

Class Aves

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Searcy
ZOO2010

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Class Aves

- *Archaeopteryx lithographica*

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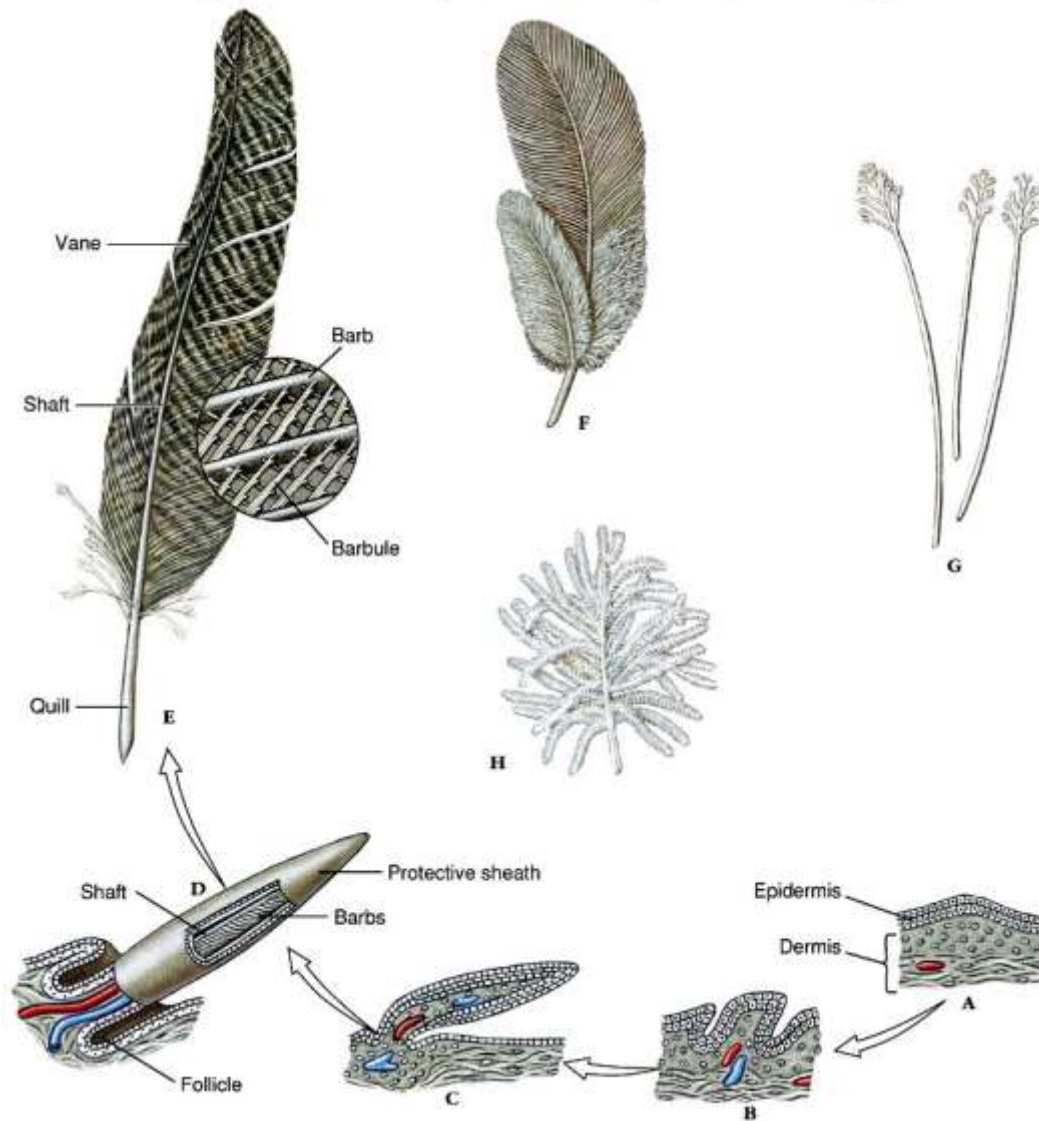


Birds

- Neorinthes (living birds)
 - Flightless (ratite)
 - Flying birds (keeled sternum)

