

Birds

## BIRDS and FEATHERS

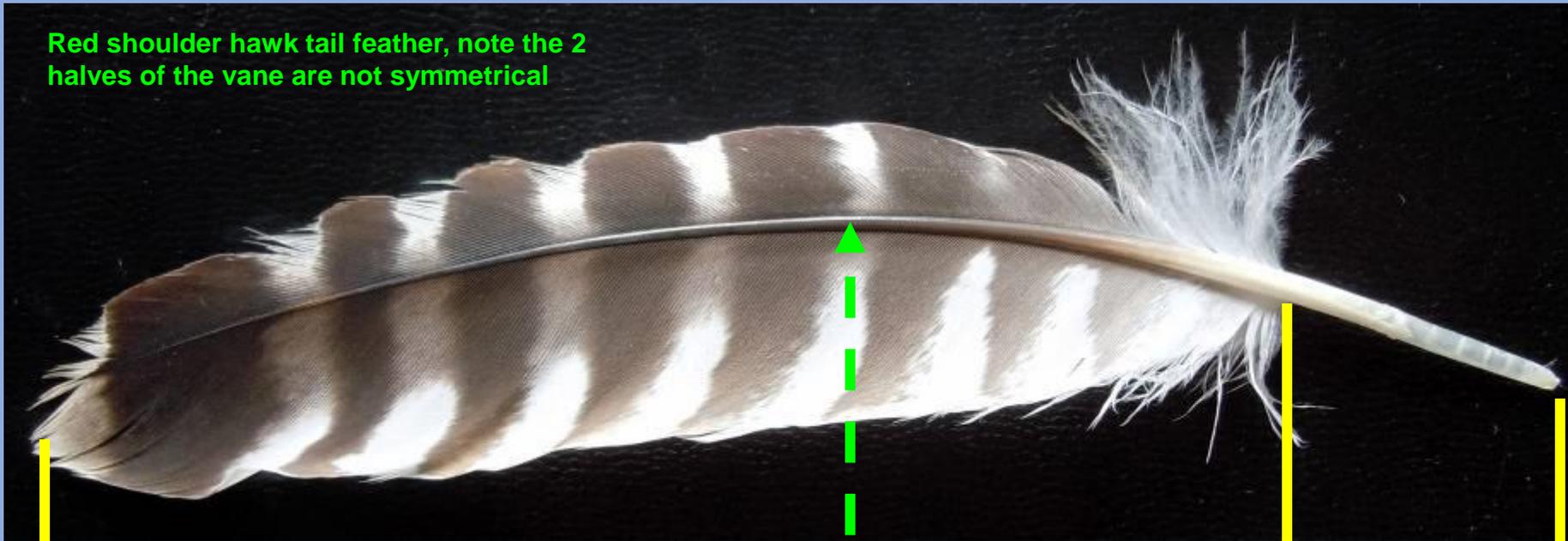




**Feathers-  
insulation, flight  
(air foils), sexual  
display and  
attraction-  
competition and  
of course  
protection and  
water proofing**

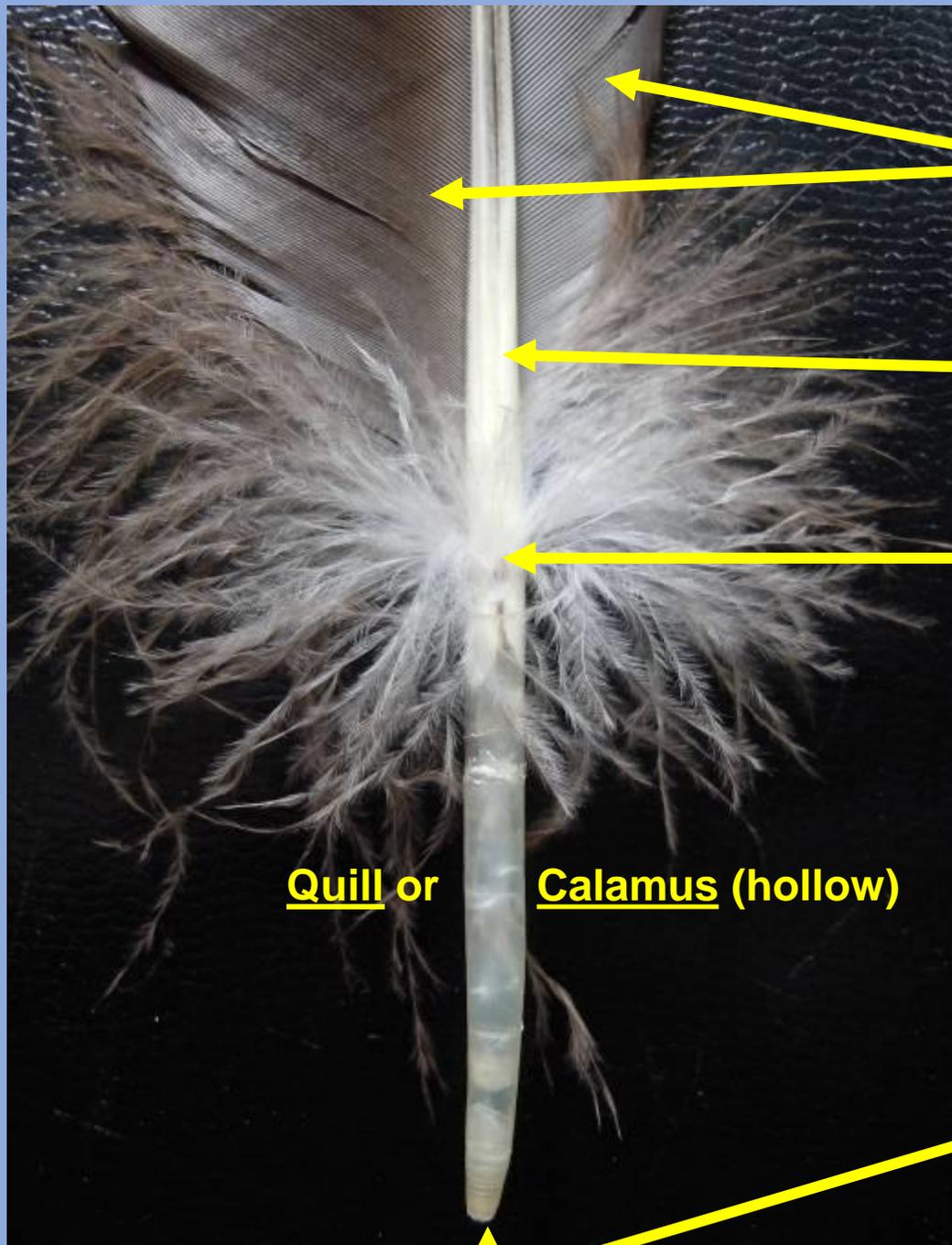
## Contour or flight feathers

Red shoulder hawk tail feather, note the 2 halves of the vane are not symmetrical



Vane with its solid Shaft  
or Rachis

hollow Quill or  
Calamus



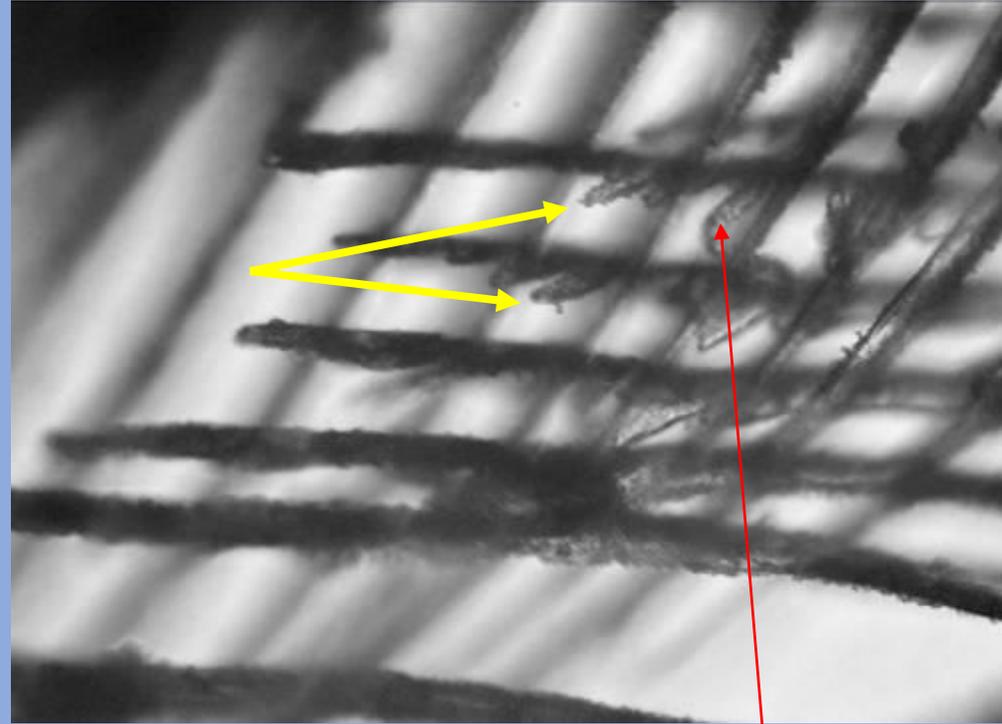
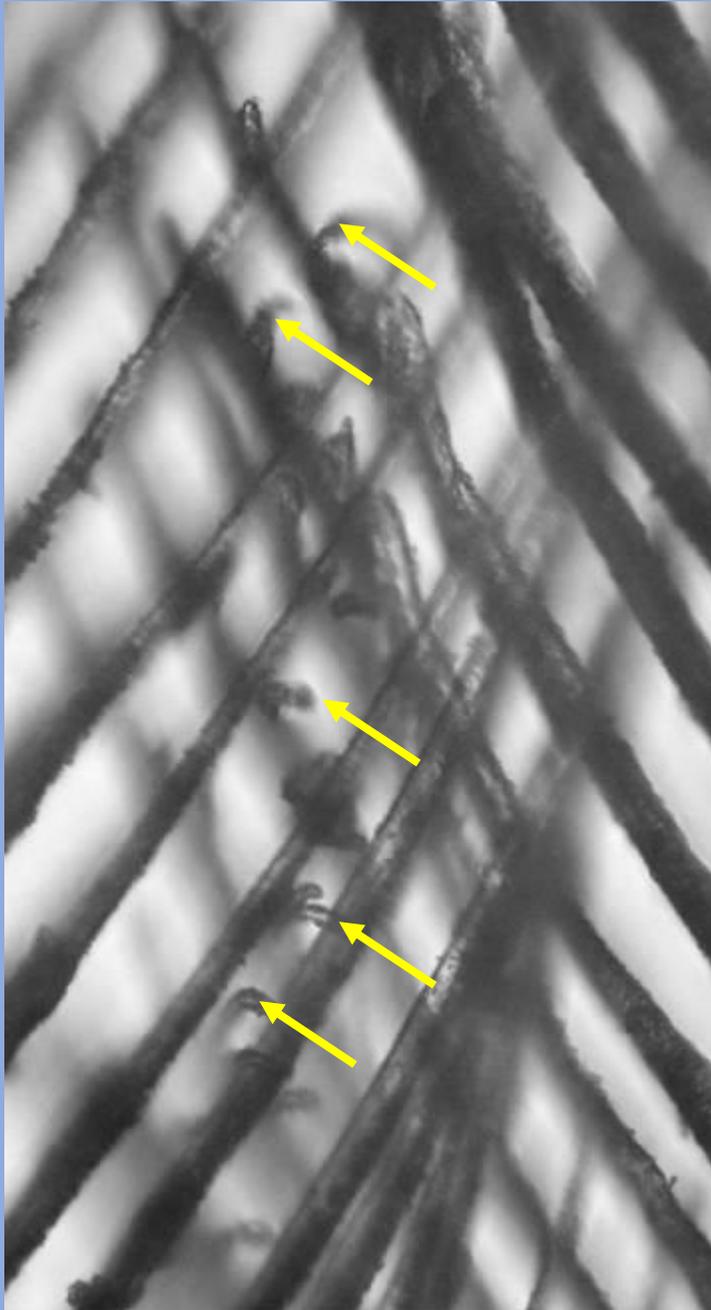
Vane with Barbs & Barbules

solid Shaft or Rachis  
above Sup. Umb.

Superior (Distal)  
Umbilicus – note tufts  
of insulational barbs  
around this opening

Quill or Calamus (hollow)

Inferior (Proximal)  
Umbilicus



2 views of opposing barbules with Hooklets (arrows) that hold them together – if ripped apart ‘preening’ with the bill can re-hook them again

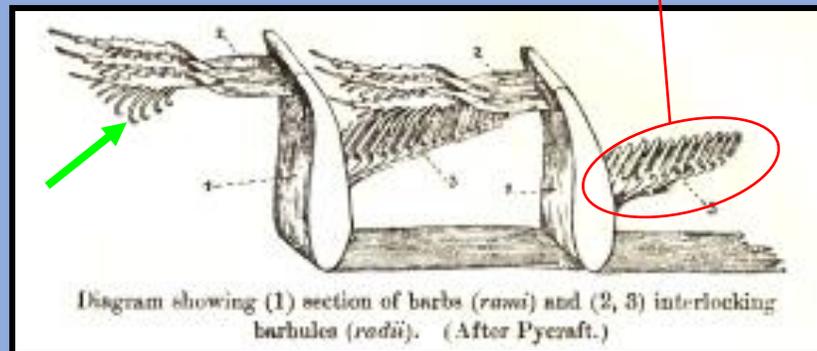
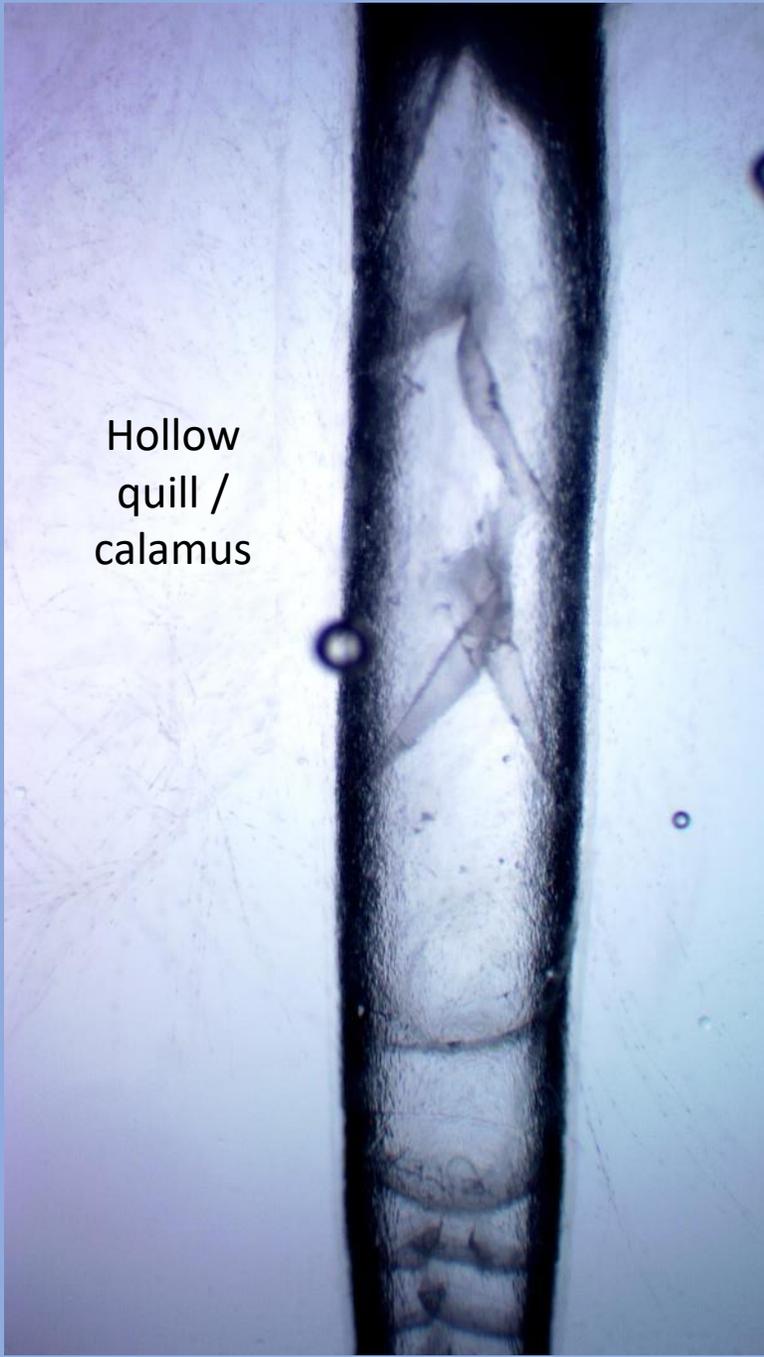


Diagram showing (1) section of barbs (*raui*) and (2, 3) interlocking barbules (*rodii*). (After Pyecraft.)

