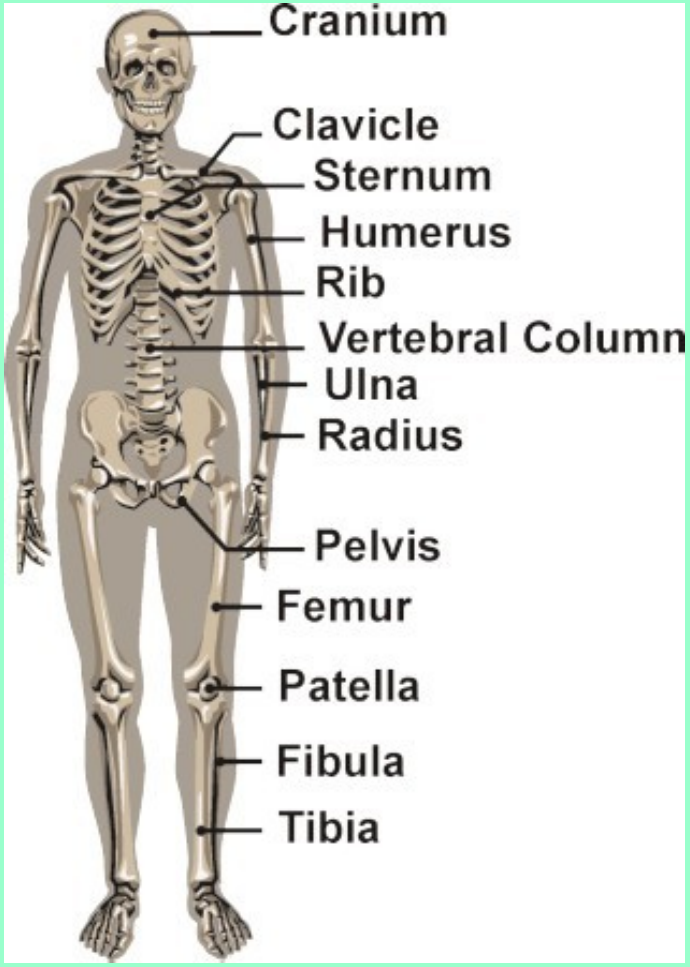
SKELETAL SYSTEMS



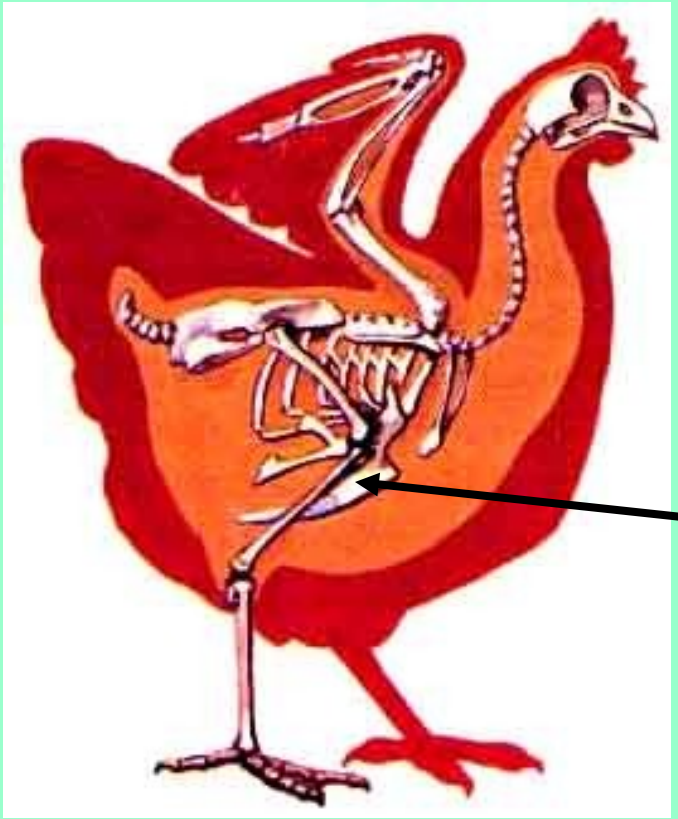


SKELETAL SYSTEM





Birds that have a keel, whether they can fly or not, are called <u>carinate</u> birds.