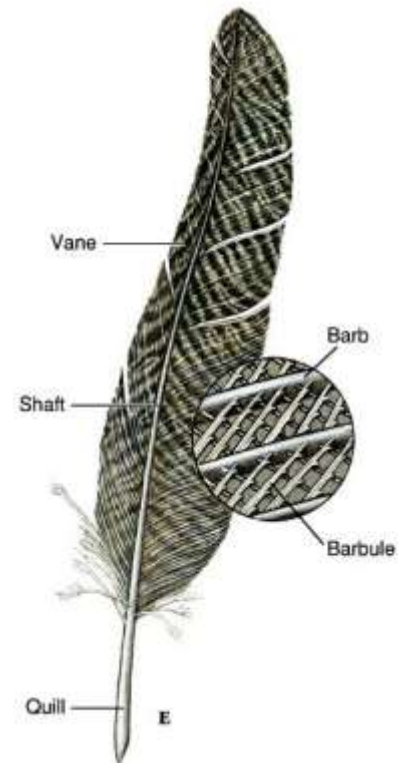
Feathers

- Uses
 - Flight
 - Insulation
 - Water proofing
- Has pineal gland on top of skull detects light – actually determines changes in length of day
-)



Contour Feathers

- Hollow quill
- Rachis subdivided into barbs
- Barbs connected by barbules
- When used in flight, called flight feathers



Down Feathers

- No barbules
- Found beneath contours
- Conserve heat
- Abundant in waterfowl



Filoplumes

- Degenerate
- Hair-like
- Usually two at base of contour
- Possibly sensory in function



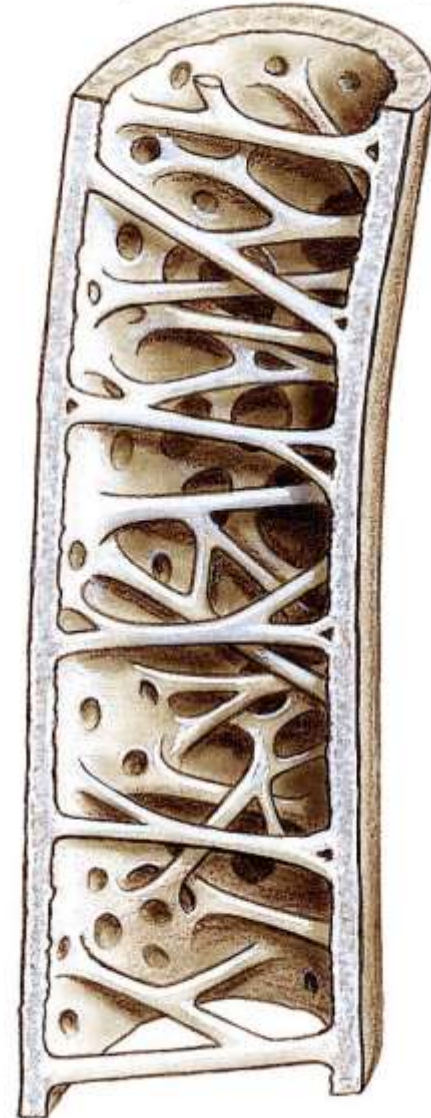
Powder Down

- Similar to down feathers
 - Tips disintegrate
 - Produce talc-like powder
 - Waterproofs animal