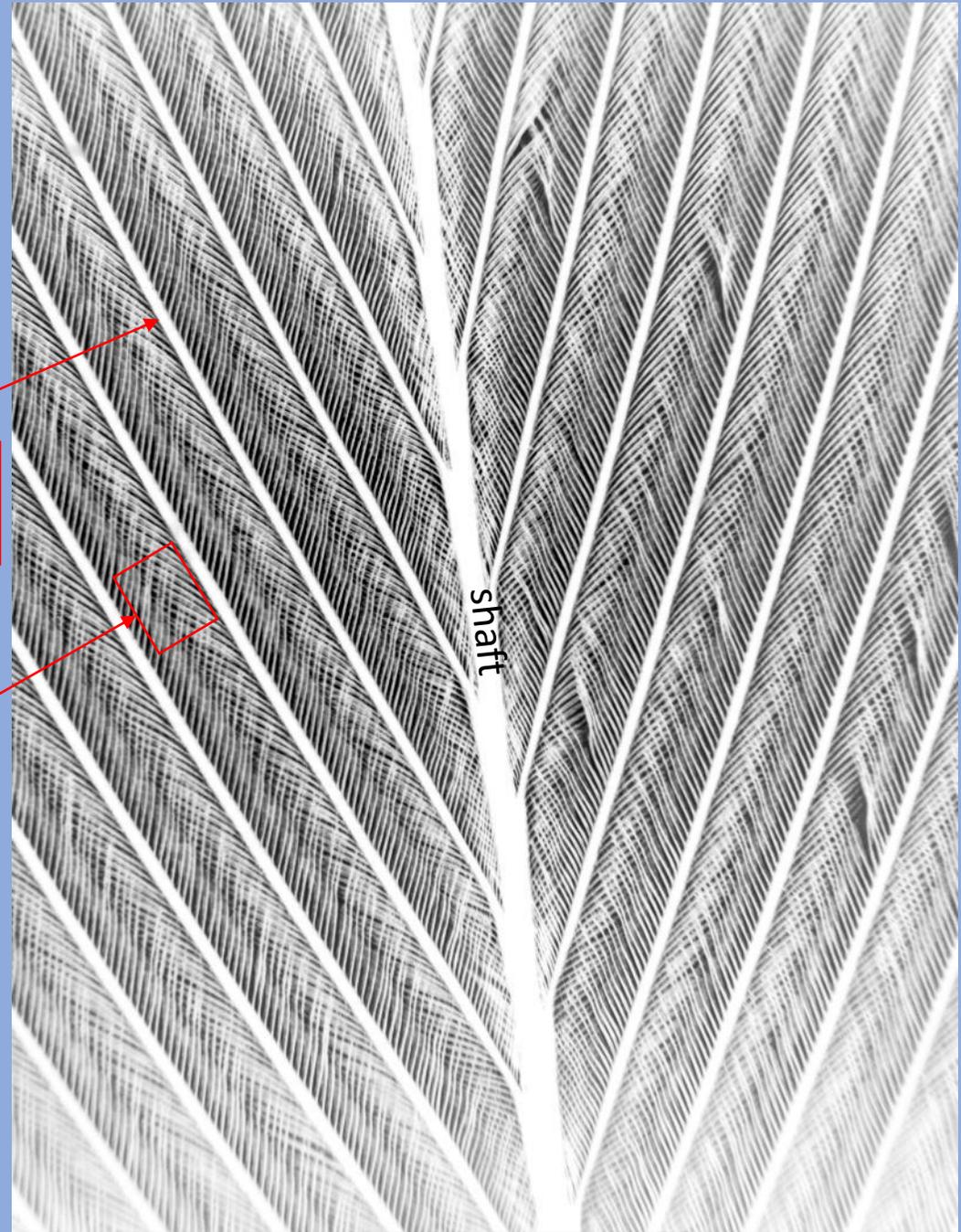


Hollow  
quill /  
calamus

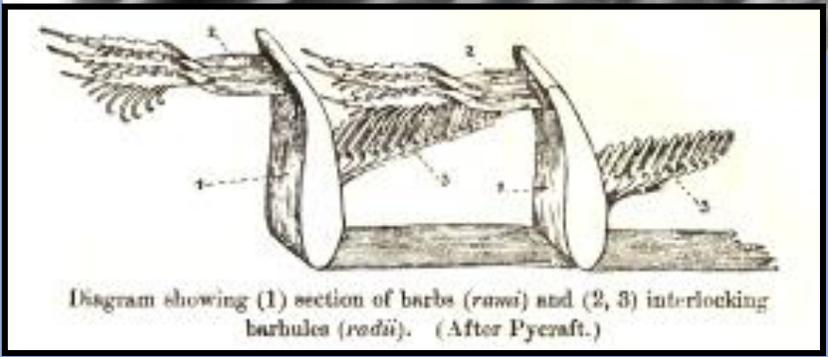
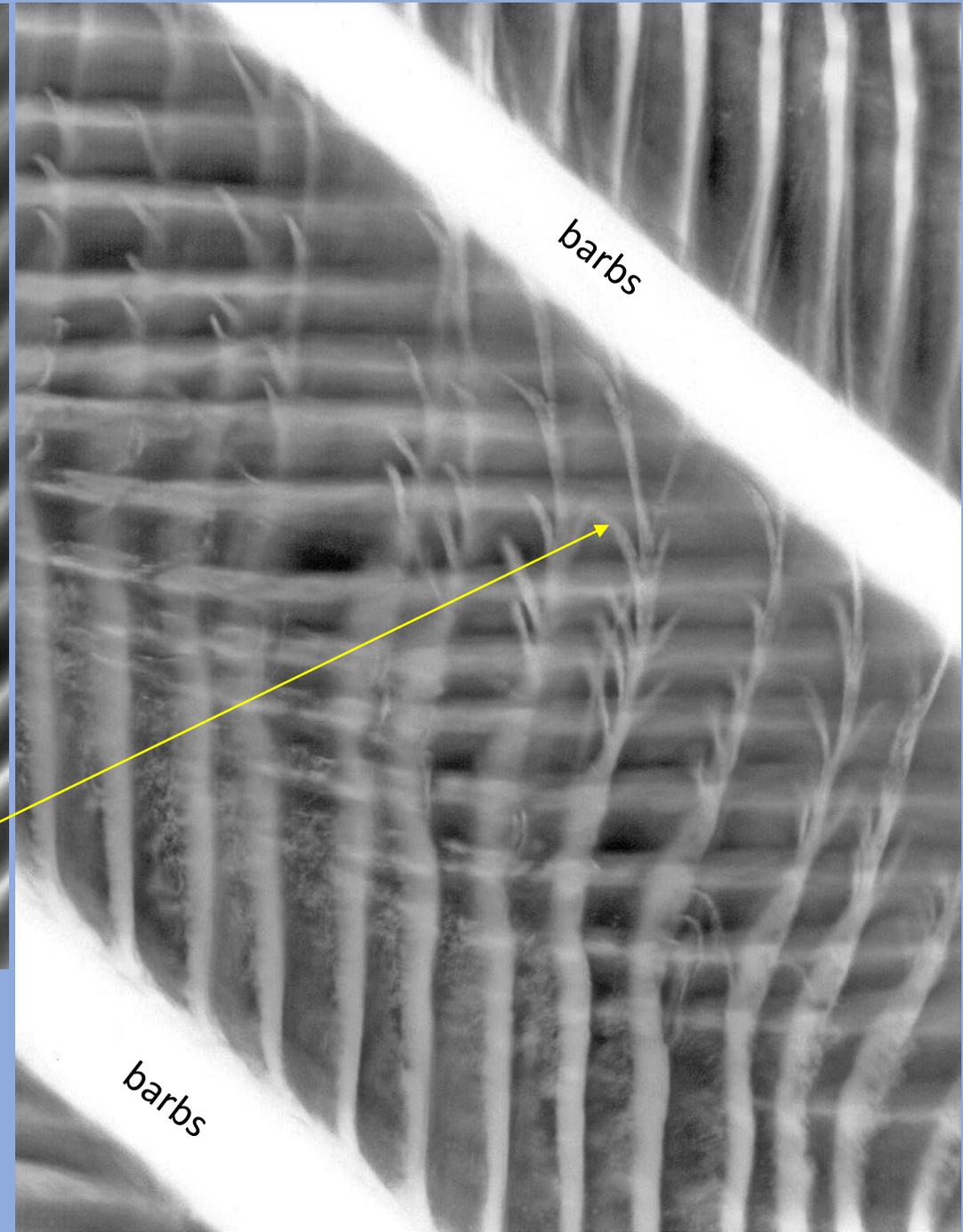
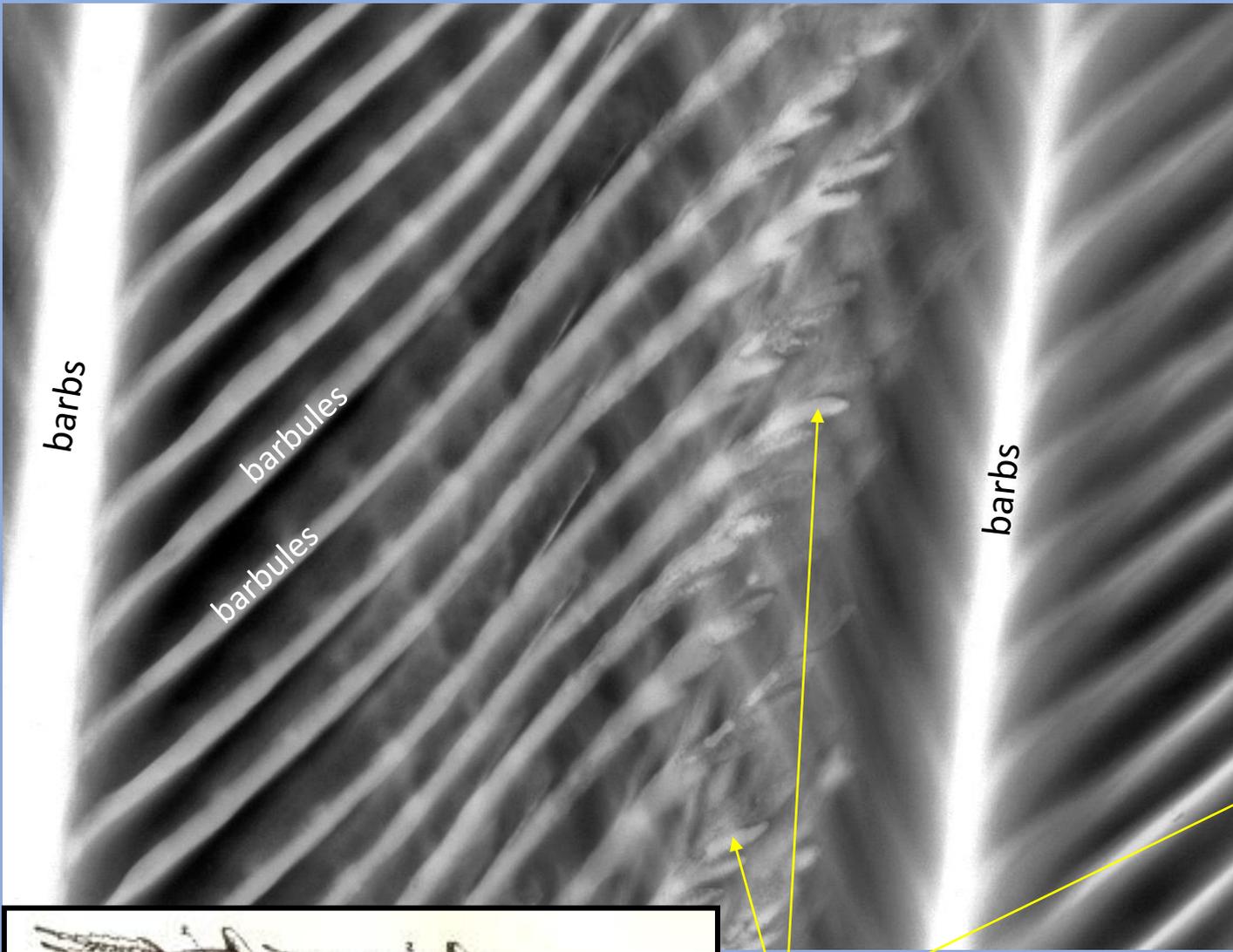


Barb  
(radius)