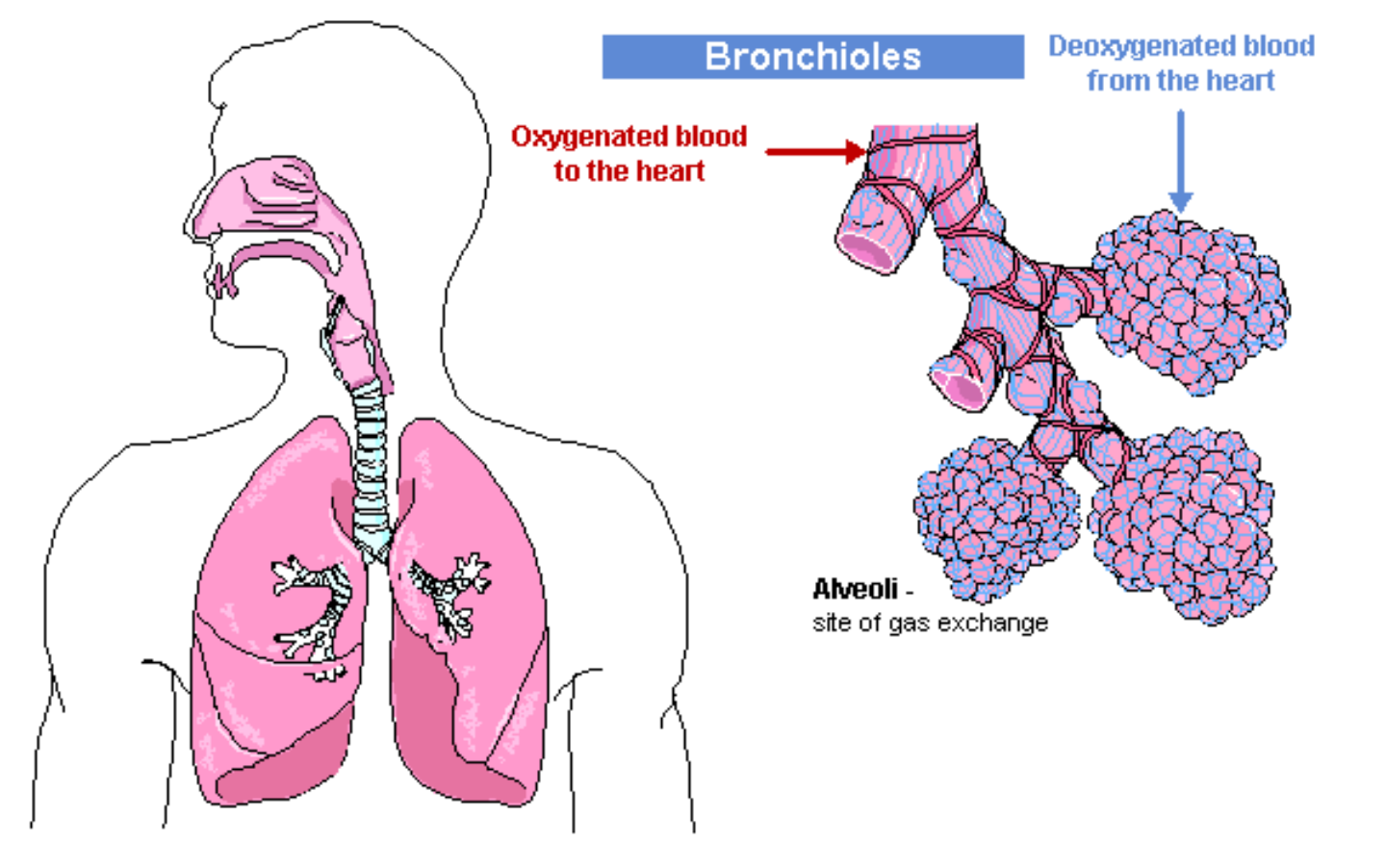
KEEL BONE

***Ratite* – No keel bone**

POULTRY VS MAMMALIAN ANATOMY AND PHYSIOLOGY

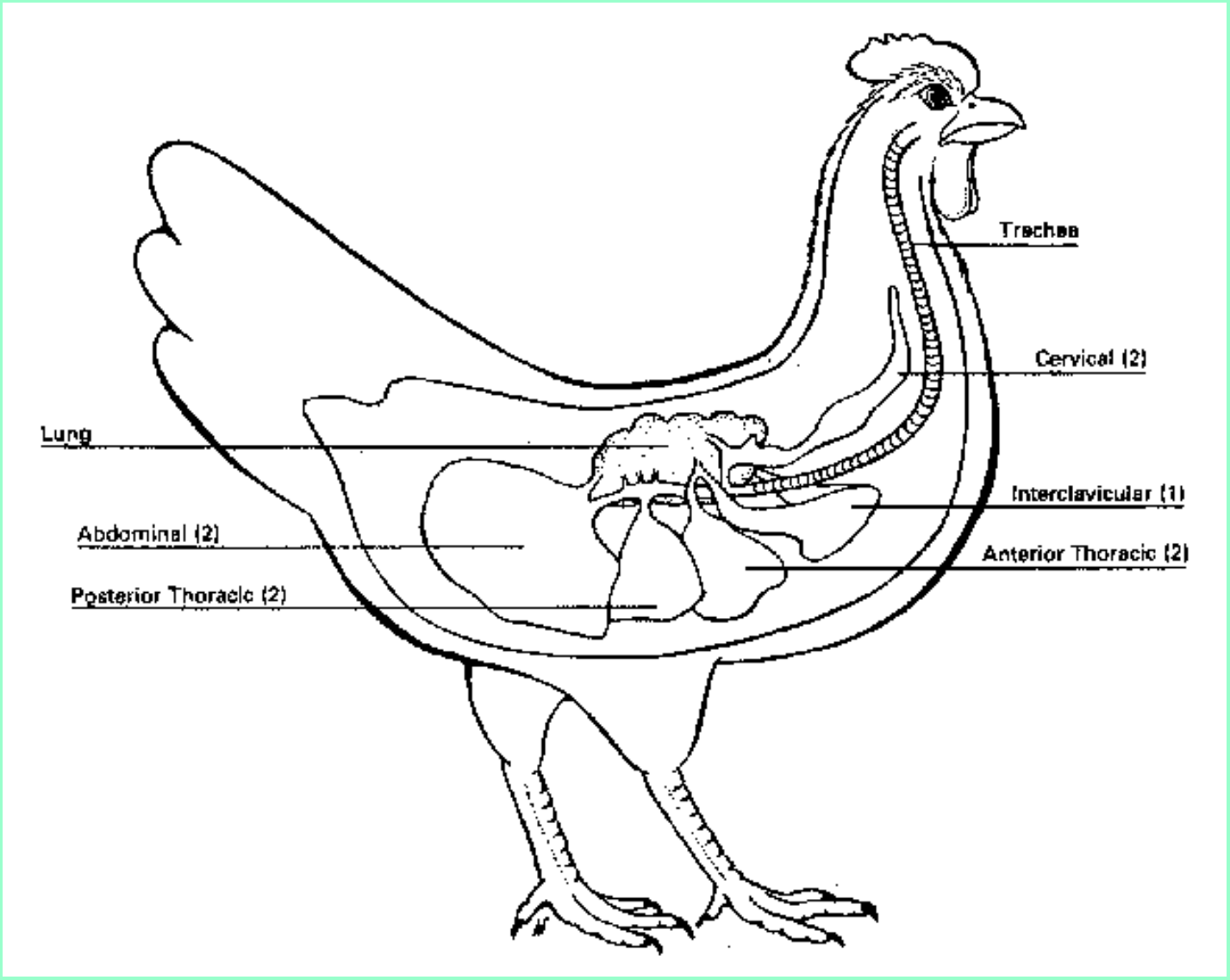
- **Respiratory system**