Skeleton

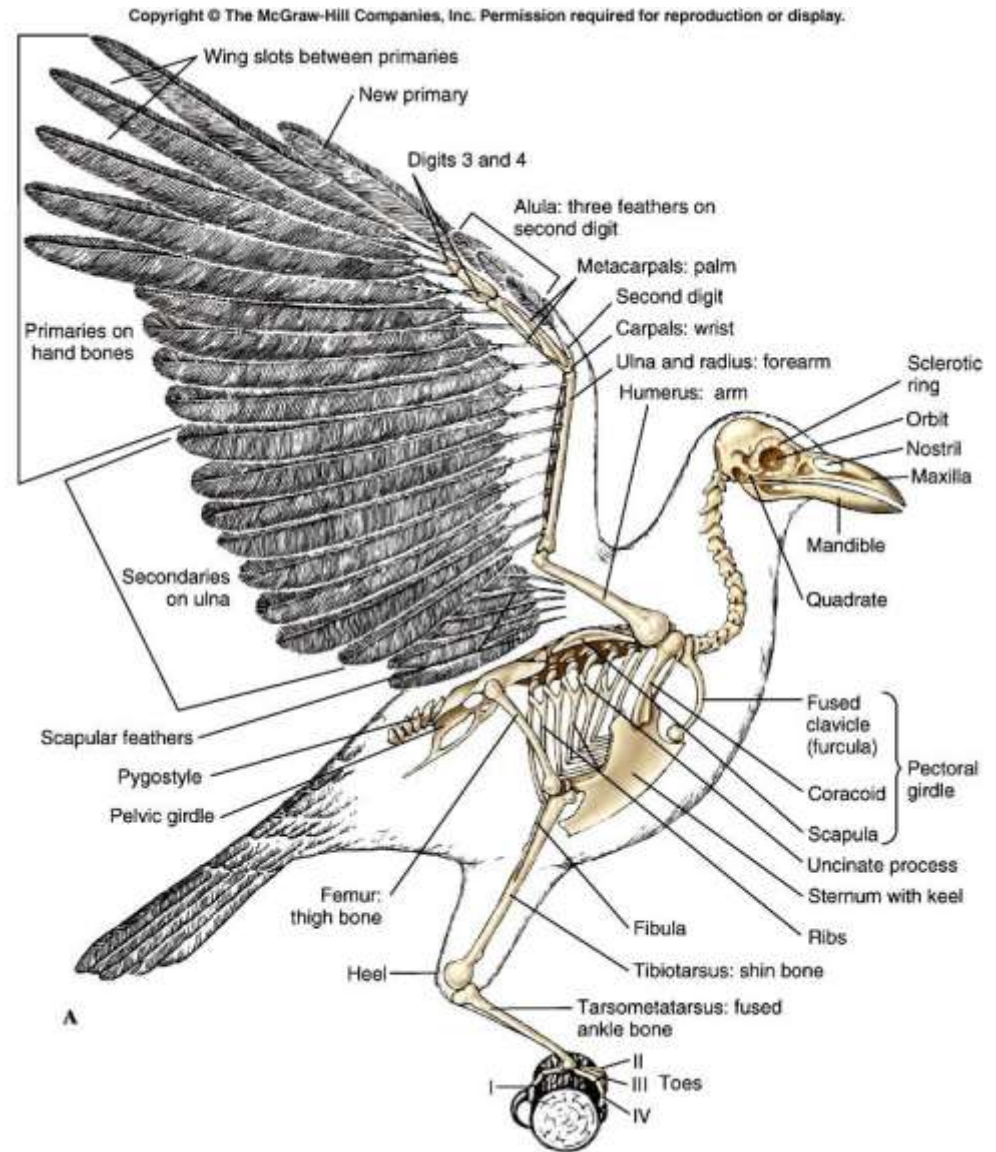
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- Strong yet light bones
- Pneumatized space with cross struts
- Spaces extend to air sacs of respiratory system
- Birds not any lighter than other mammals of same size
 - Distribution of weight over legs provide lower center of gravity
 - Aerodynamic stability



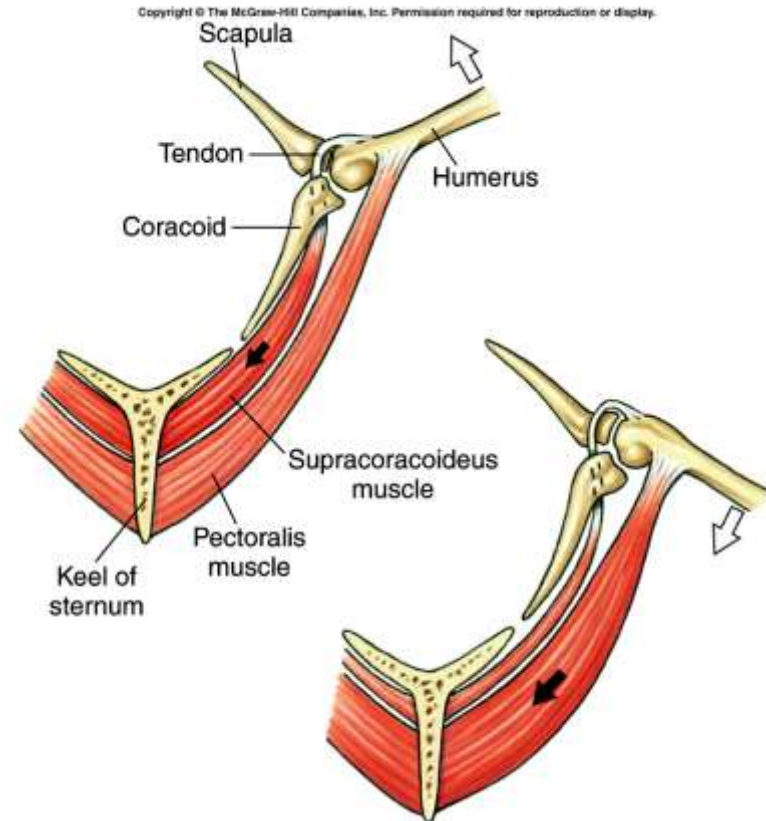
Skeleton

- Several parts fused to increase rigidity
- Cervicals not fused, most others are
- Caudal completely fused to form pygostyle
- Trunk vertebra fused to form synsacrum
- Ribs brace each other in addition to attachment to vertebrae & sternum (braces are called uncinat processes)
- Clavicles fused to a furcula (pulley bone in chickens) which flexes during flight