Barbules



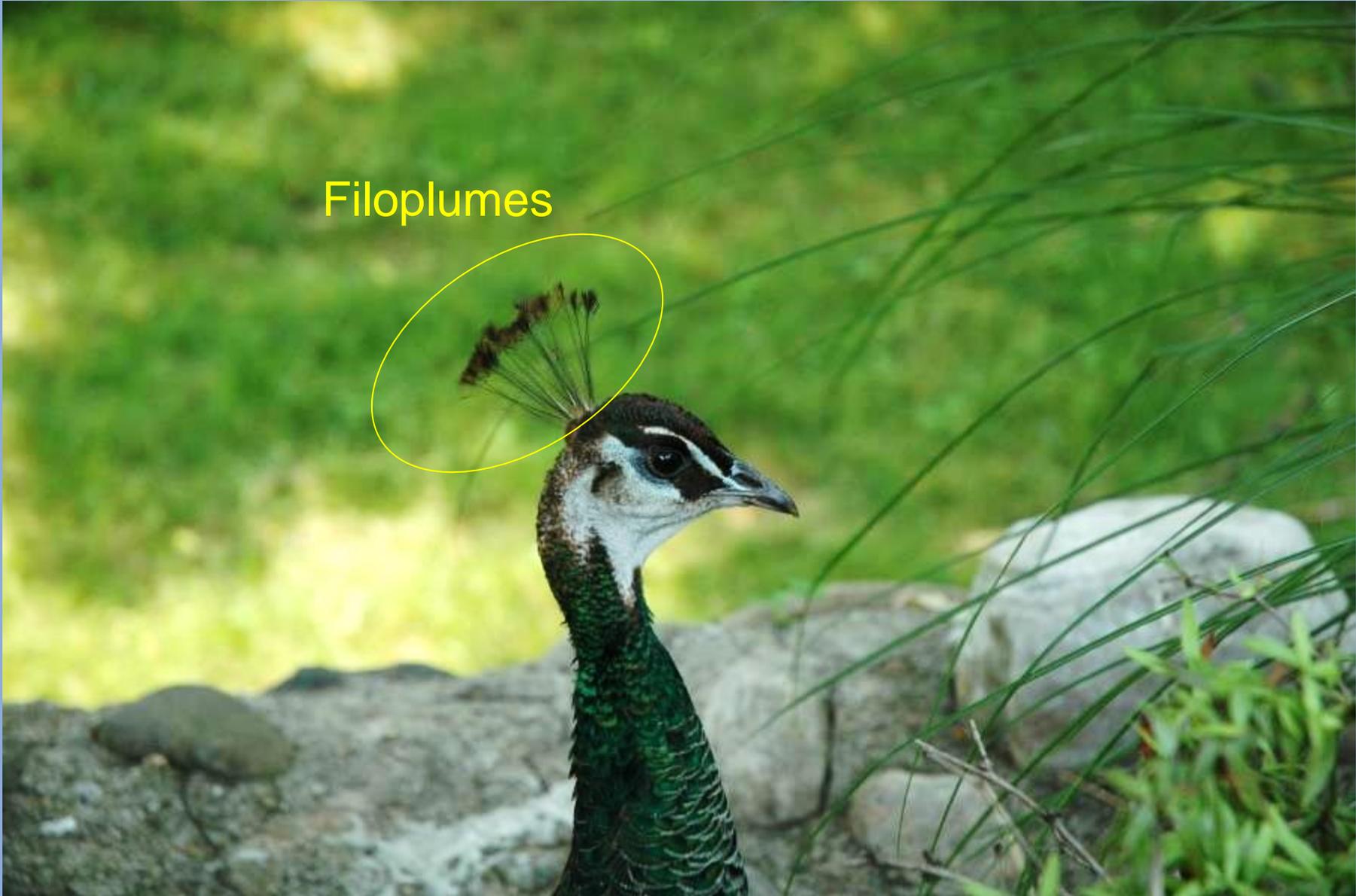
shaft



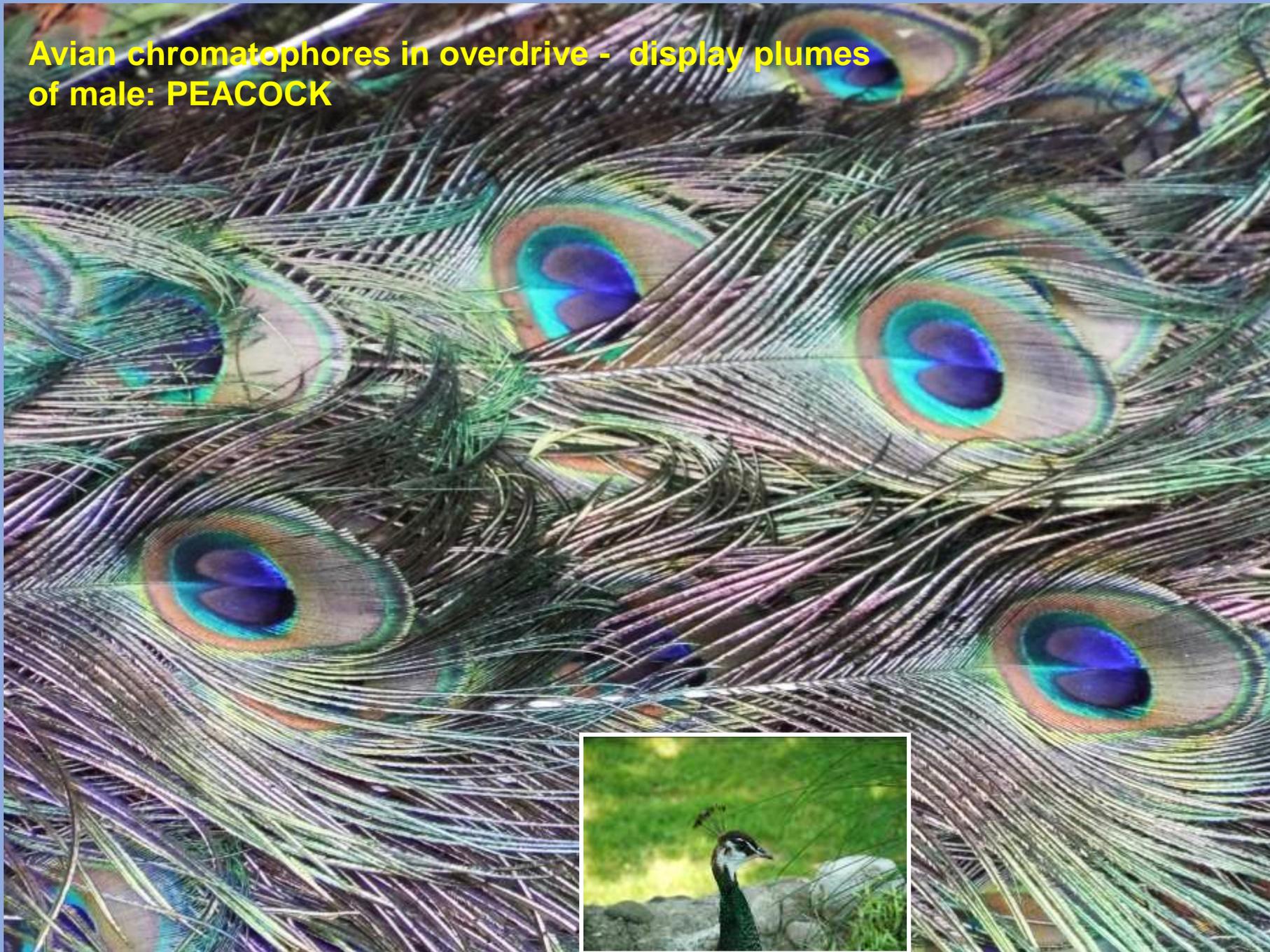
hooks

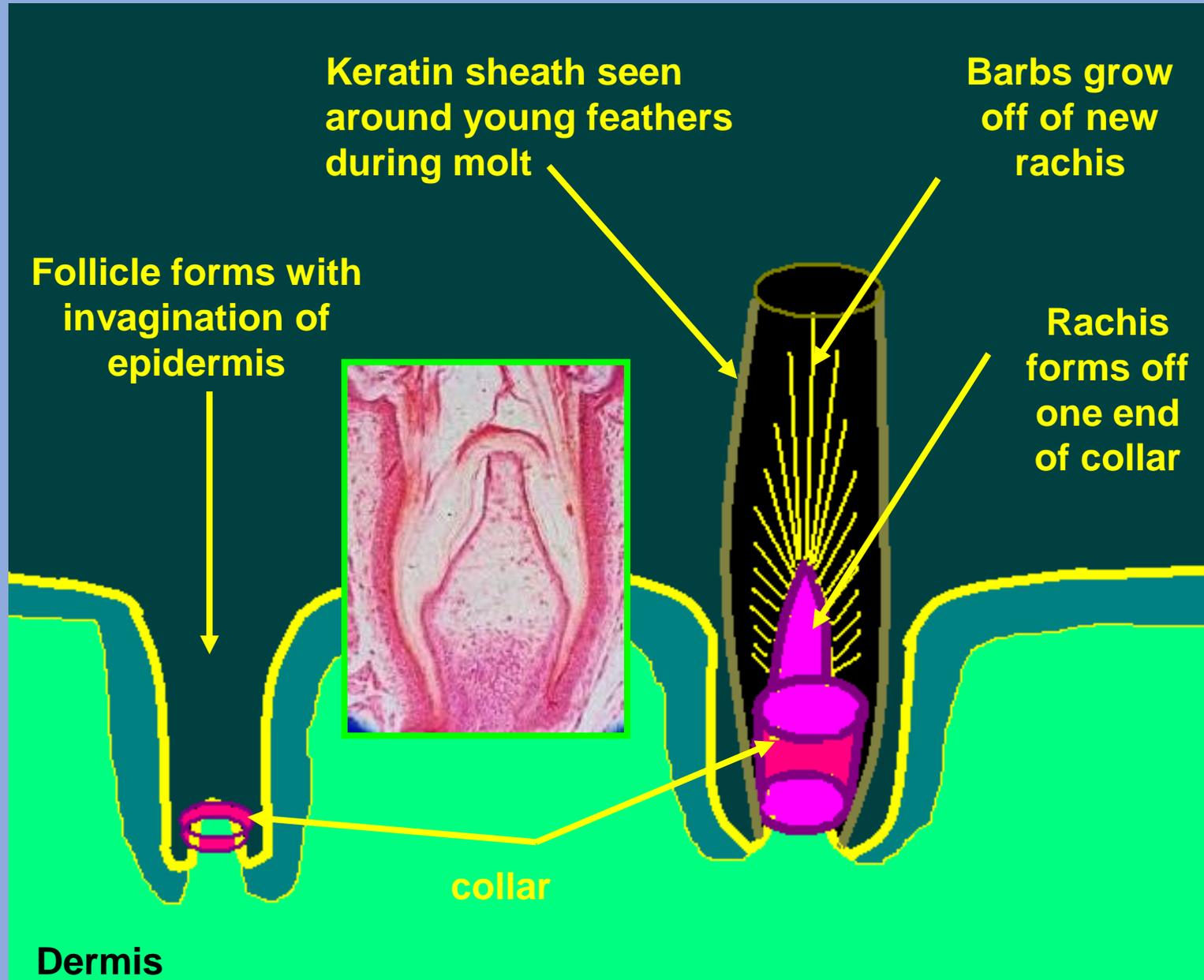
Diagram showing (1) section of barbs (*rami*) and (2, 3) interlocking barbules (*radii*). (After Pycraft.)

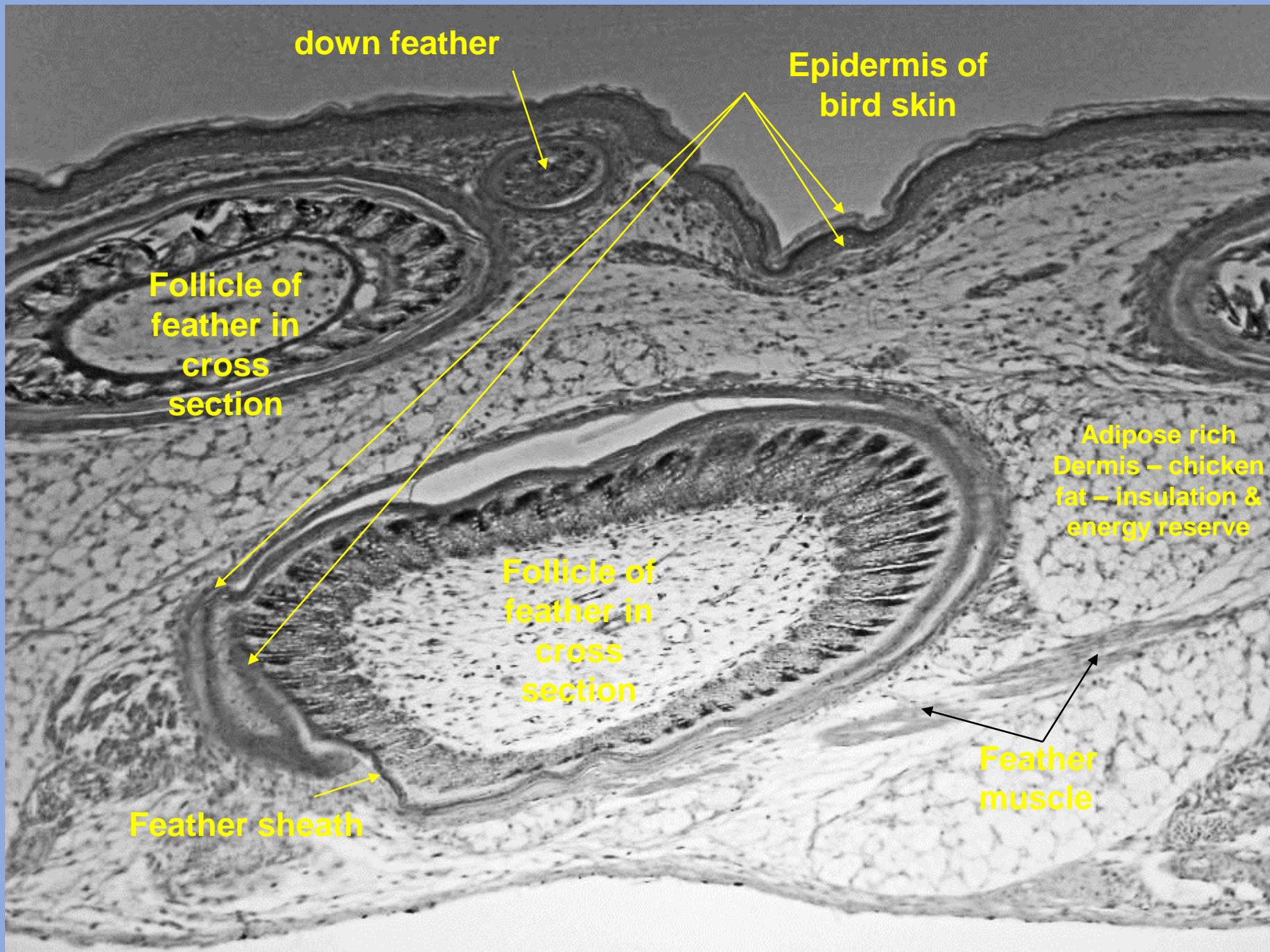
Filoplumes



Avian chromatophores in overdrive - display plumes  
of male: PEACOCK







down feather

Epidermis of  
bird skin

Follicle of  
feather in  
cross  
section

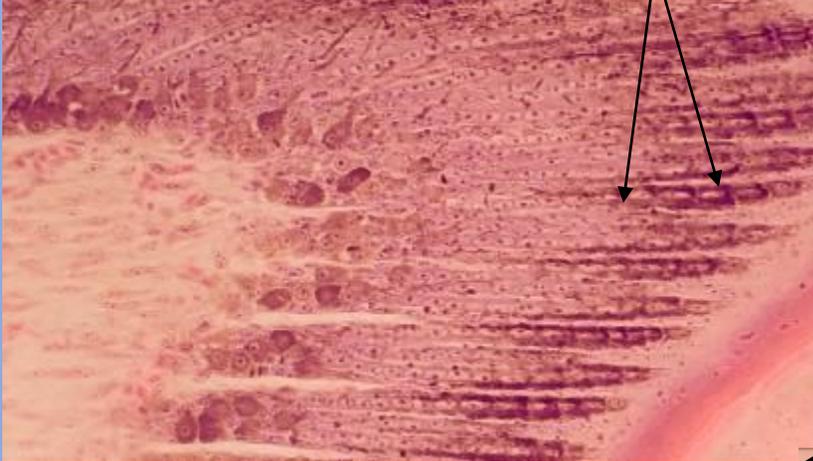
Adipose rich  
Dermis - chicken  
fat - insulation &  
energy reserve

Follicle of  
feather in  
cross  
section

Feather sheath

Feather  
muscle

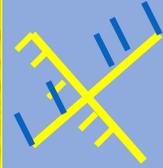
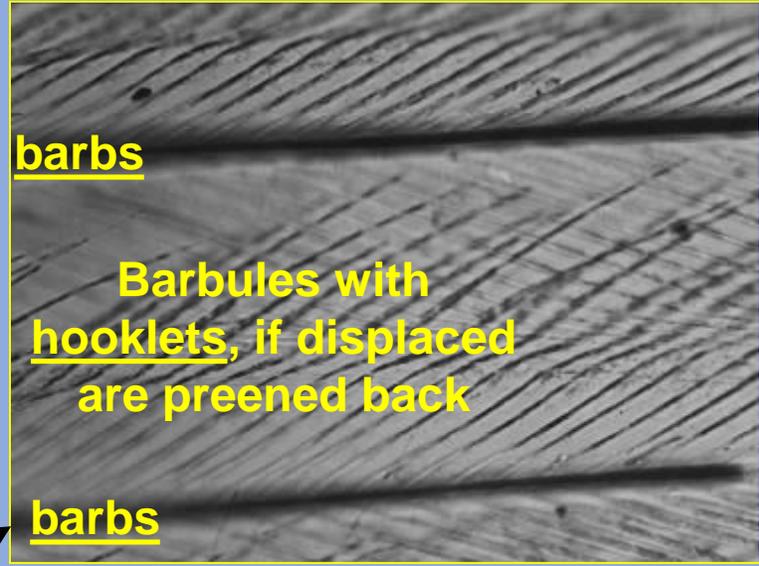
Chromatophores invading rows of rachis cells each of which becomes a barb with their own barbules & hooks