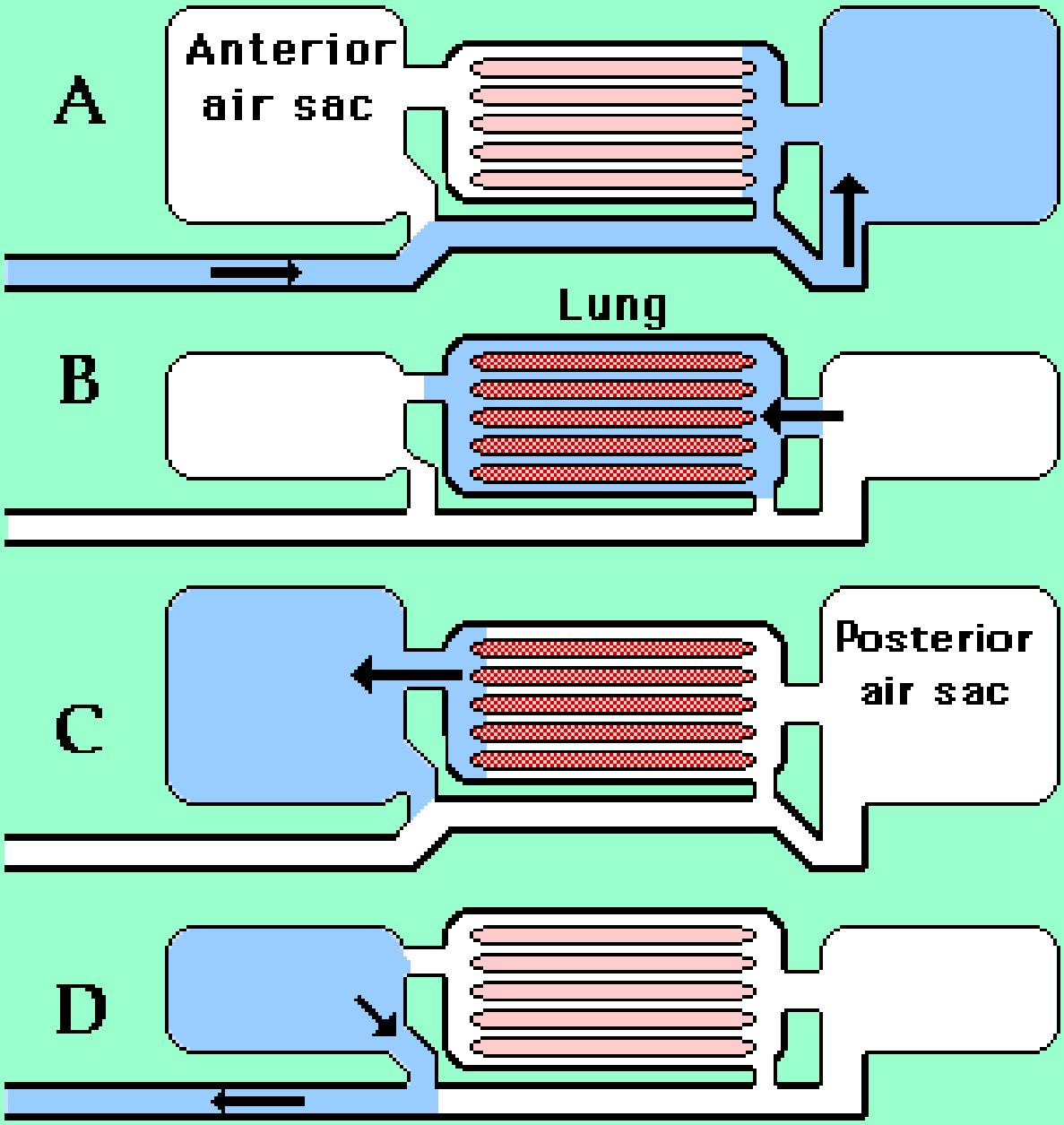
HUMANS

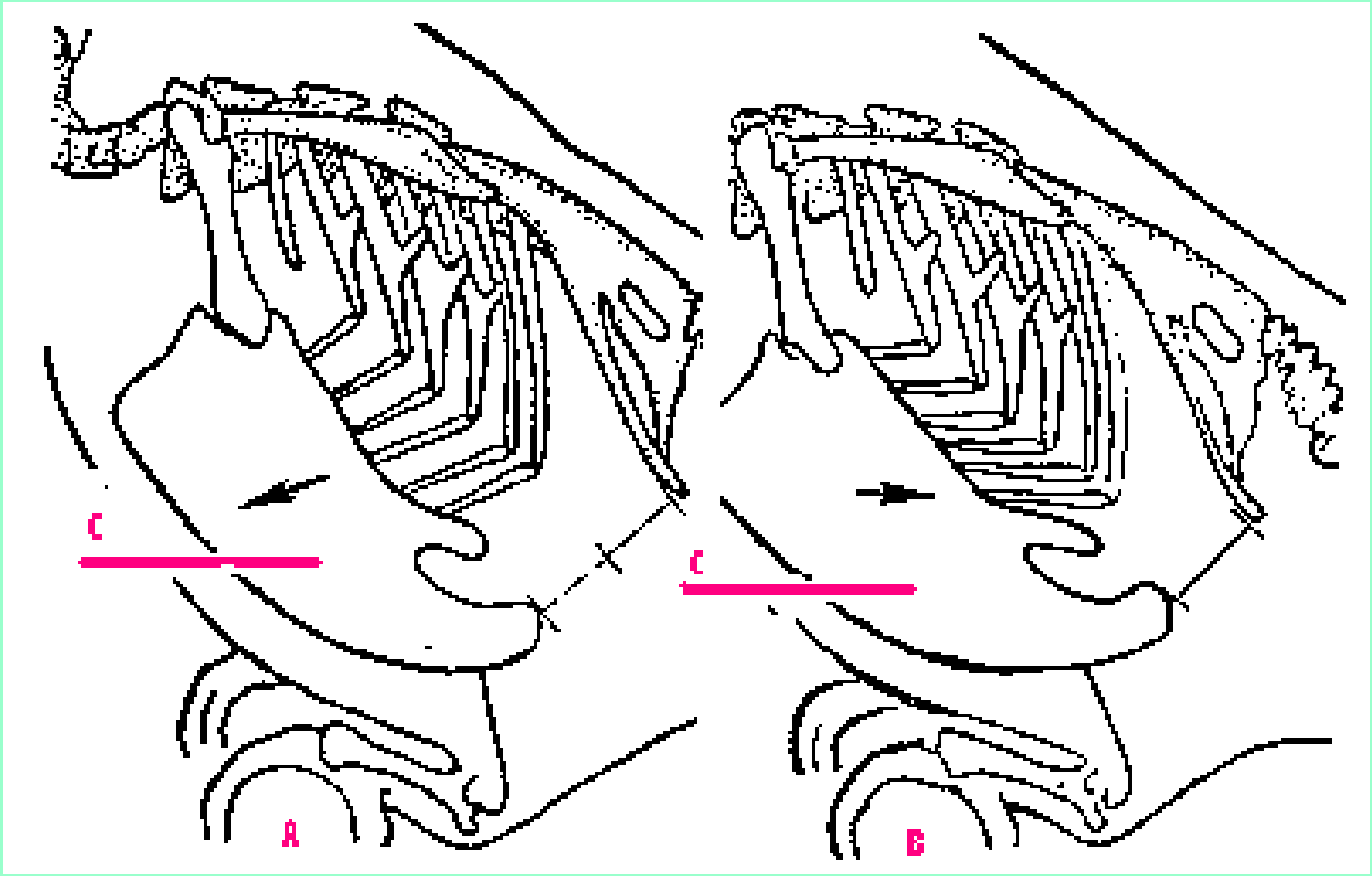


Tidal respiration

CHICKENS


Trachea
Cervical (2)
Lung
Interclavicular (1)
Abdominal (2)
Anterior Thoracic (2)
Posterior Thoracic (2)