Muscles

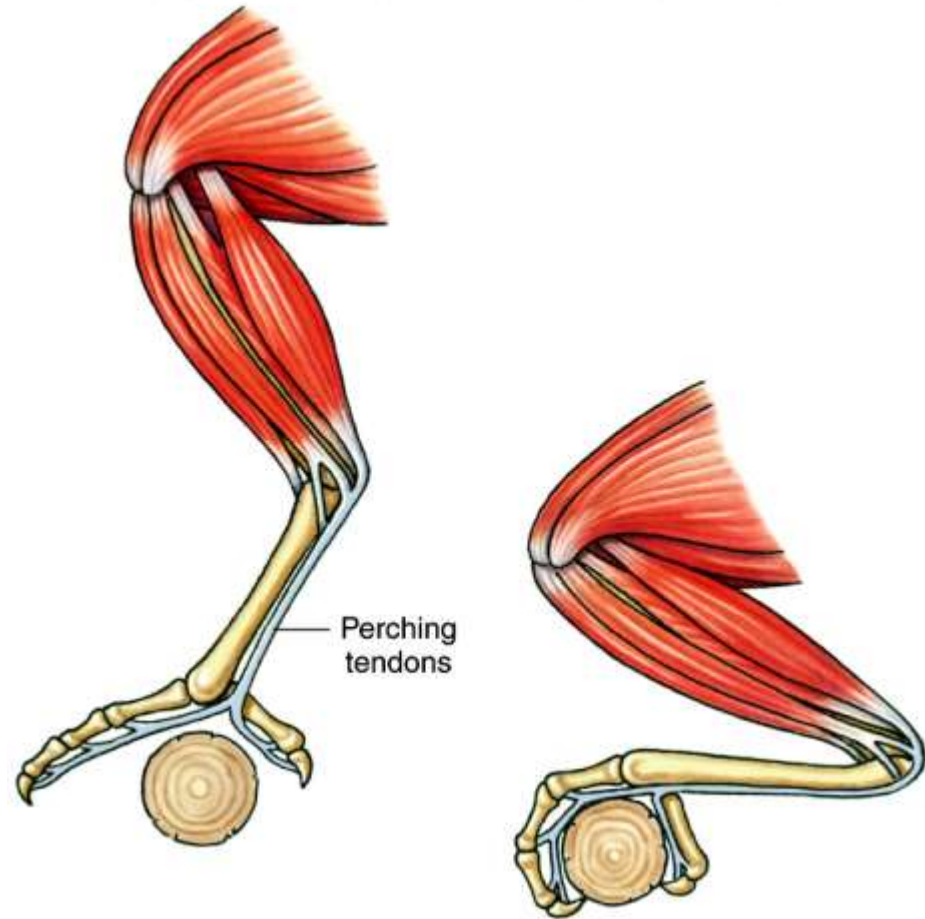
- Pectoralis largest
 - Downward beat of flight
- Supracoracoideus raises wings
- Pectoralis connects to humerus with keeled sternum.
- Supracoracoideus connect to coracoid bone with keeled sternum



Feet

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- Mostly bone, scales and skin
- Keeps bird from feeling cold and heat at foot
- Perching due to special tendons



Feeding & Digestion

- Diet
 - Euryphagous (omnivores)
 - Stenophagous (select diet)
- Large appetites due to high metabolic requirements
- No teeth
- Gizzard for grinding (keratinized plates)
- Proventriculus adds gastric juices
- Crop stores food
- Caeca – where small intestine joins cloaca
 - Hold bacteria in herbivorous birds
- Young birds have bursa of Fabricius
 - Process B cells of immune system