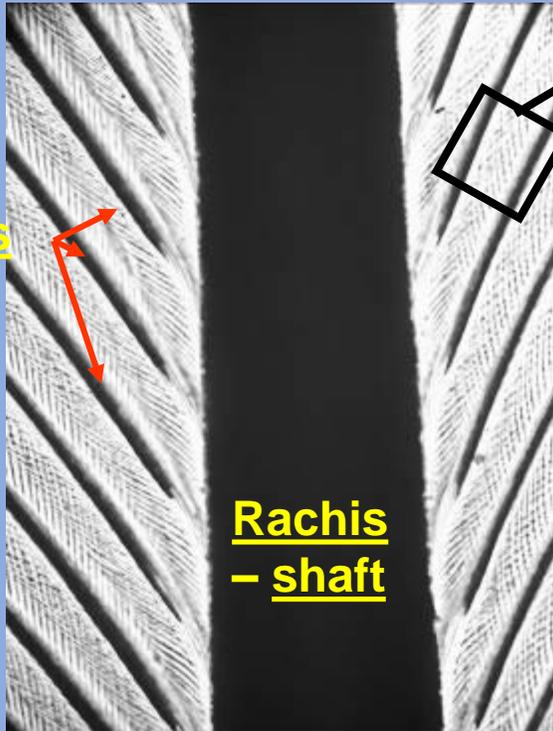
barbs

Barbules with hooklets, if displaced are preened back

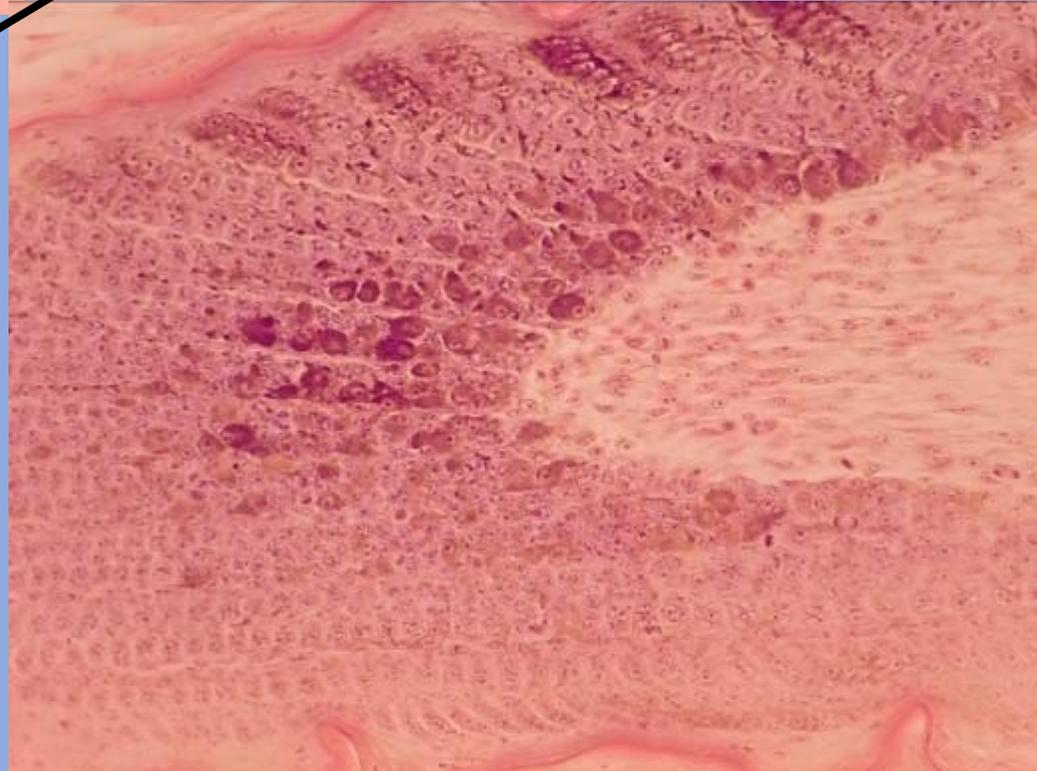
barbs

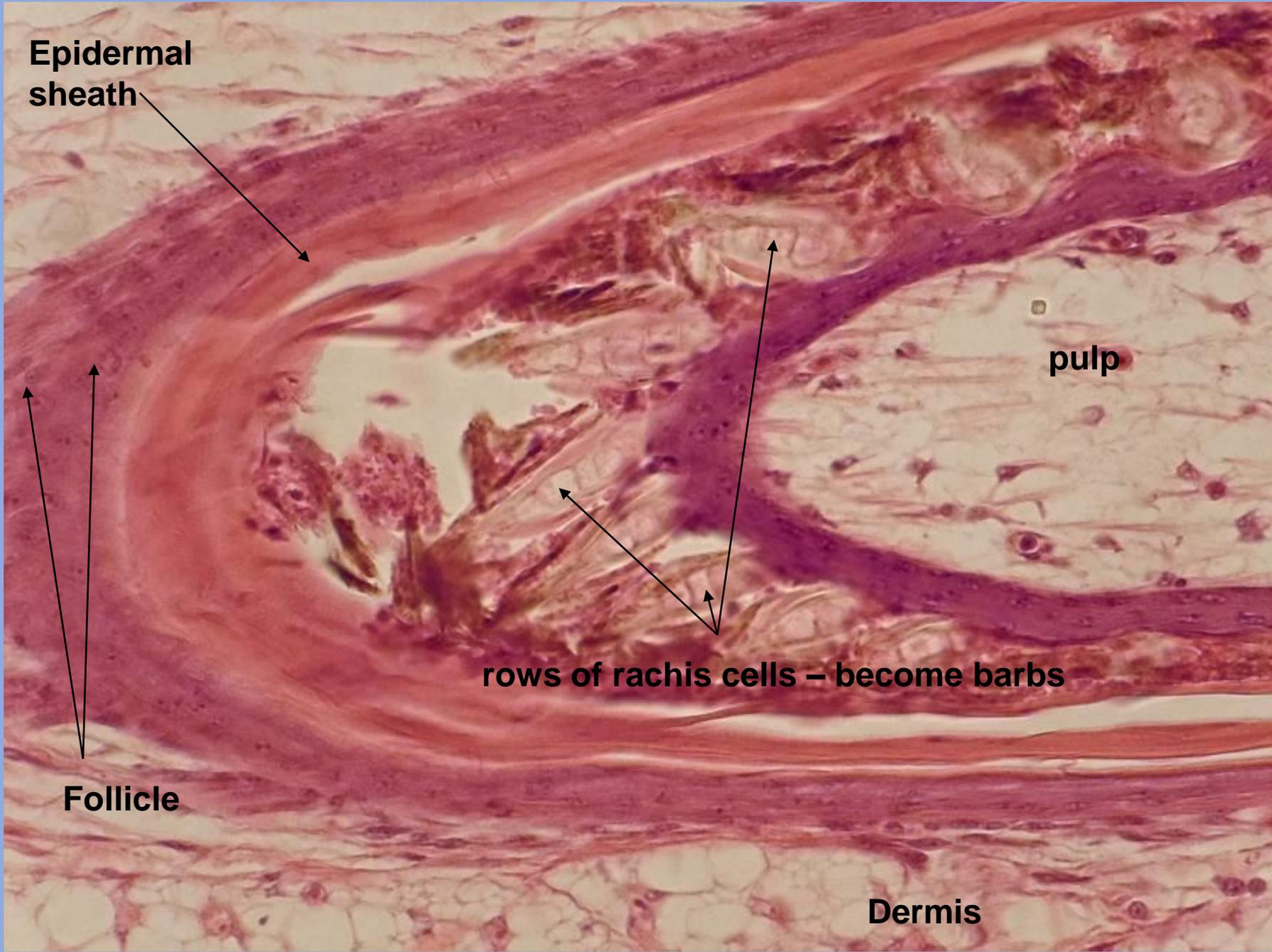


barbs



Rachis  
- shaft





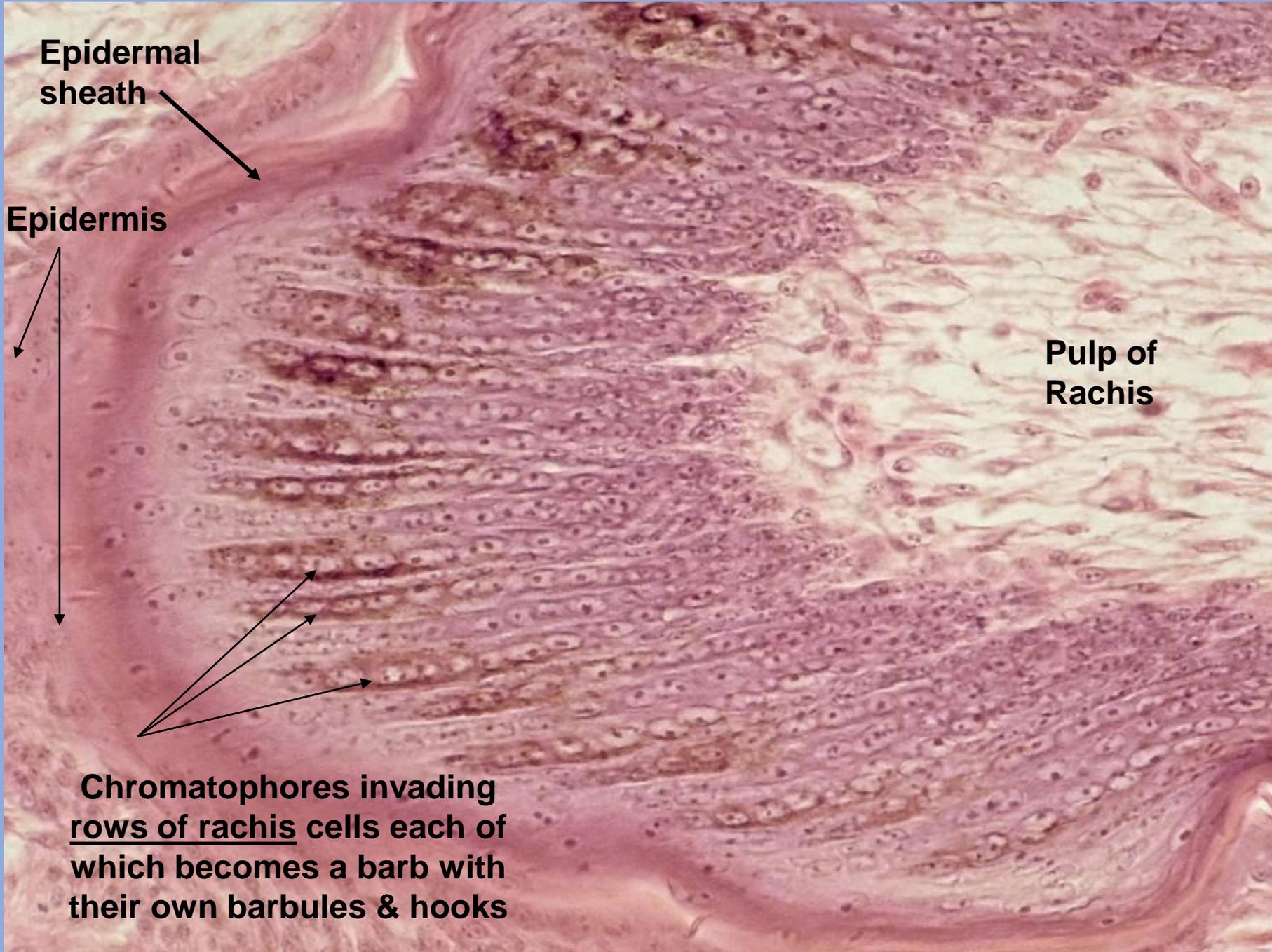
**Epidermal sheath**

**pulp**

**rows of rachis cells – become barbs**

**Follicle**

**Dermis**



**Epidermal sheath**

**Epidermis**

**Pulp of Rachis**

**Chromatophores invading rows of rachis cells each of which becomes a barb with their own barbules & hooks**

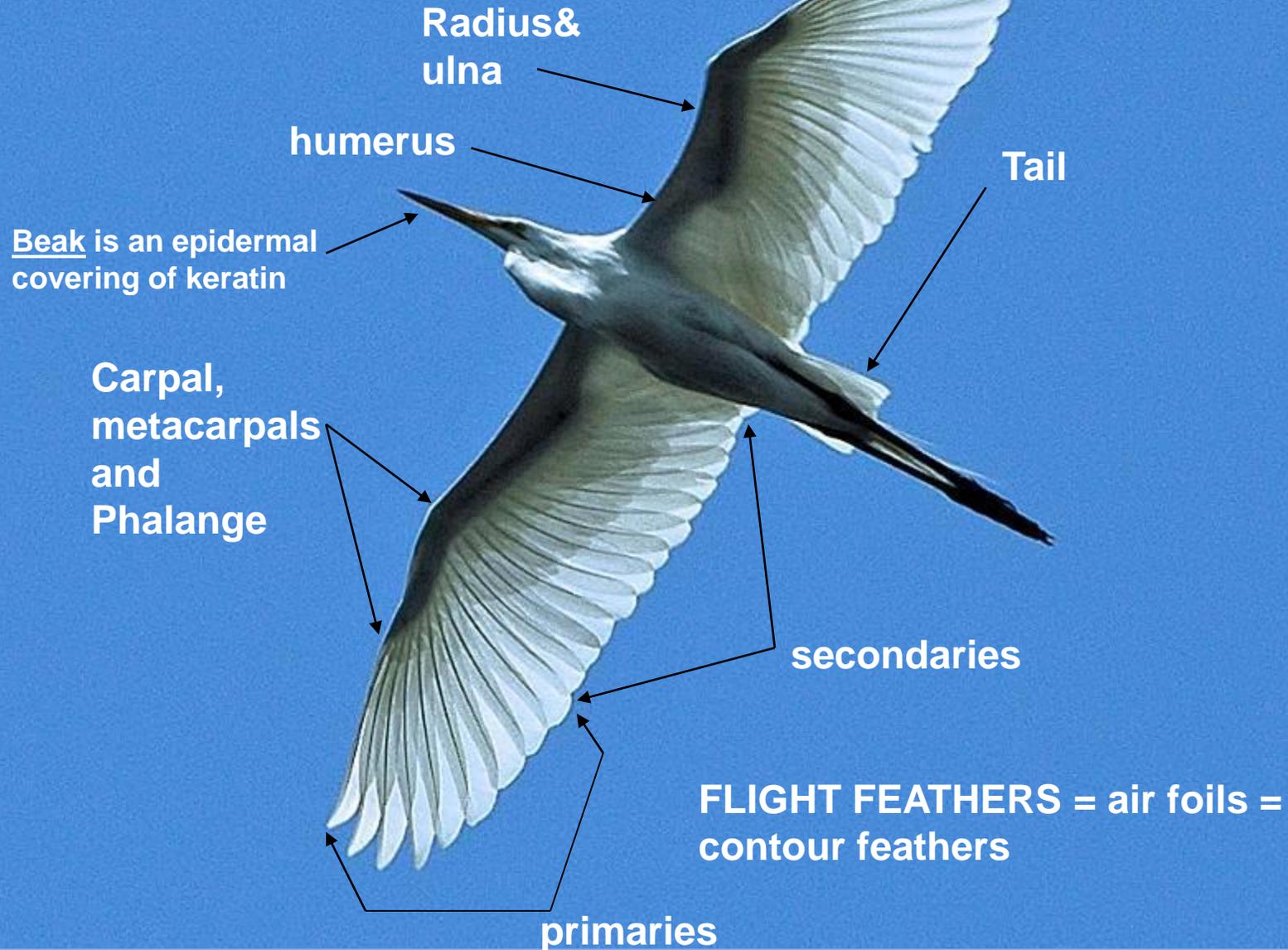


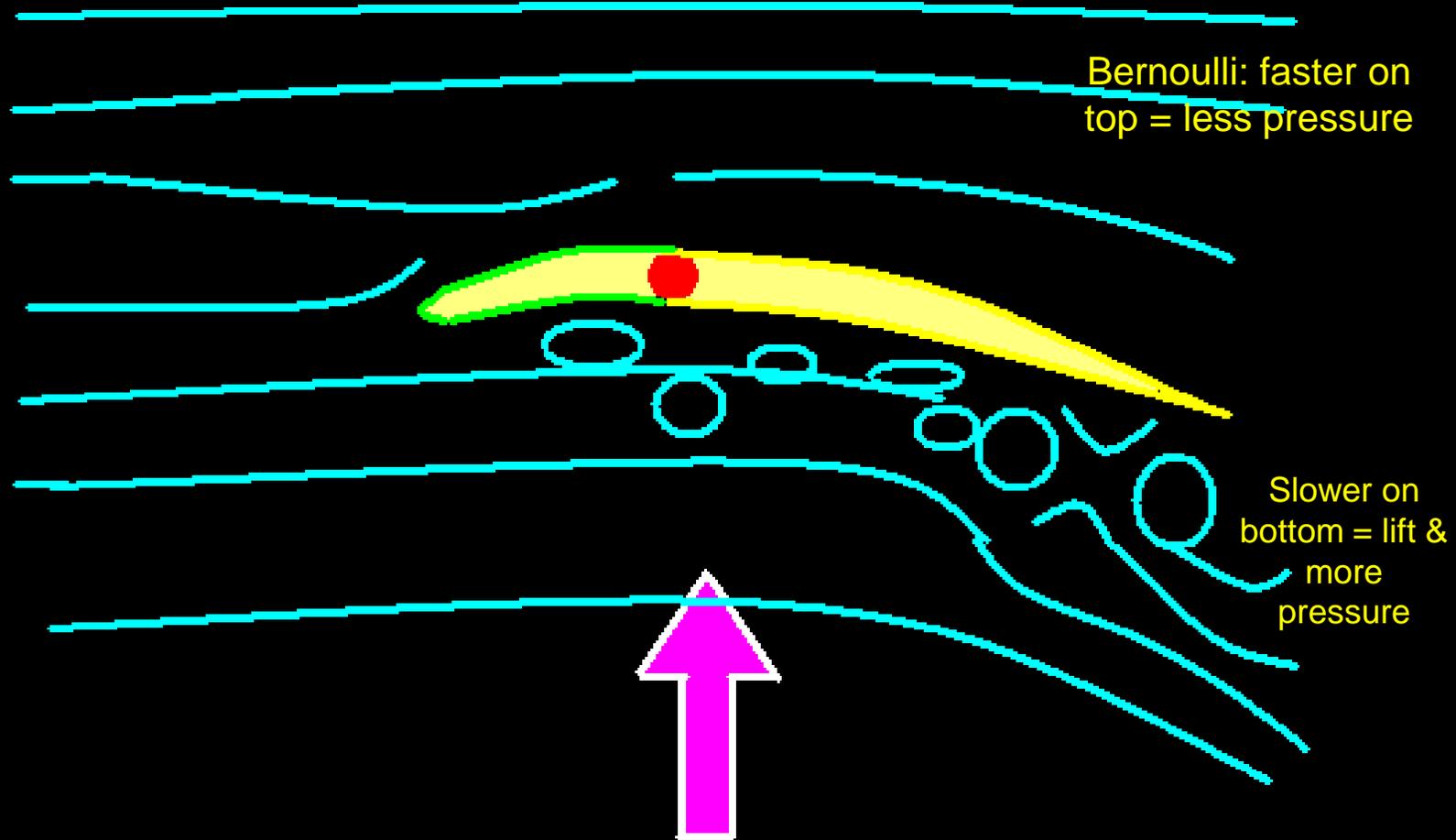
**Down feathers - insulation**

Down feathers - insulation



Great Egret:  
*Casmerodius albus*





In cross section, air foil dynamics of feather & wing: air passes over curved wing or flight feather faster above than below where there is more pressure involved; thus, a 'lift' occurs

**Anhingas** have no oil secreting gland in the skin above their tail base (uropygeal gland) to waterproof the feathers during preening. This permits them to dive deeper for fish, but they have to dry-off in the sun to prevent waterlogging. This guy is sun bathing for a reason.