A
Anterior
air sac
Lung
B
C
Posterior
air sac
D



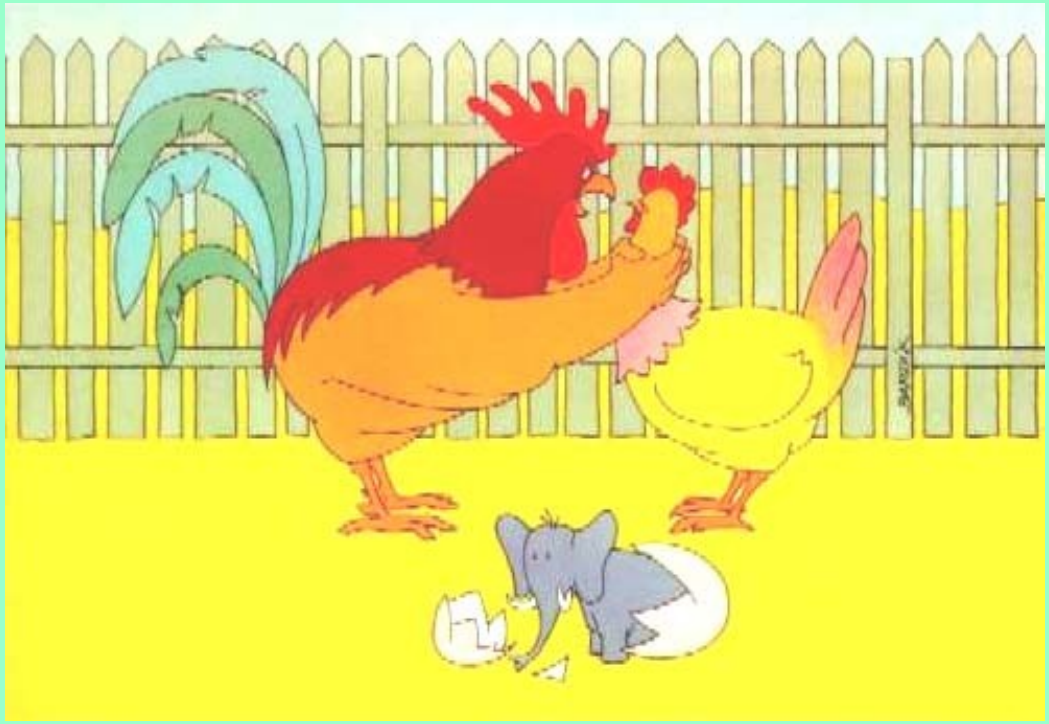
Inspiration **Expiration**

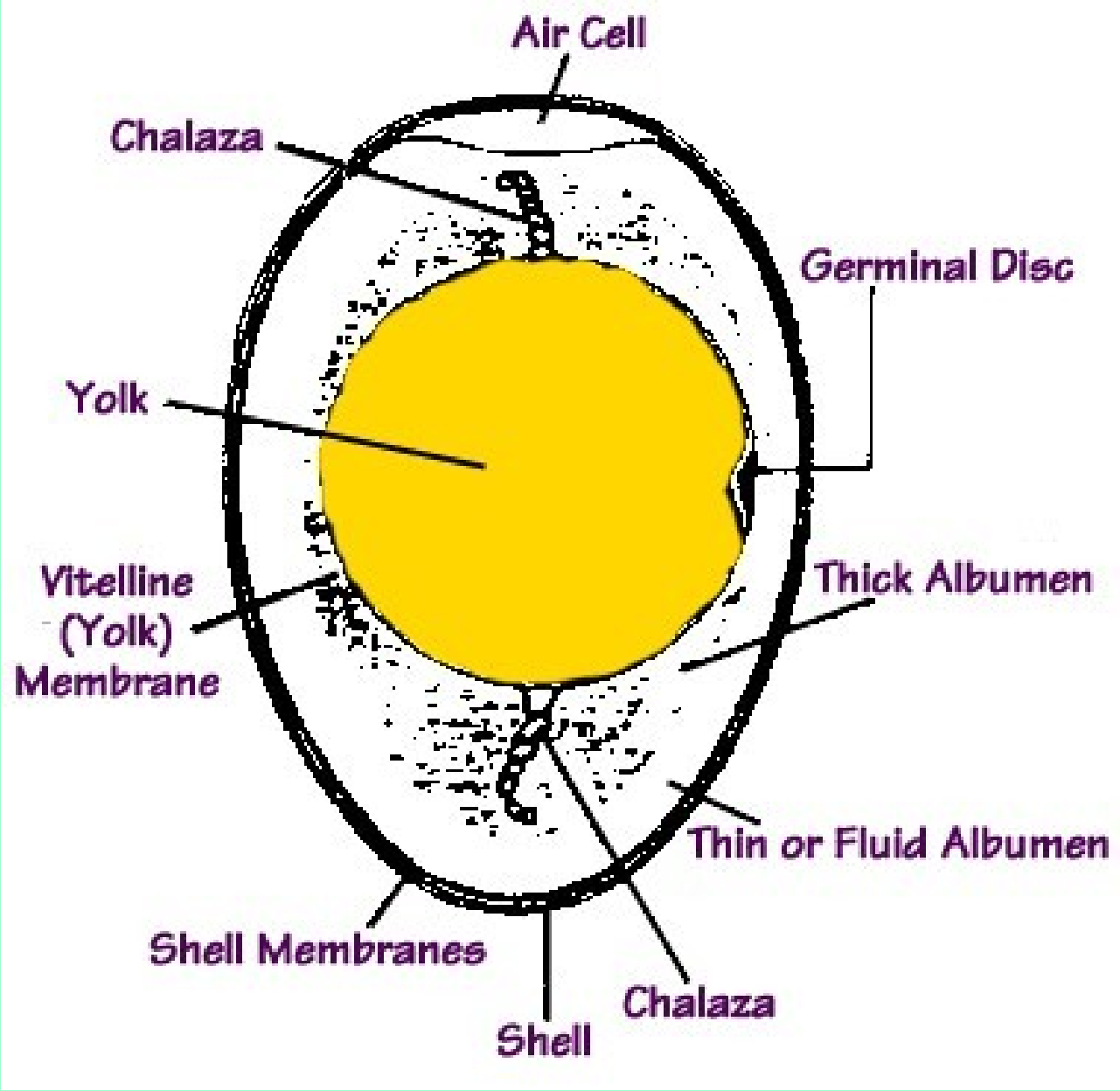
Avian Genetics

- **Mammals**
  - **Male XY**
  - **Female XX**
  - **<u>Males</u> determine sex of offspring**
- **Birds**
  - **Male ZZ**
  - **Female ZW**
  - **<u>Females</u> determine sex of offspring**

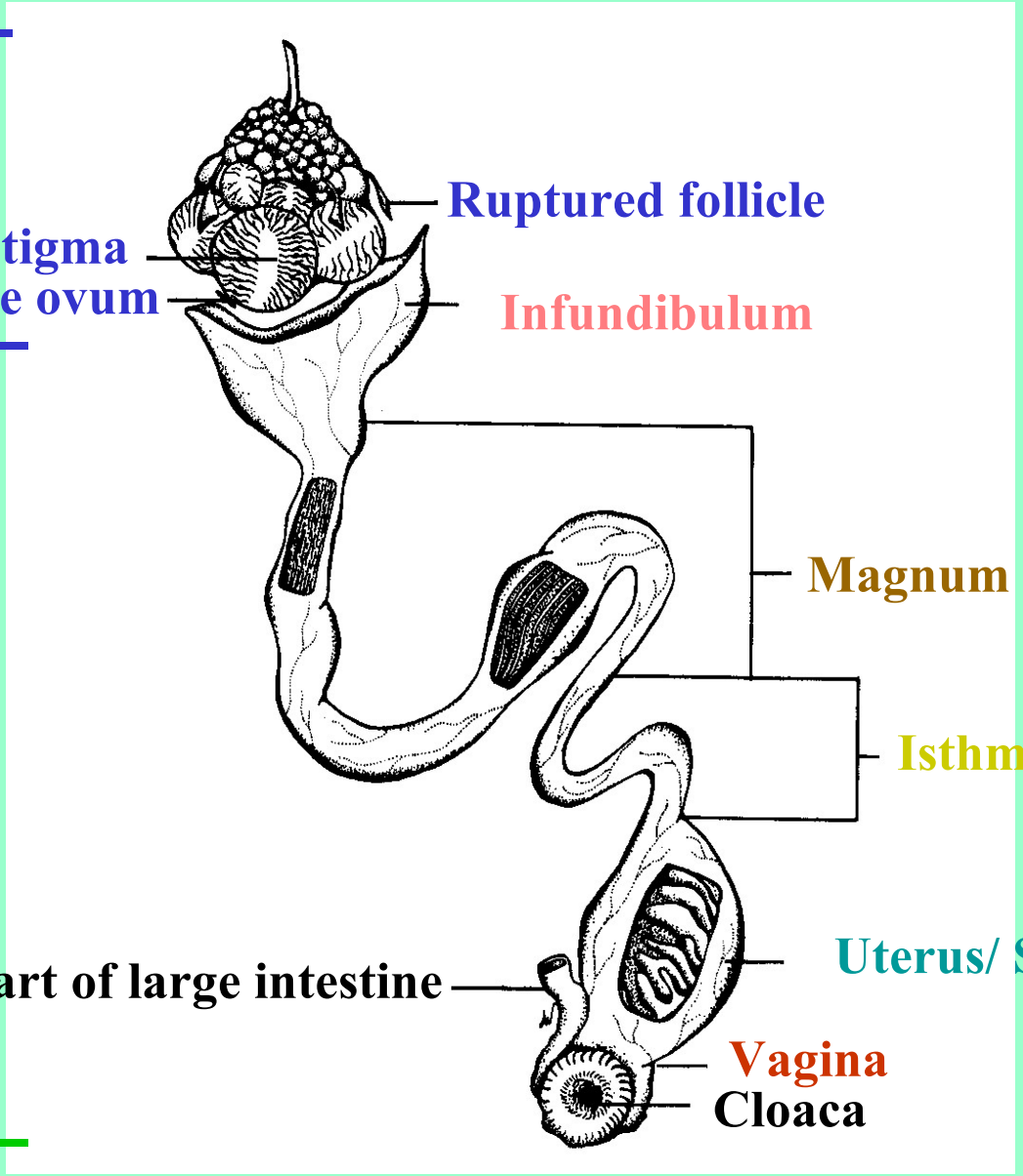
POULTRY VS MAMMALIAN ANATOMY AND PHYSIOLOGY

- **Reproductive system**




Air Cell
Chalaza
Germinal Disc
Yolk
Vitelline
(Yolk)
Membrane
Thick Albumen
Thin or Fluid Albumen
Shell Membranes
Chalaza
Shell

Avian reproductive tract



When the yolk comes to full size, it is released from the ovary by the rupture of the follicle along the stigma.

The discharged yolk and its germinal disc are engulfed by the infundibulum, and within ten minutes the journey down the oviduct commences.

It is in the infundibulum that fertilization will occur if the particular ovum is to become a fertile egg. Once the egg has passed through the infundibulum and the layers of albumen have started to be placed on the yolk, fertilization is impossible.

The yolk spends approximately 3 hours in the magnum where the thick albumen is added. This is about half of the total egg white. The remainder of the egg white is added after the shell membranes have been formed and the egg has entered the uterus.

The two shell membranes are formed in the isthmus during a period of 1.25 hours.

However, the yolk and the thick albumen do not have the appearance of an egg until water secreted in the uterus, passes through the shell membranes and the egg assumes its characteristic shape.