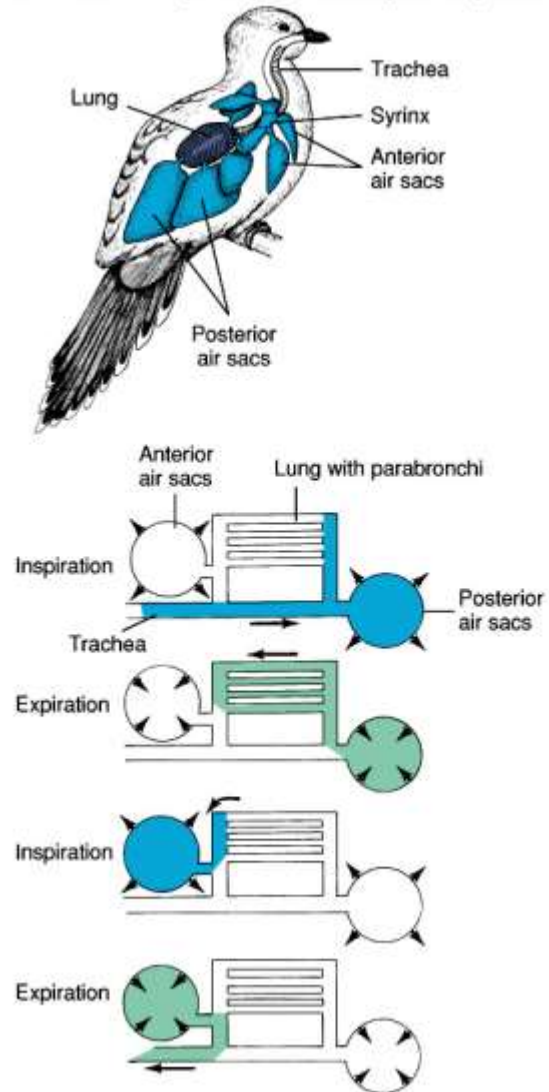
Circulatory System

- 4 chambered heart
- Closed system
- Separation of respiratory and systemic circulations
- Right aortic arch leads to dorsal aorta (left in humans)
- Larger the bird, slower the heartbeat
- Nucleated erythrocytes
- Phagocytes present

Respiratory System

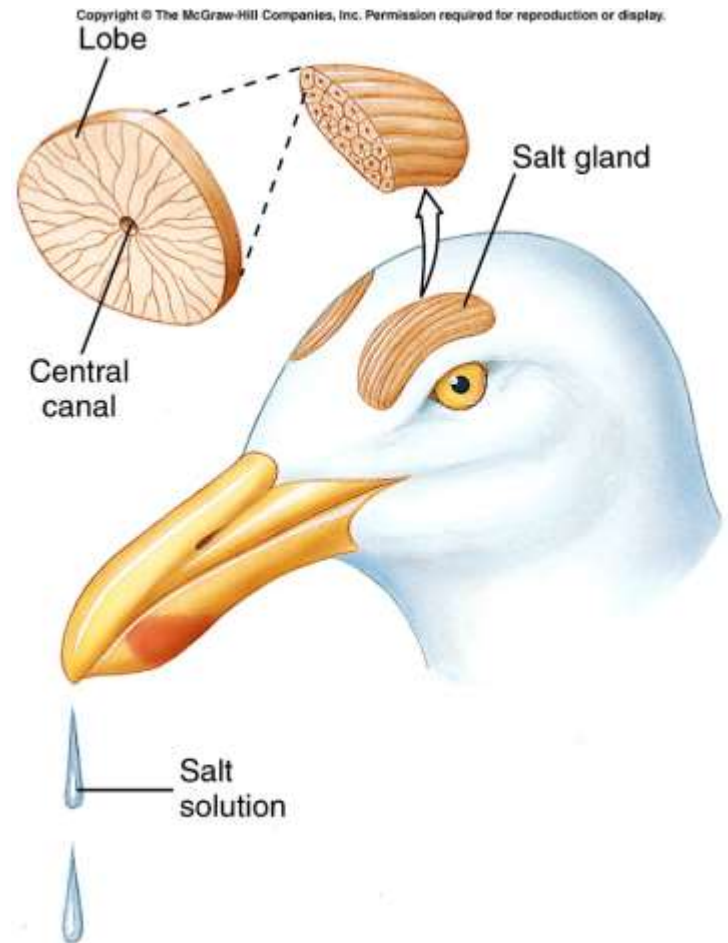
- 9 interconnecting air sacs paired in thorax and abdomen
 - Divide into extensions to bones
- Branches of bronchi don't end in alveoli as in humans
 - Form parabronchi
 - Then into air sacs

- Takes two passes through respiratory system for a single “breath”