Like Reptiles and 'Dinosaurs', bird's legs and feet are covered with scales and the distal phalanges (claw cores) are covered by a keratin CLAW: Emu

The Beak is also an epidermal, keratin overgrowth on the jaws

An osprey catches and holds its food (fish)... with its Claws

**Osprey: *Pandion haliaetus***



AVES: birds



Great Blue Heron



Great egret





Wiedersheim, Parker, 1907



Sandhill crane

## BIRDS and FEATHERS



Osprey  
eating sea  
trout



Turkey buzzards

Alaska, bald eagle



Female Anhinga



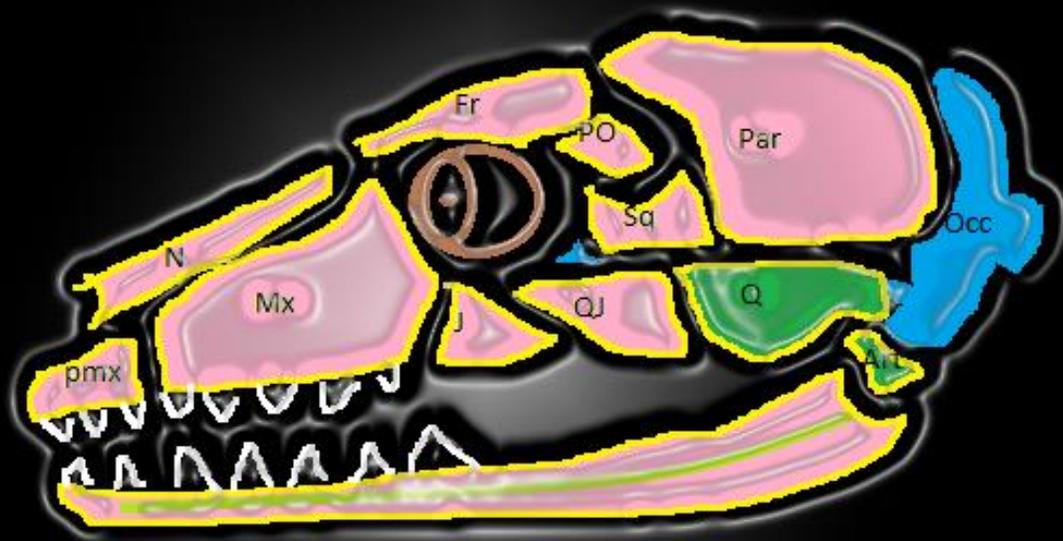


**Feathers-  
insulation, flight  
(air foils), sexual  
display and  
attraction-  
competition and  
of course  
protection and  
water proofing**

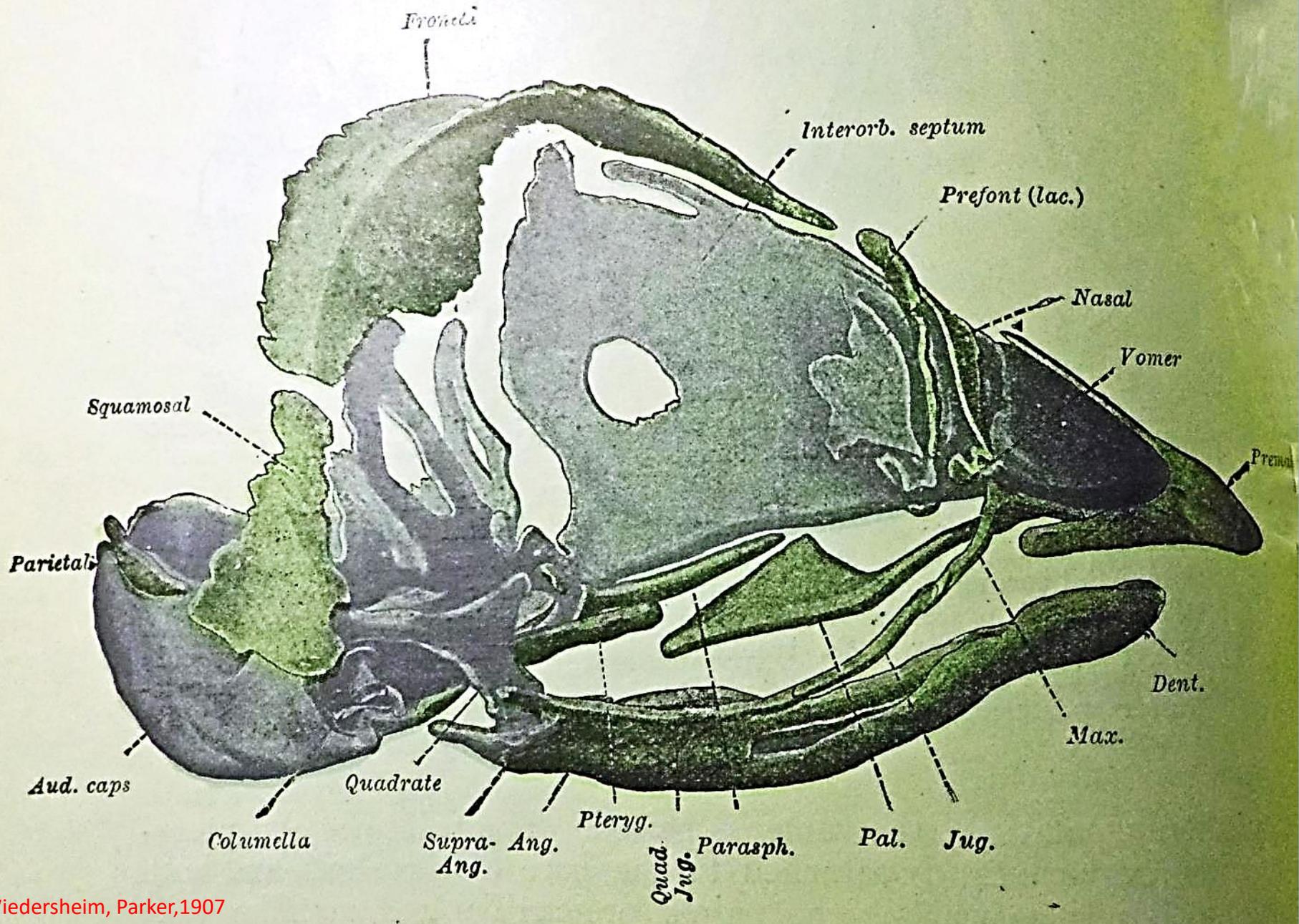


Alizarin red s stain of chick hatchling

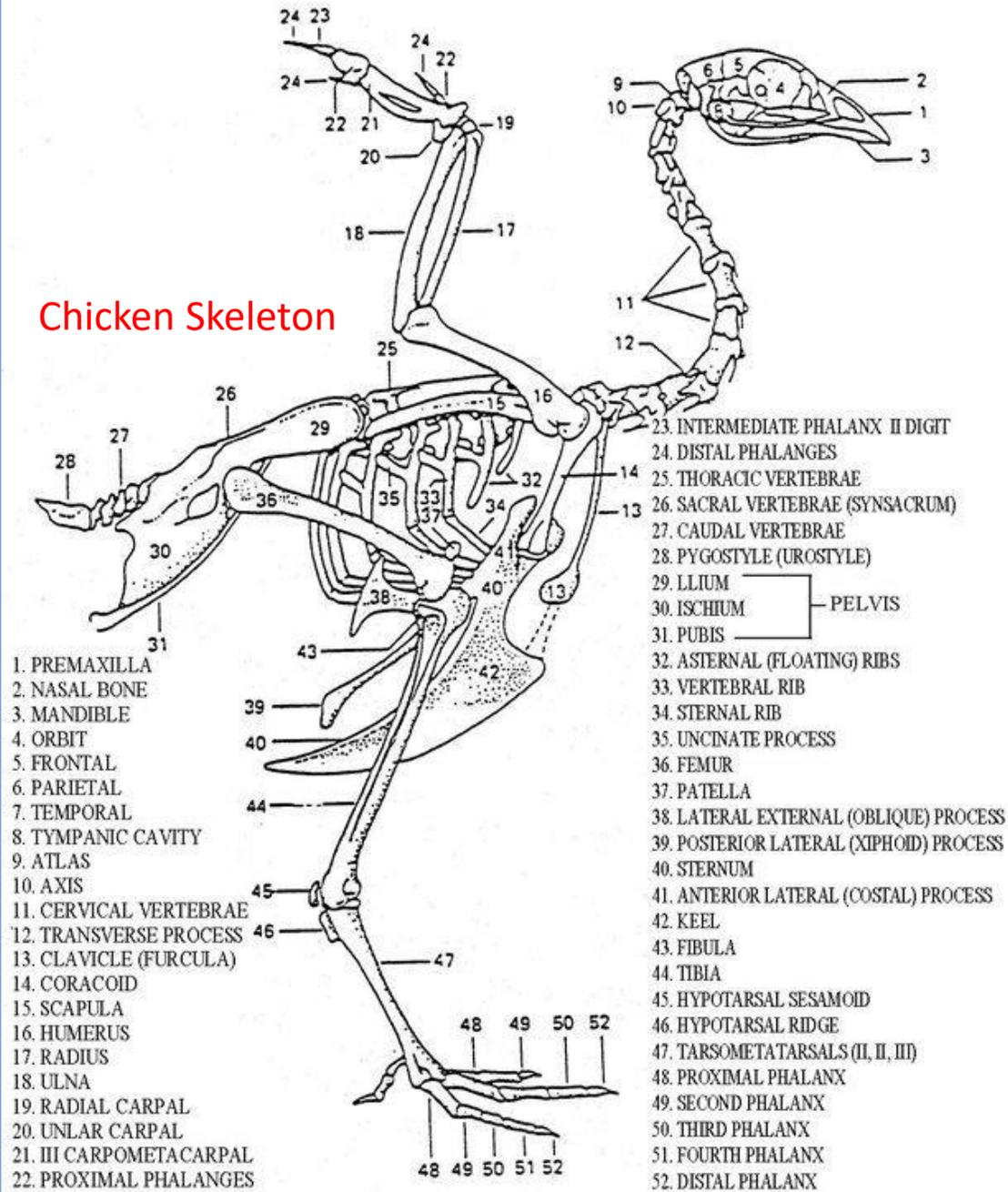
# Dermatocranium - dermal roof bones



Parker's English edition (1907) of Wiedersheim's Comparative Anatomy showing dermal roof bones (Dermatocranium), in yellow, growing over the embryonic cartilage Chondrocranium in blue/grey. Chick embryo.

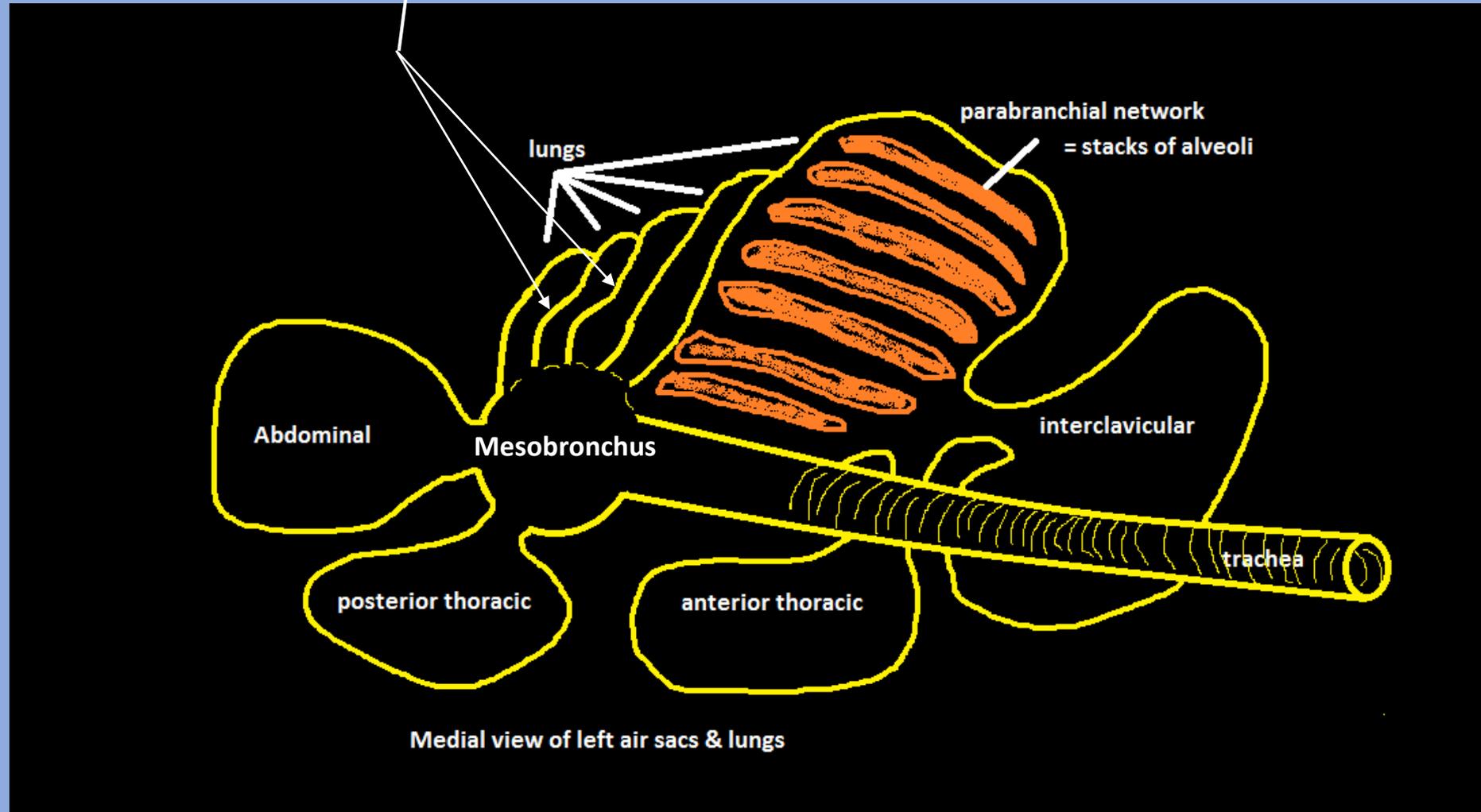


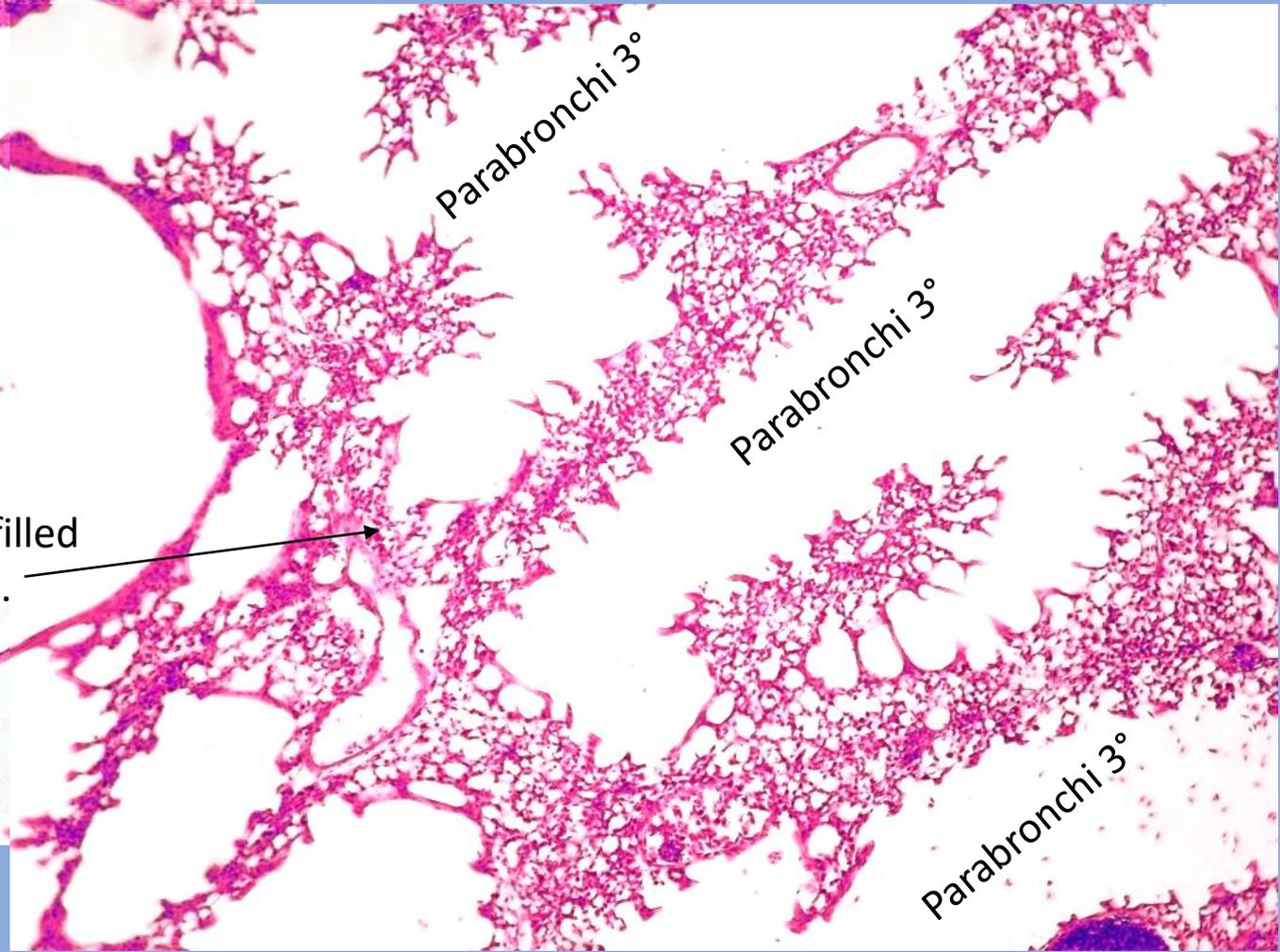
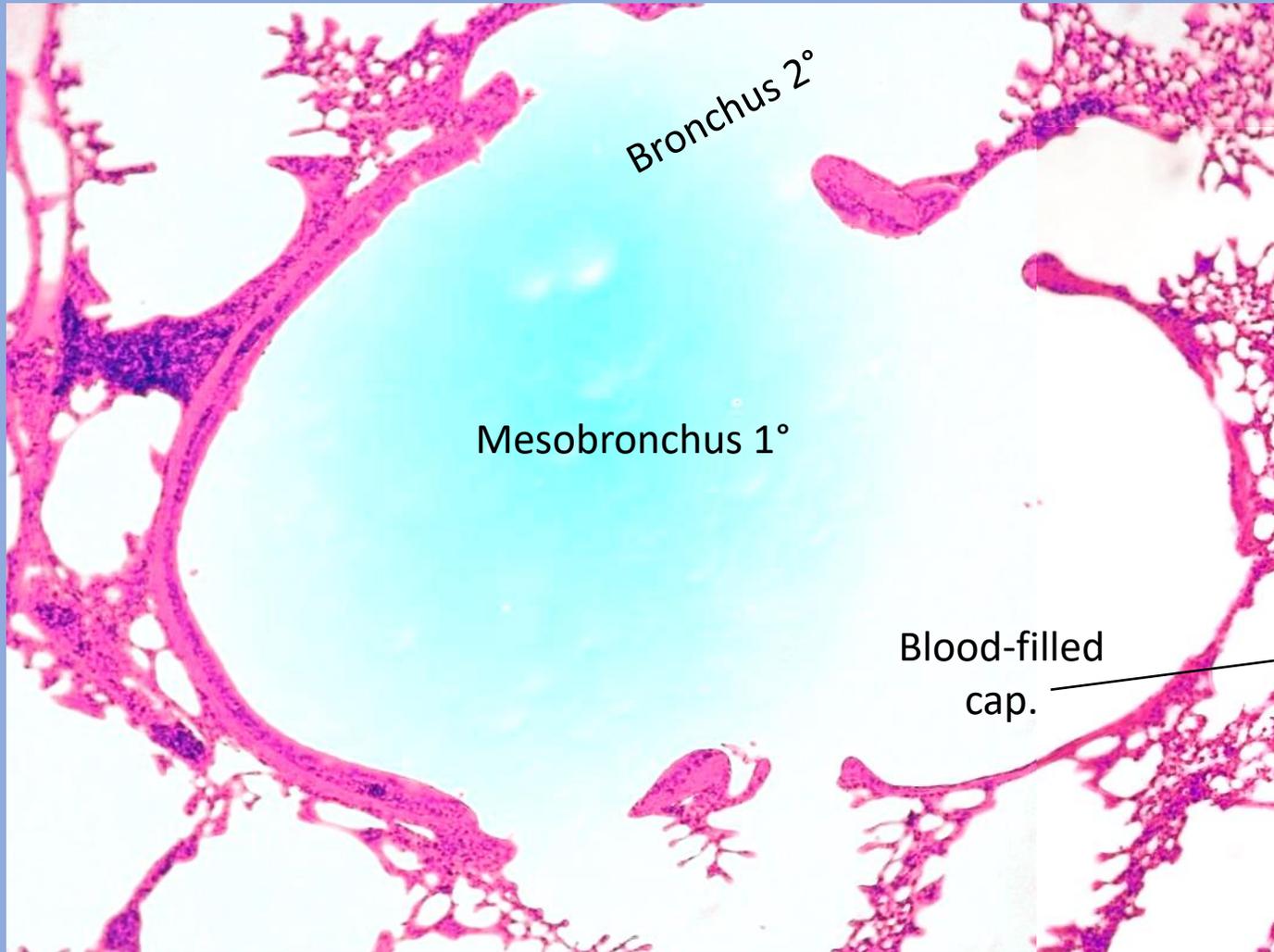
## Chicken Skeleton