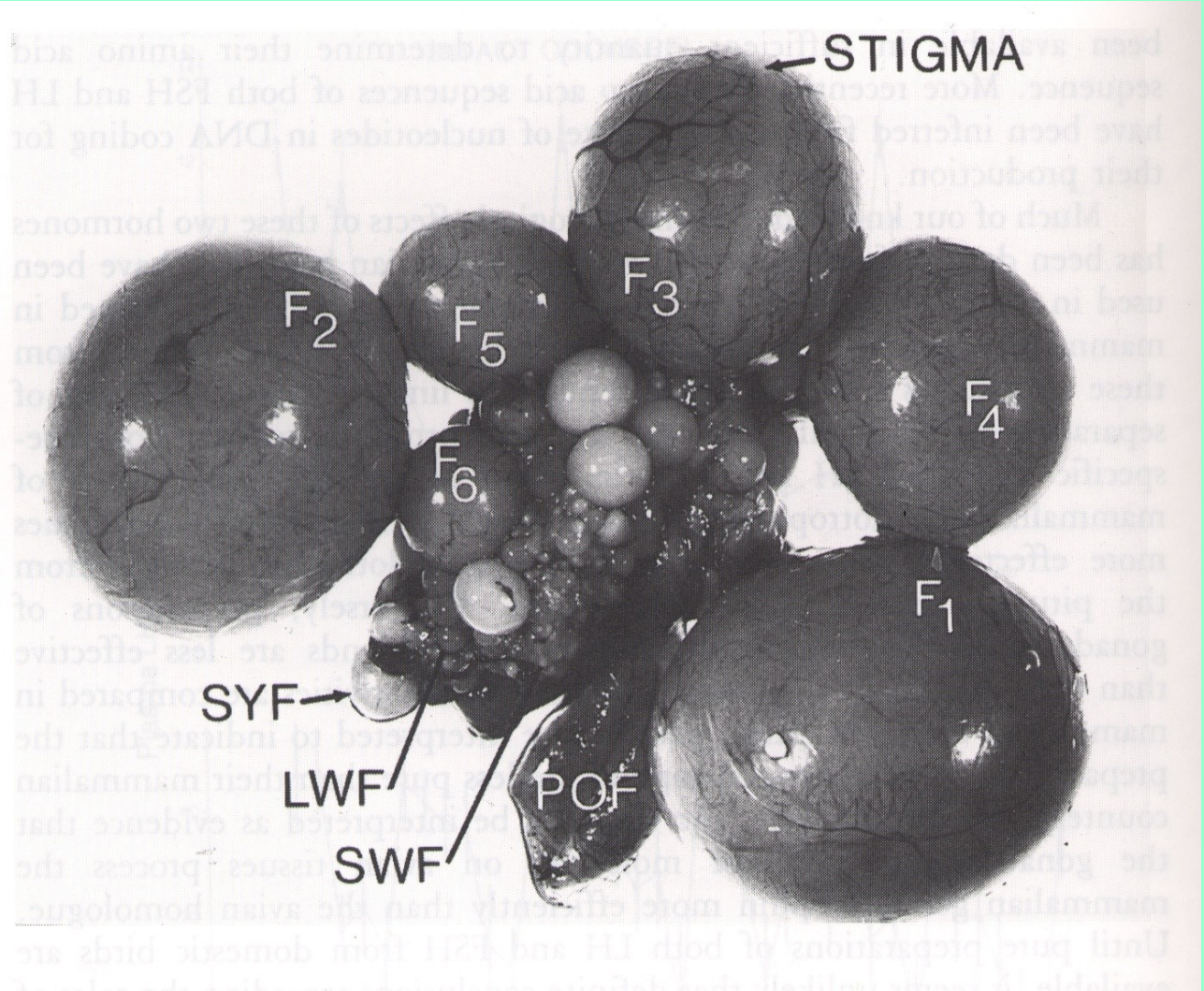
The egg spends over 20 hours in the uterus, where calcium carbonate is deposited on the outer shell membrane.

When the shell structure is complete, the egg passes into the vagina where it may be retained for a few minutes while a very thin coat of albumen-like material is deposited over the shell.

This material is referred to as the bloom or cuticle and functions to fill the pores of the shell.

The egg passes through the oviduct small end first, but just prior to laying the egg turns horizontally 180° so that the large end of the egg comes out first. This allows for more shell surface area on which uterine muscles may apply pressure prior to the egg-laying process.