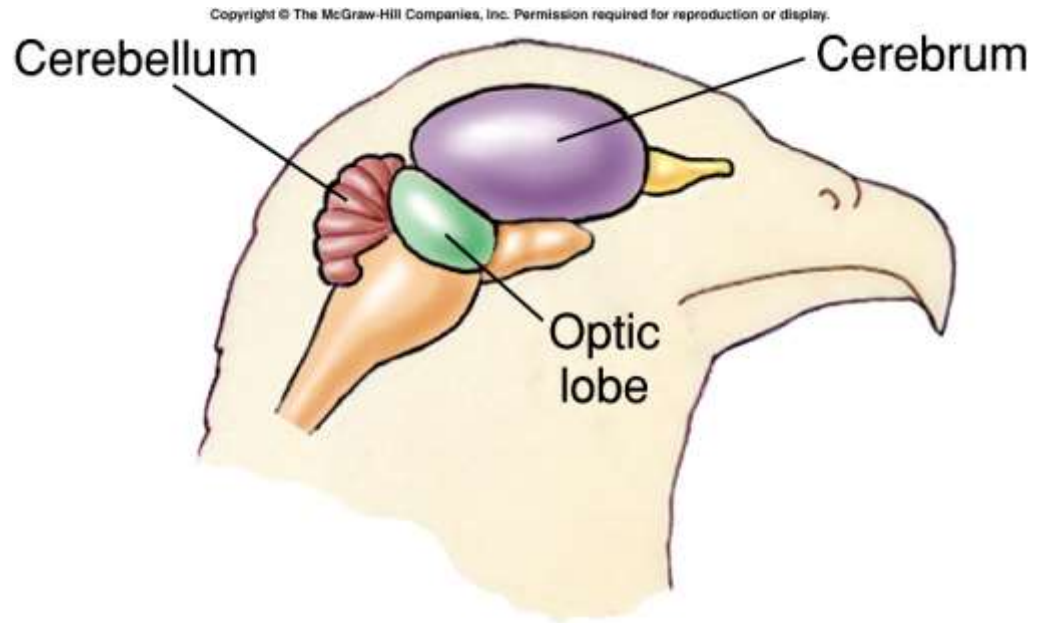
Excretory System

- Paired metanephric kidneys
 - Selective re-adsorption of solutes
- Urine formed and passed via ureters to cloaca
- No urinary bladder
- Water removed in cloaca and forms uric acid
- Salt glands, particularly in sea birds



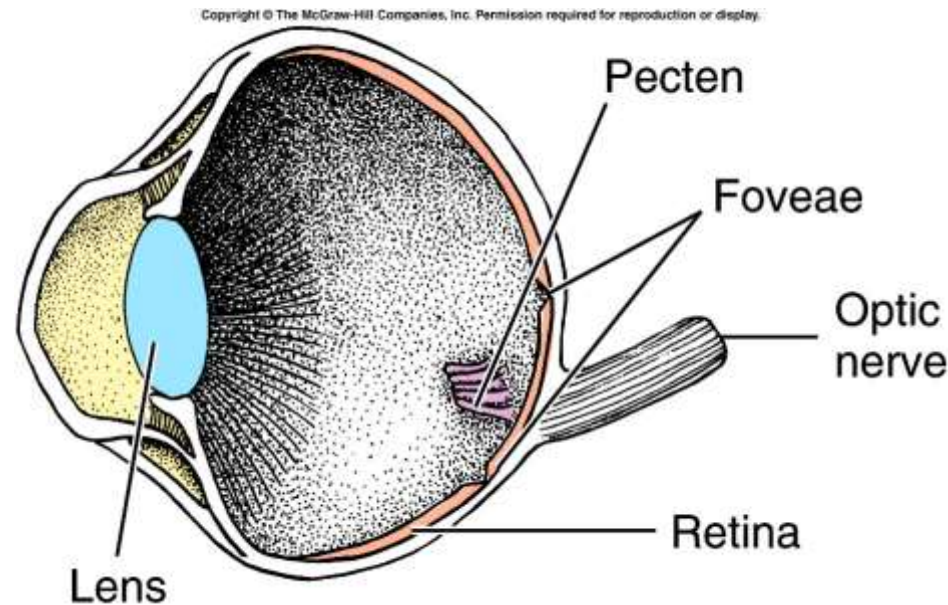
Nervous and Sensory System

- Need well developed brain
 - Cerebral hemispheres, cerebellum and optic lobes
 - Cerebral cortex less developed
- Cerebellum coordinates
 - Muscle position
 - Equilibrium
 - Visual clues
 - All necessary for movement and balance
- Poor sense of smell and taste (carnivorous, flightless, oceanic and waterfowl have good tasting ability)
- Hearing good
 - External ear
 - Middle ear
 - Inner ear
 - Basic arrangement of mammals