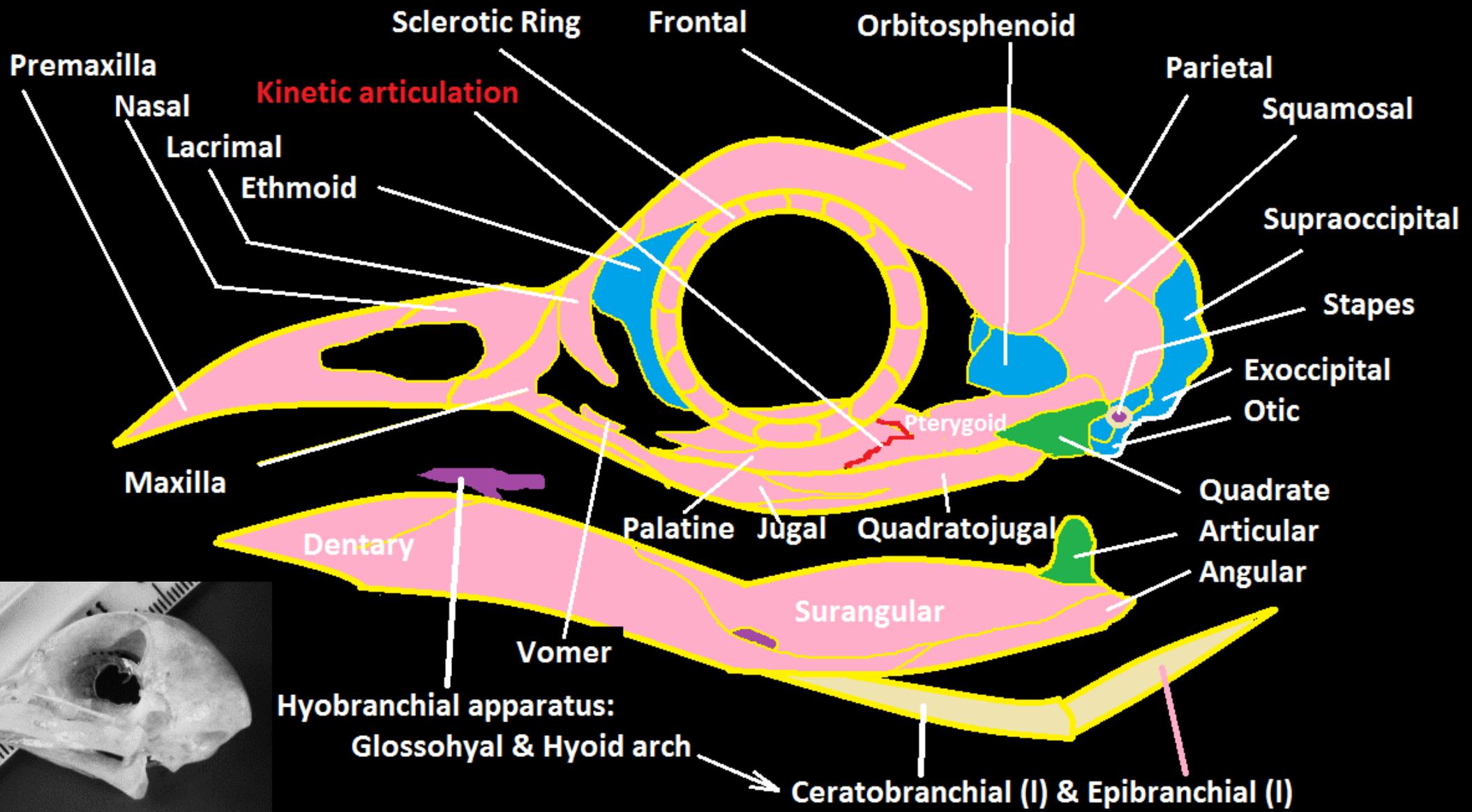
Rib indentations

Bird respiration ( for high level O<sub>2</sub> movement )





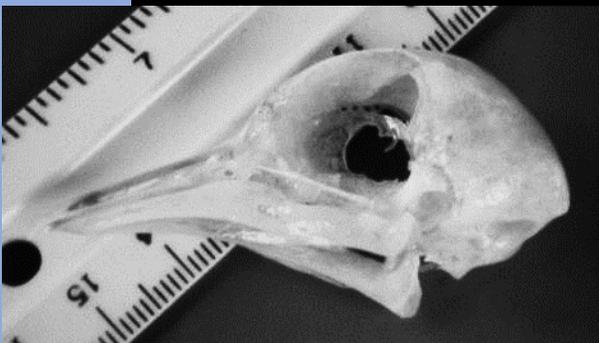
**BIRD LUNG**



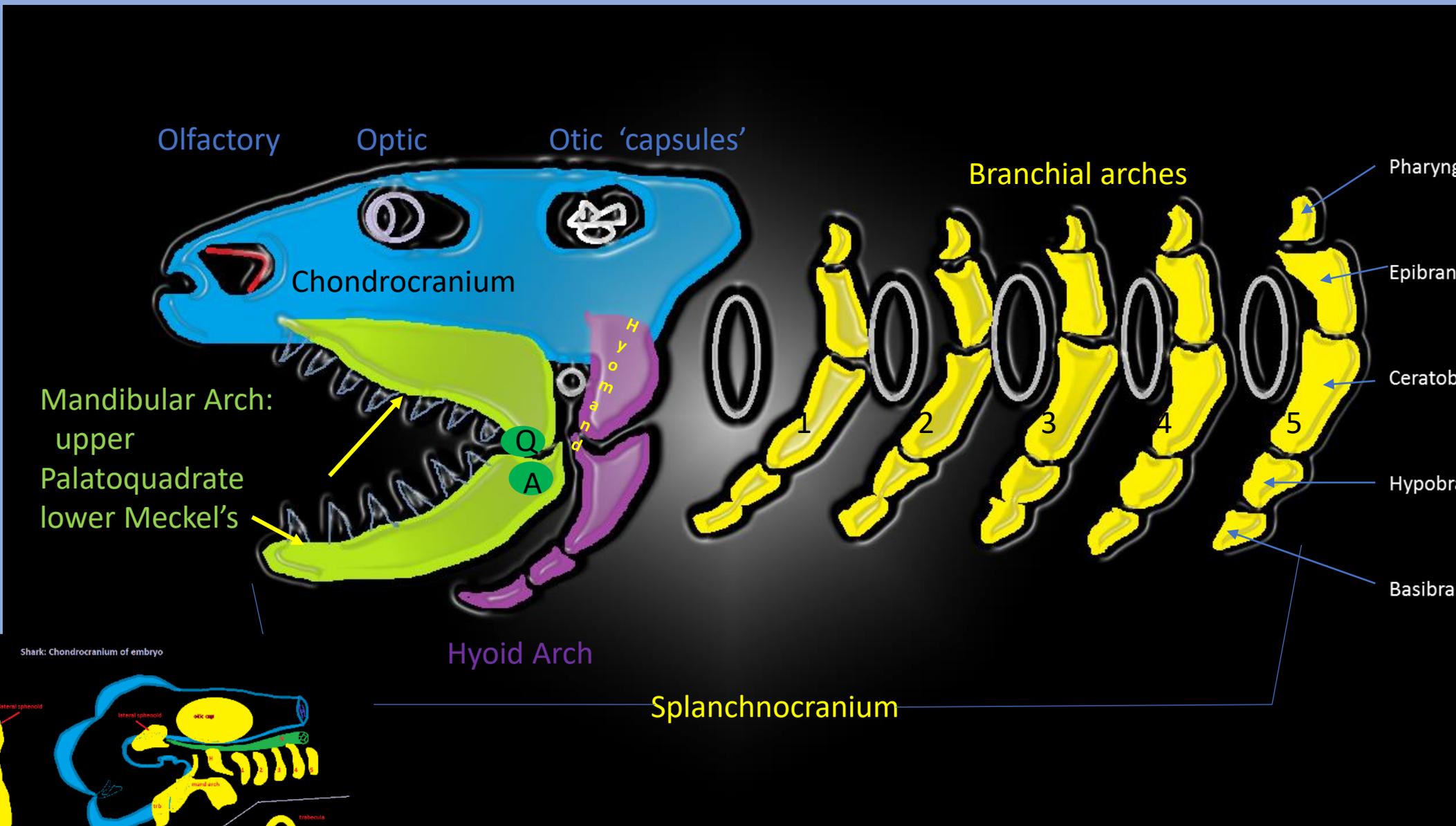
**Avian Skull & Mandible**

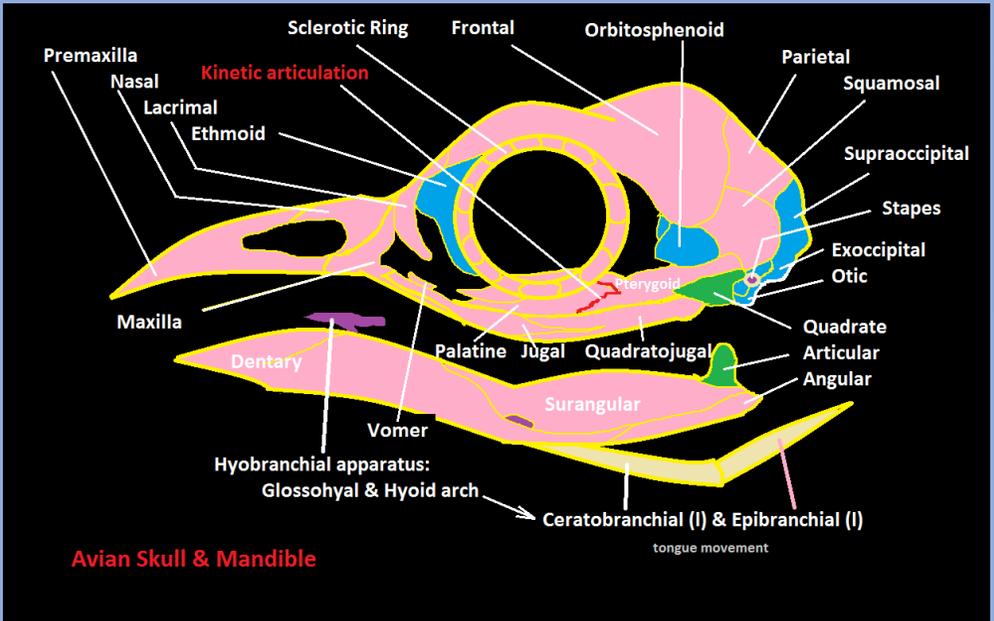
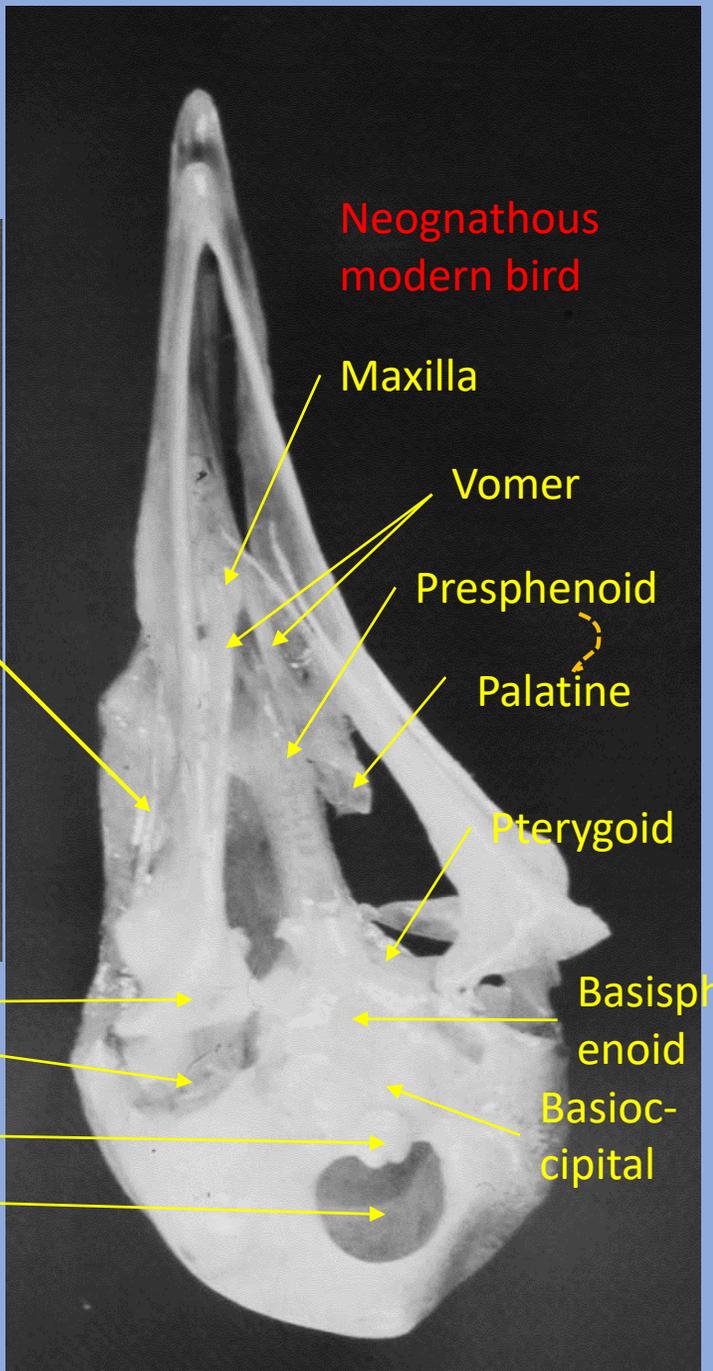
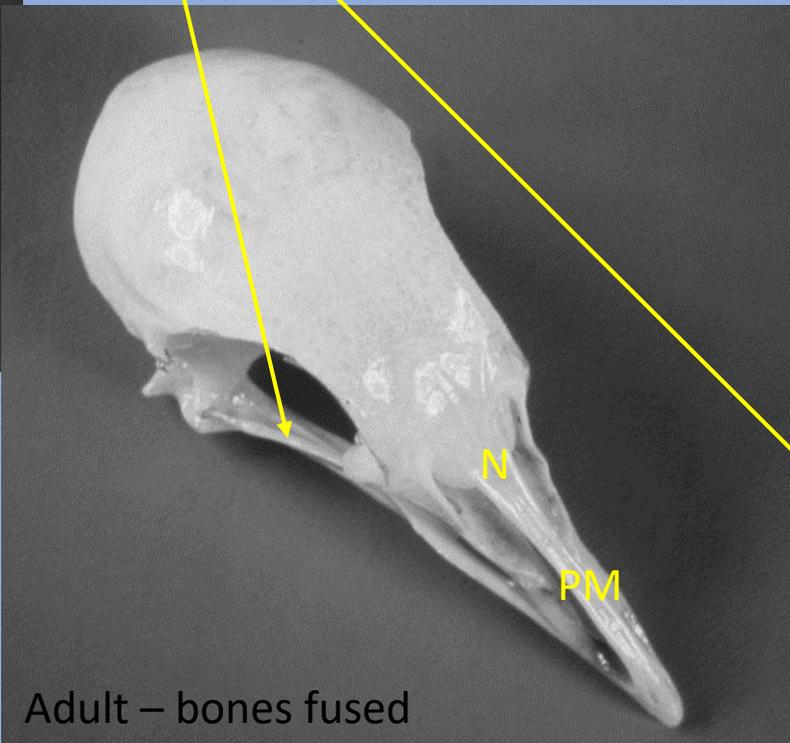
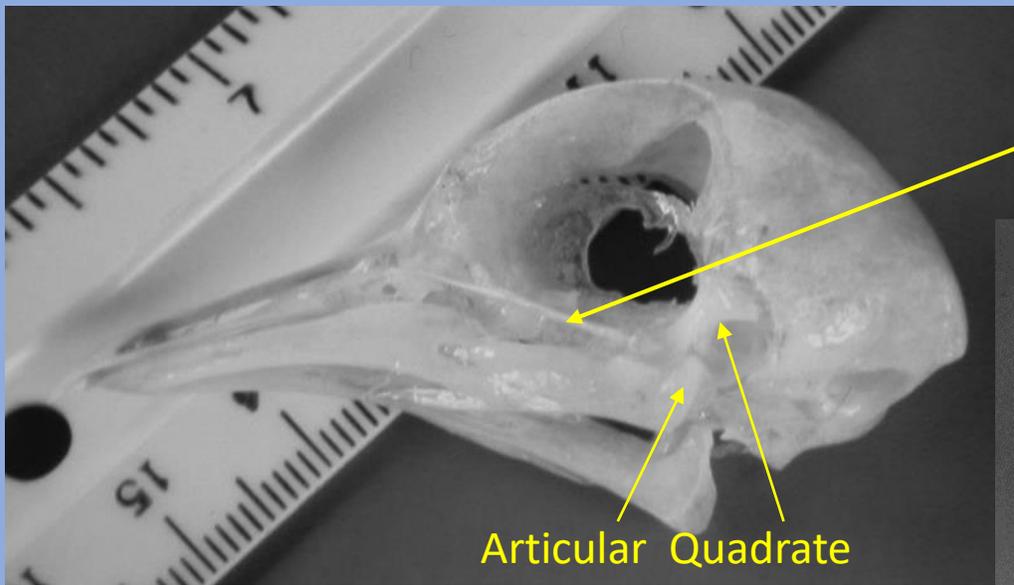
tongue movement