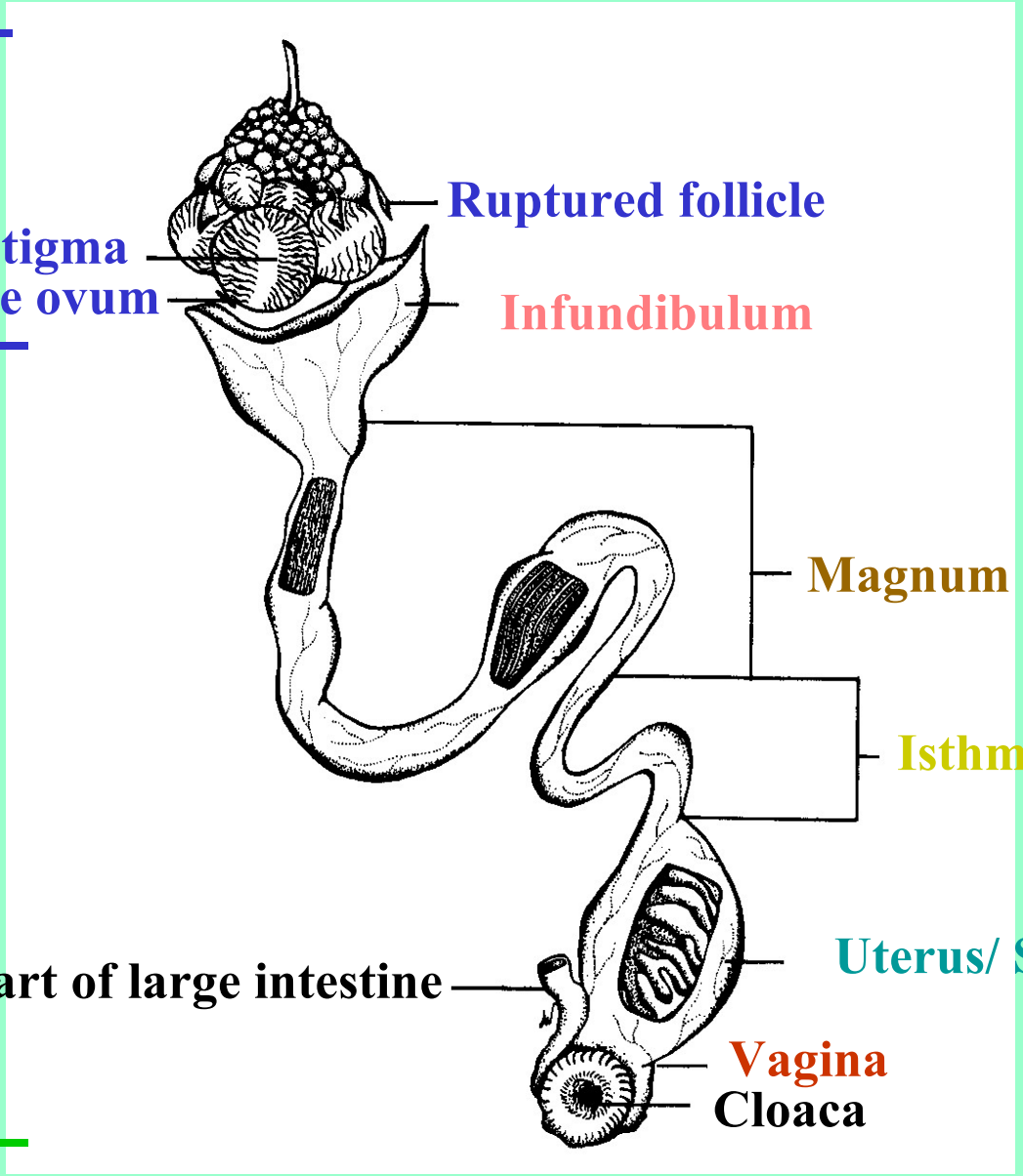
Ovary



Ovulation

Video

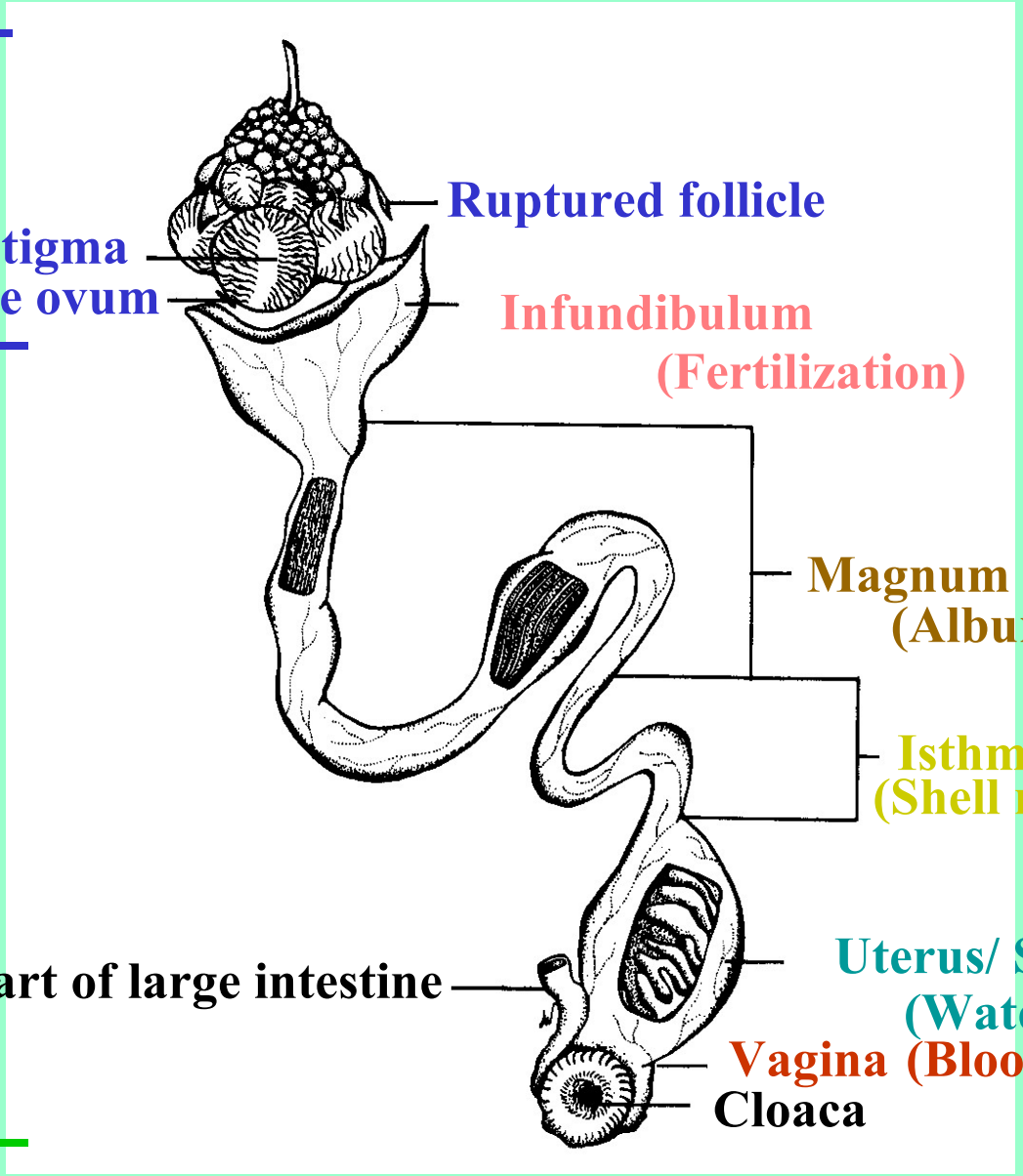
Avian reproductive tract



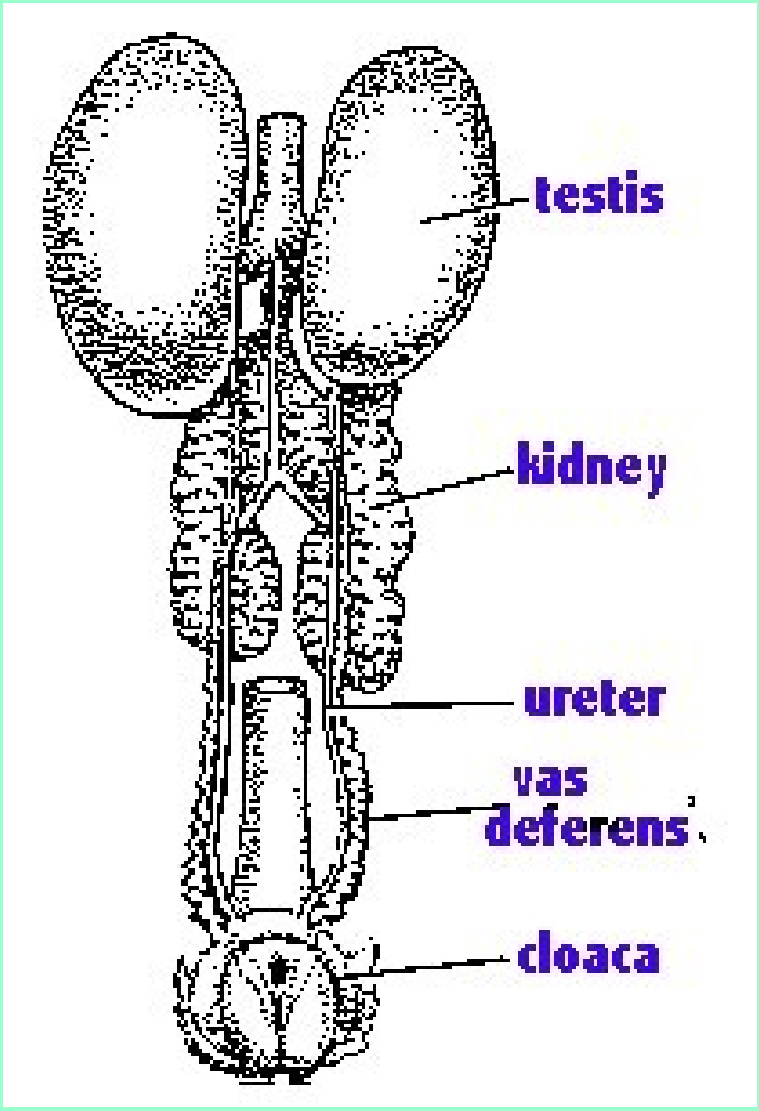
Infundibulum

Video

Avian reproductive tract

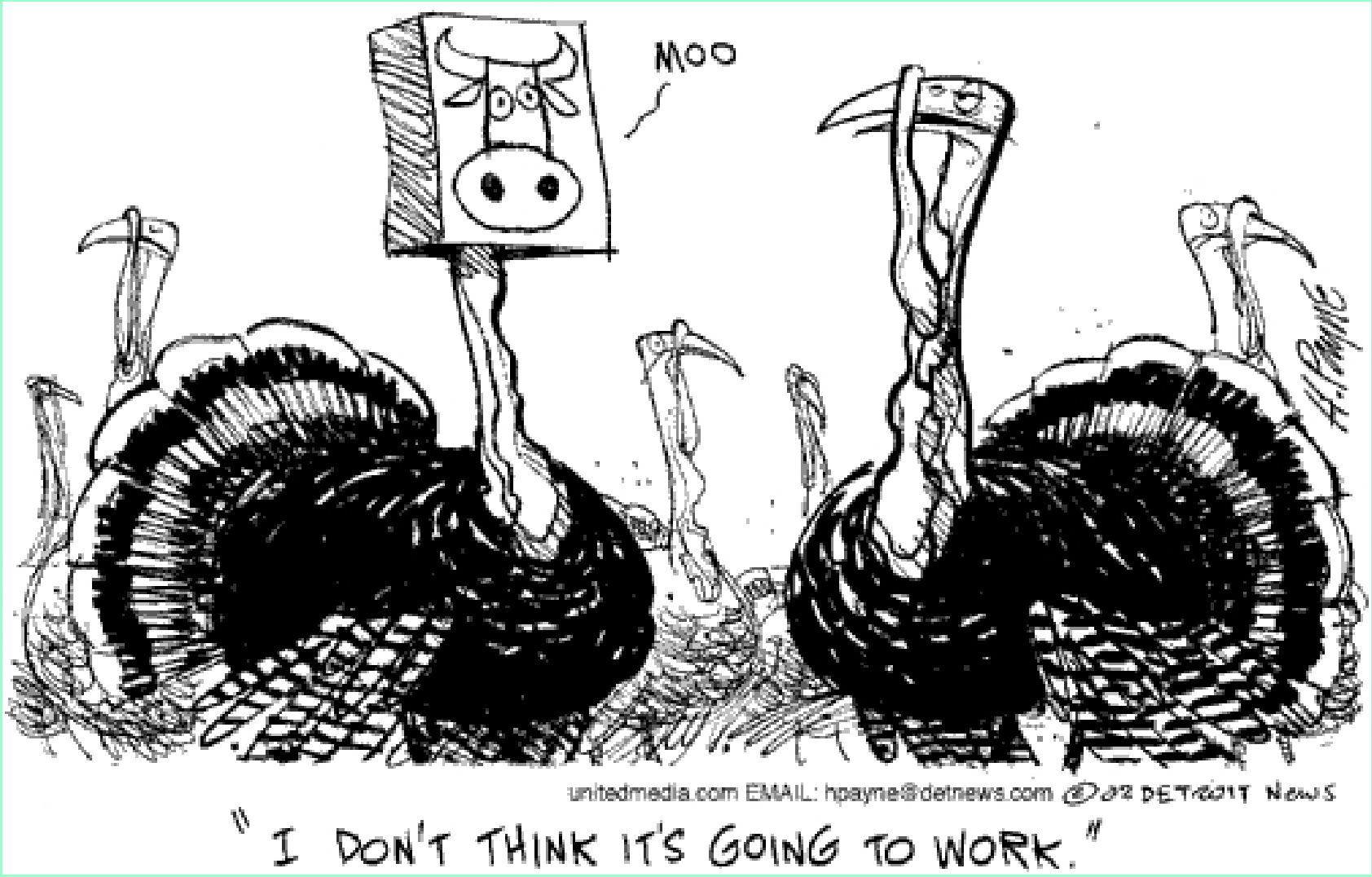


Avian male reproductive tract



Avian system similar to mammalian system, but testes are located <u>inside</u> the abdominal cavity

Questions?


MOO
unitedmedia.com EMAIL: hpayne@detnews.com
"I DON'T THINK IT'S GOING TO WORK."