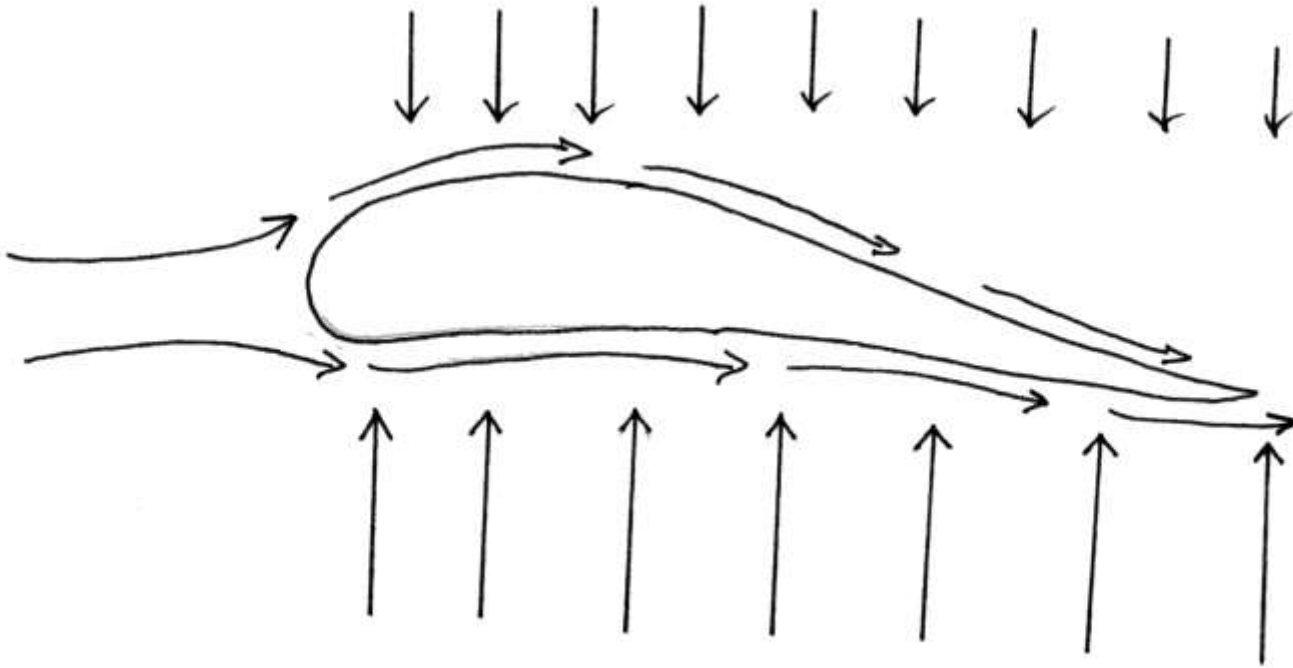
Vision

- Similar to humans
- Rods & cones
- Highly vascularized area near optic nerve called pecten (adds additional nutrients to eye)
- Fovea may be found in pits on retina
 - Some birds have two fovea
 - Binocular vision birds
 - Central fovea for sharp monocular images
 - Posterior fovea for sharp binocular vision



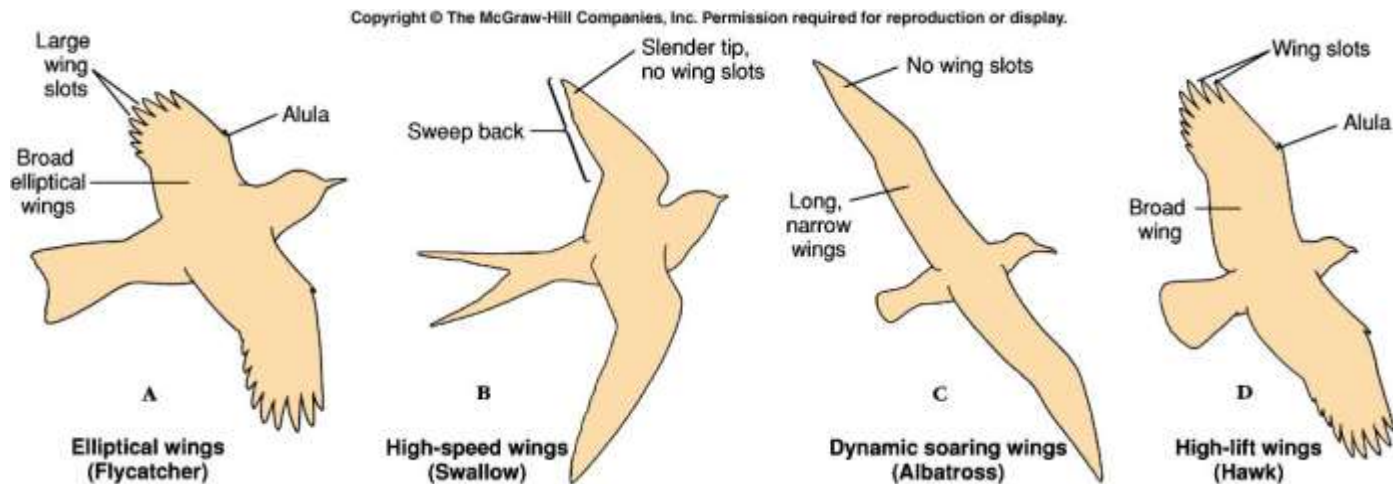
Flight

- Bernoulli Effect



Wing Types

- Elliptical
 - Low aspect ratio (ratio of length to average width)
 - Greater maneuverability
- High speed
 - High aspect ratio
 - Stay aloft at low speeds
- Dynamic soaring
 - High aspect ratio
- High lift
 - Heavy, large bodies
 - High lift at low speed



Migration & Navigation

- Most have established routes
- 1/2 of all species migrate
 - Most from north to south in fall and south to north in spring
- Parameters of migration
 - Use of different routes in fall and spring
 - Time to complete route
 - Night vs day migration (or both)
 - Distance of migration
 - Use of landmarks