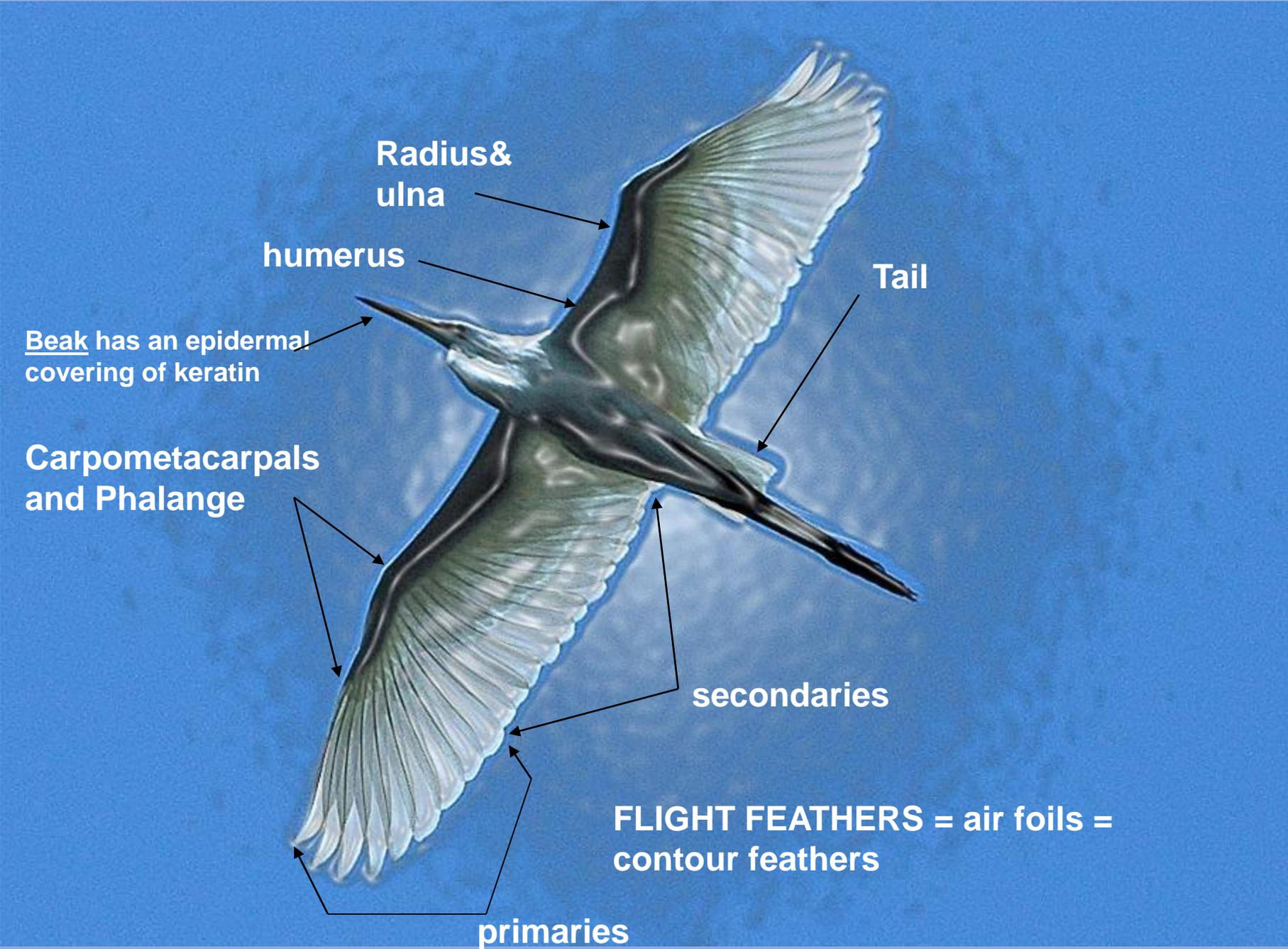
Hatchling chicken

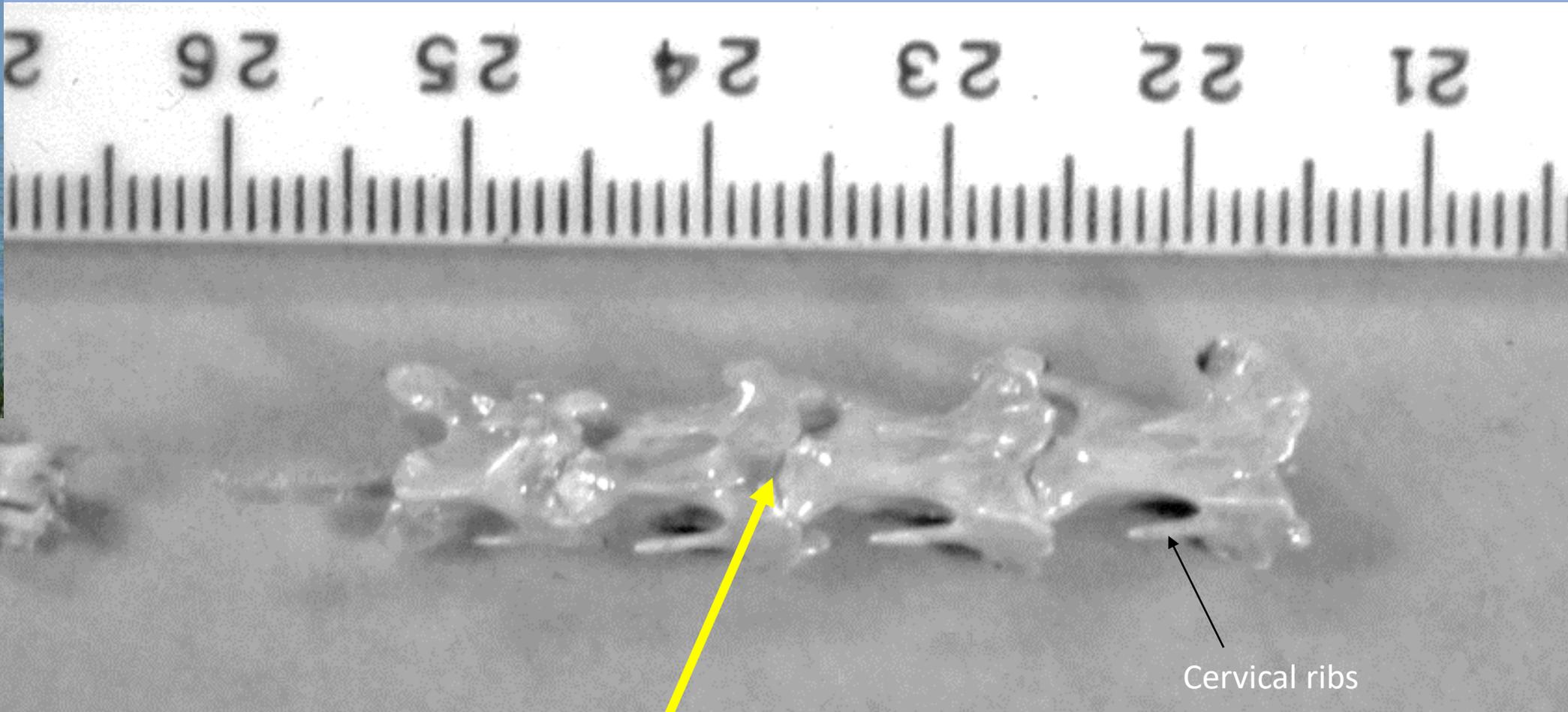


# Shark head cartilages; NO dermatocranium









Bird cervical vertebrae are 'HETEROCELOUS', because each end of the centrum is saddle-shaped. That's how they can twist their neck so much.



**Black Vulture: *Coragyps atratus***

Turkey Vulture: *Cathartes aura*



Sandhill Crane: *Grus canadensis*



Sandhill Crane: *Grus canadensis*





Two day old chick

Sandhill Crane: *Grus canadensis*





Sandhill Crane: *Grus canadensis*

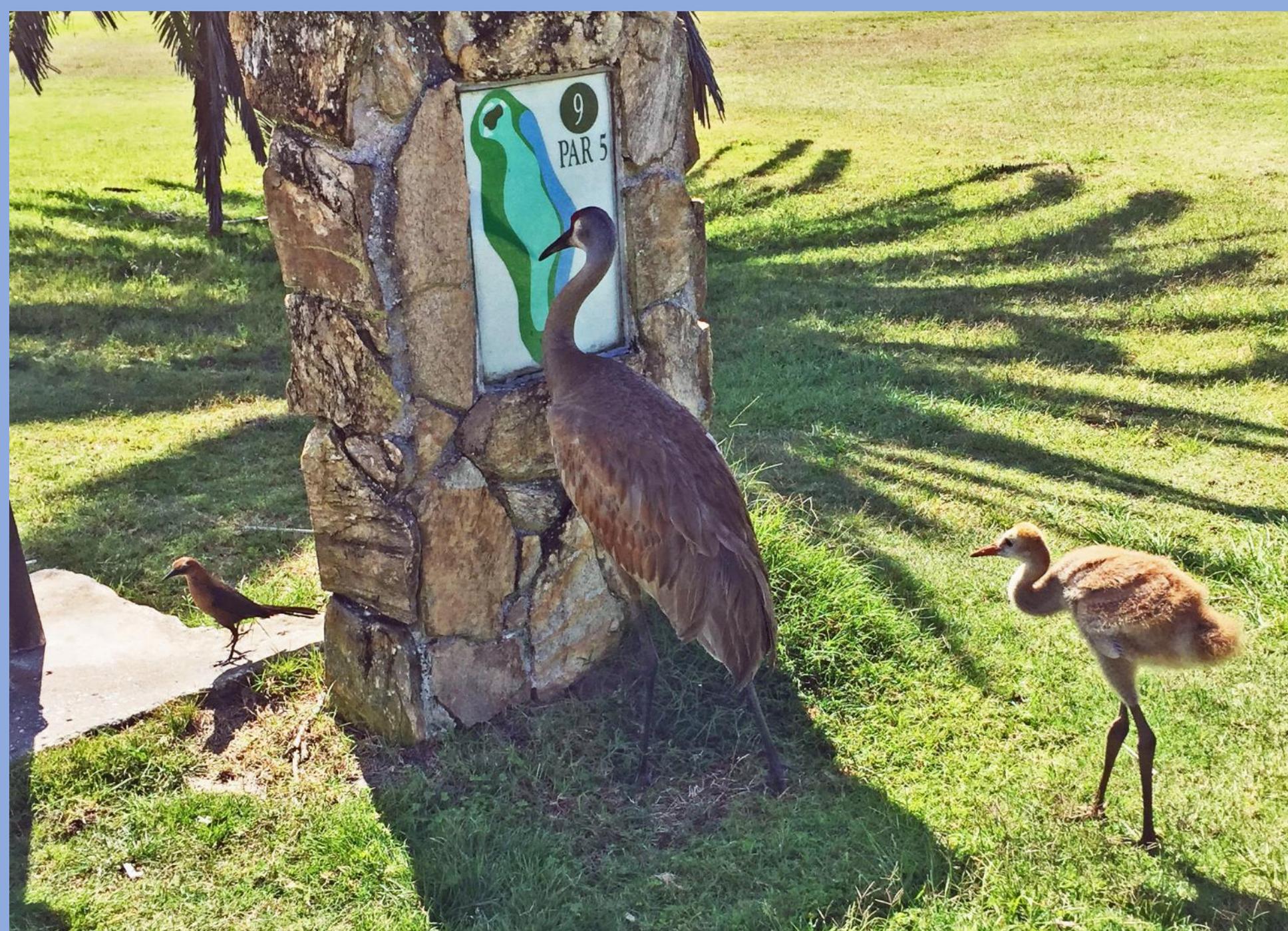
Sandhill Crane: *Grus canadensis*



I'm really big...stay away

Sandhill Crane: *Grus canadensis*



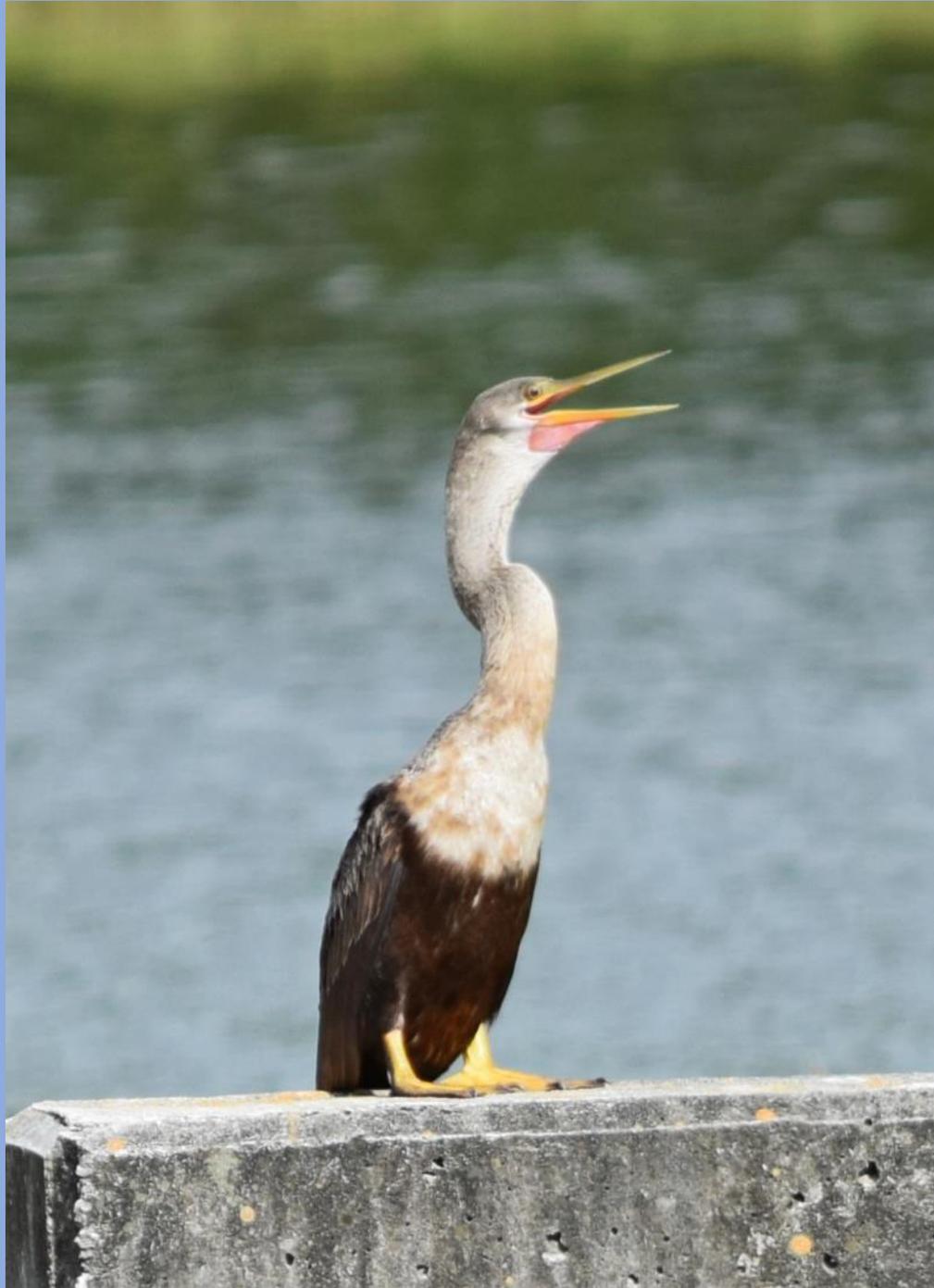


Mom shows me how to peck  
at her own reflection

Sandhill Crane:  
*Grus canadensis*

Sandhill Crane:  
*Grus canadensis*





**2 females and a  
male Anhinga:  
*Anhinga anhinga***



Cormorants (*Phalacrocorax auritus*), egrets & brown pelicans etc.