Direction Finding

- Factors
 - Use of topographical landmarks
 - Flock behavior by following experienced birds
 - Innate sense of time
 - Use of earth's magnetic field
 - Celestial clues (both stars and sun)
 - Sun-azimuth orientation (use of sun and innate sense of time)

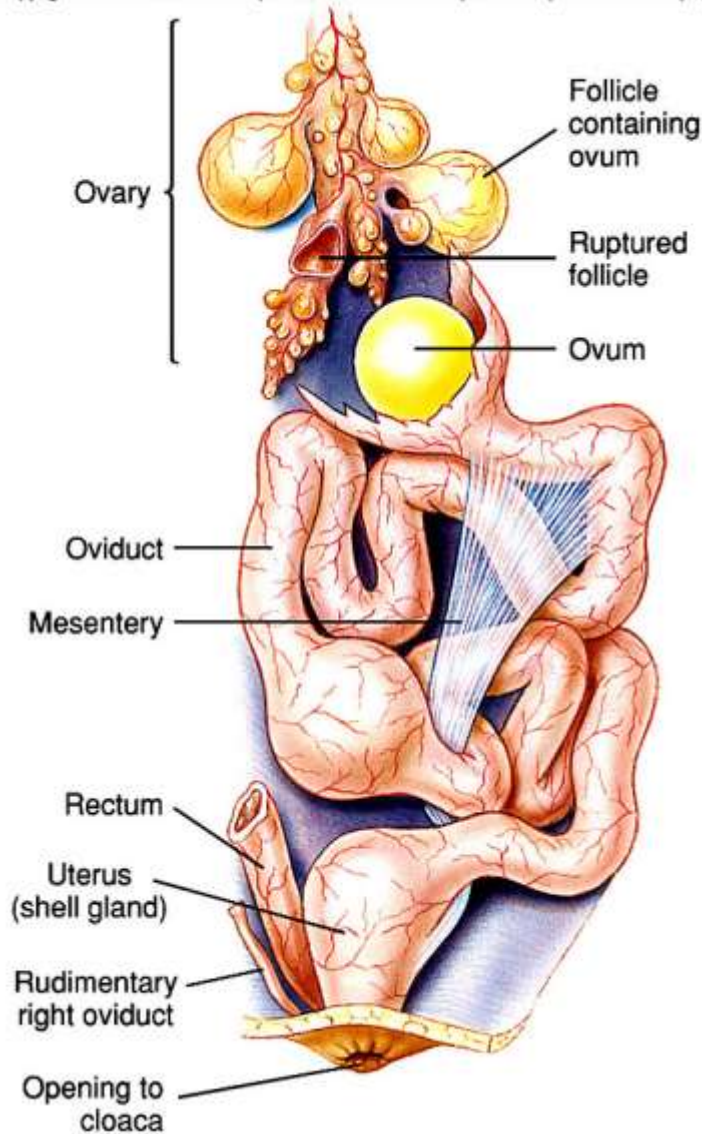
Behavior

- Complex behavior
 - Breeding
 - Nesting
 - Courtship
 - Feeding, etc.

Reproduction

- Males with paired testes
- Females often have only left ovary and oviduct
- Males typically have no penis (waterfowl do)
- Egg captured by oviduct (infundibulum)
- Yolk added, then shell
- Sperm remains viable in some species 5-6 days

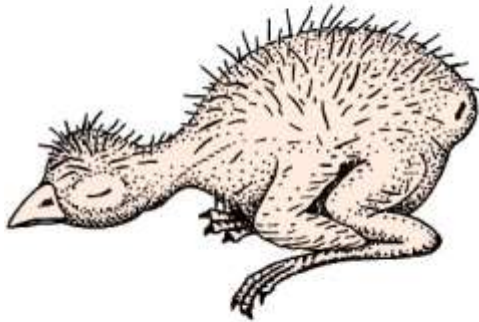
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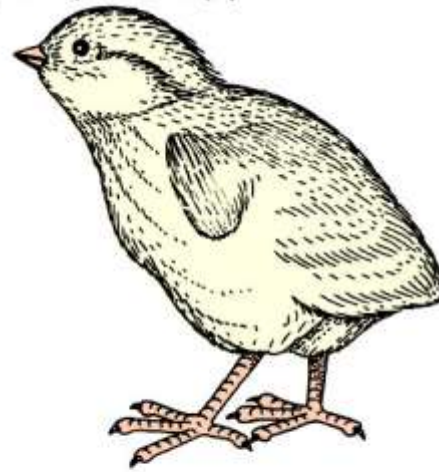
Nesting & Development

- Simple and complex nests
- Altricial and precocial

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Altricial
One-day-old meadowlark



Precocial
One-day-old ruffed grouse