Bank swallows:  
*Riparia riparia*

Snowy Egret:  
*Egretta thula*



Snowy Egret:  
*Egretta thula*





Snowy Egret:  
*Egretta thula*

Great Egret: *Casmerodius albus*





Great Egret: *Casmerodius albus*



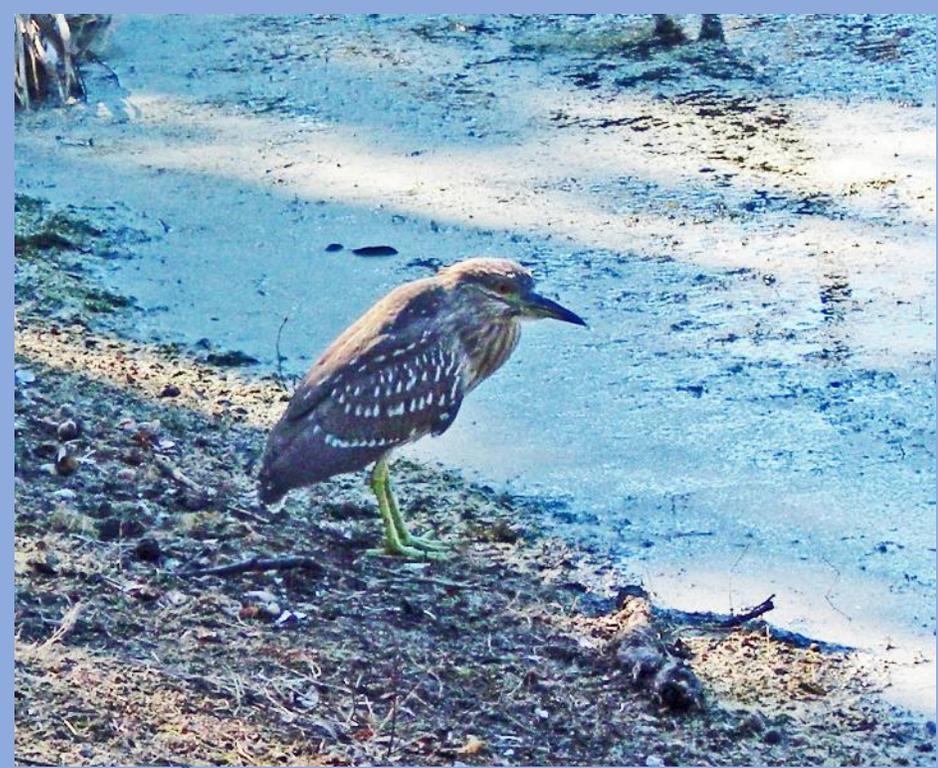
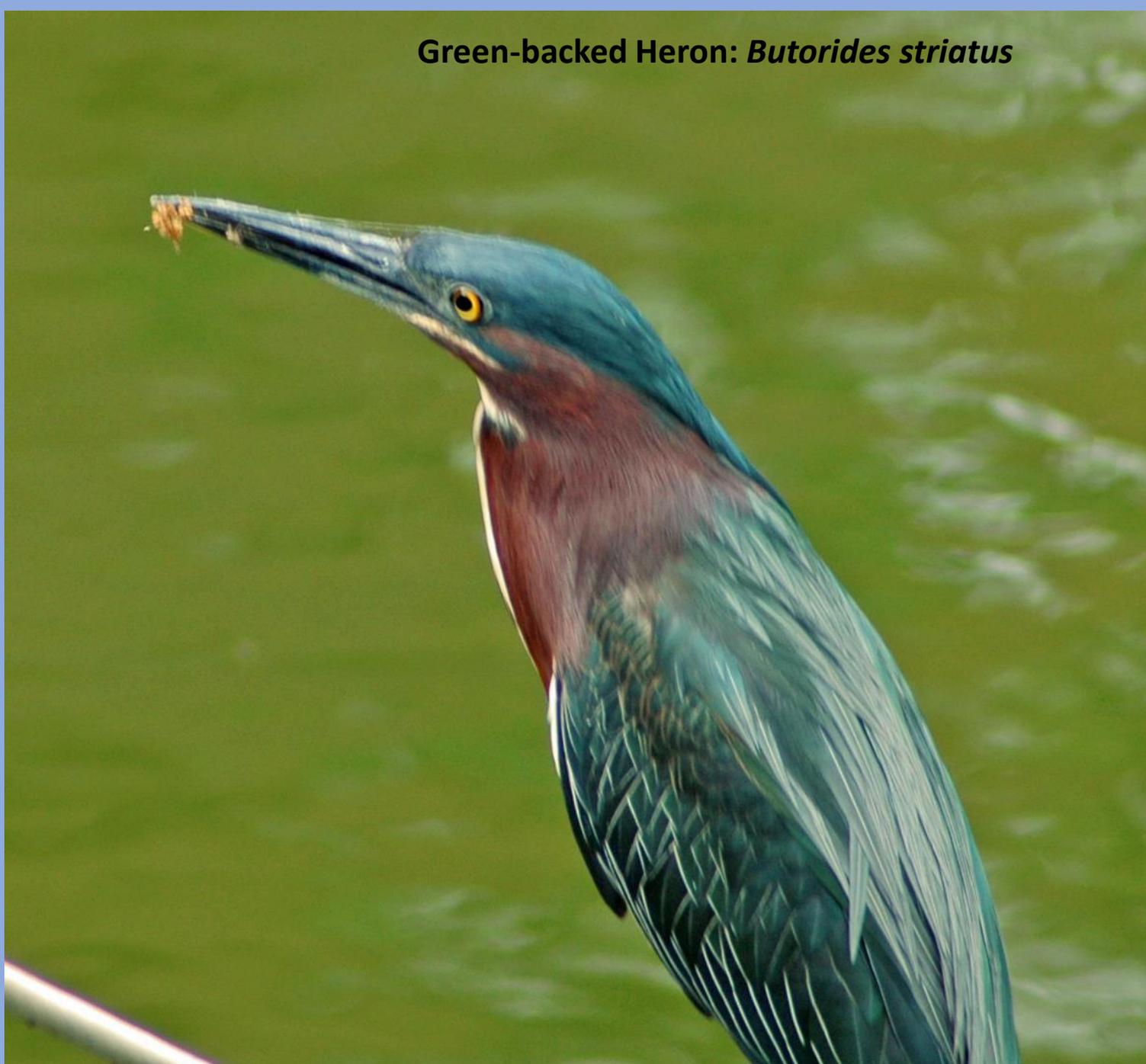
**Little Blue Heron:**  
*Egretta caerulea*





**Little Blue Heron:**  
*Egretta caerulea*

**Green-backed Heron: *Butorides striatus***



**Yellow-crowned Night Heron:  
*Nyctanassa violacea* female**



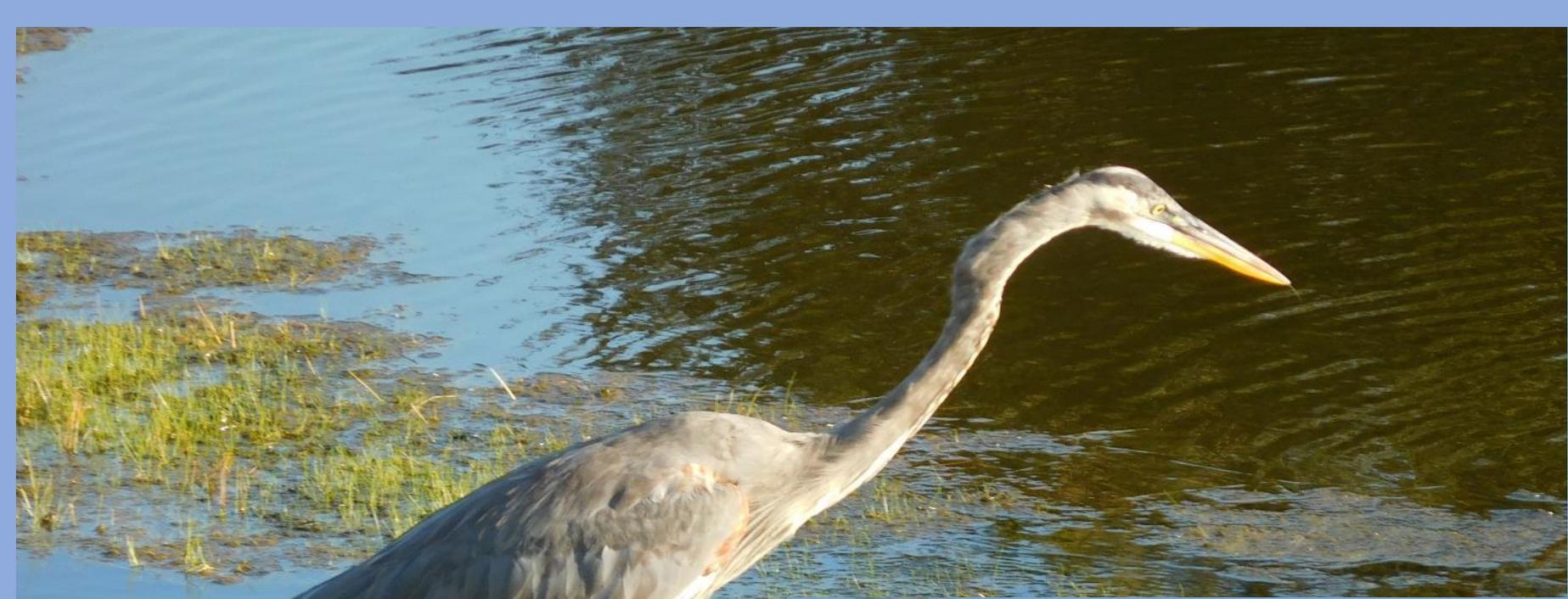




**Great Blue Heron:**  
*Ardea herodias*



Great Blue Heron:  
*Ardea herodias*



**Great Blue Heron:**  
*Ardea herodias*





Male



Common  
Moorhen:  
*Gallinula  
chloropus*



Female





**Mottled Duck: *Anas fulvigula***

12 young



Roseate spoonbill: *Ajaia ajaja*



**Roseate Spoonbill: *Ajaia ajaja***



White Ibis: *Eudocimus albus*



Red-bellied  
woodpecker:  
*Melanerpes  
carolinus*





Screech owl



Great Horned Owl:  
*Bubo virginianus*

Red-shouldered Hawk: *Buteo lineatus*



Osprey  
eating 'sea  
trout'





**American Swallow-tailed Kite: *Elanoides forficatus***



**Bald Eagle: *Haliaeetus leucocephalus***



**Bald Eagle: *Haliaeetus leucocephalus***



**Bald Eagle: *Haliaeetus leucocephalus***

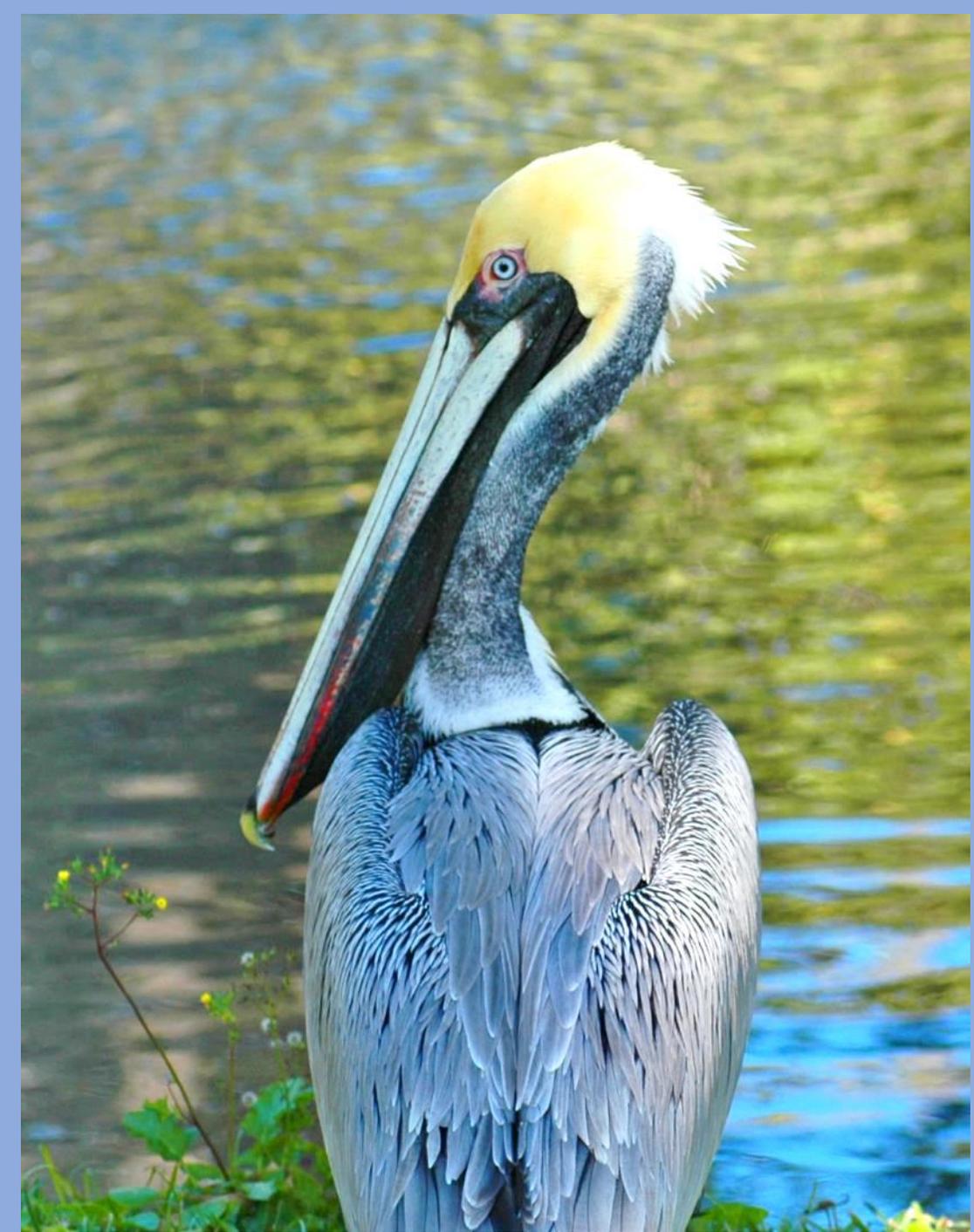
**Bald Eagle: *Haliaeetus leucocephalus***

*Young on lower branch*



**Wood Stork: *Mycteria americana***





**Brown Pelican: *Pelicanus occidentalis***



**Brown Pelican: *Pelicanus occidentalis***



**Greater Flamingo:**  
*Phoenicopterus ruber*



Male



Female

Northern Cardinal: *Cardinalis cardinalis*

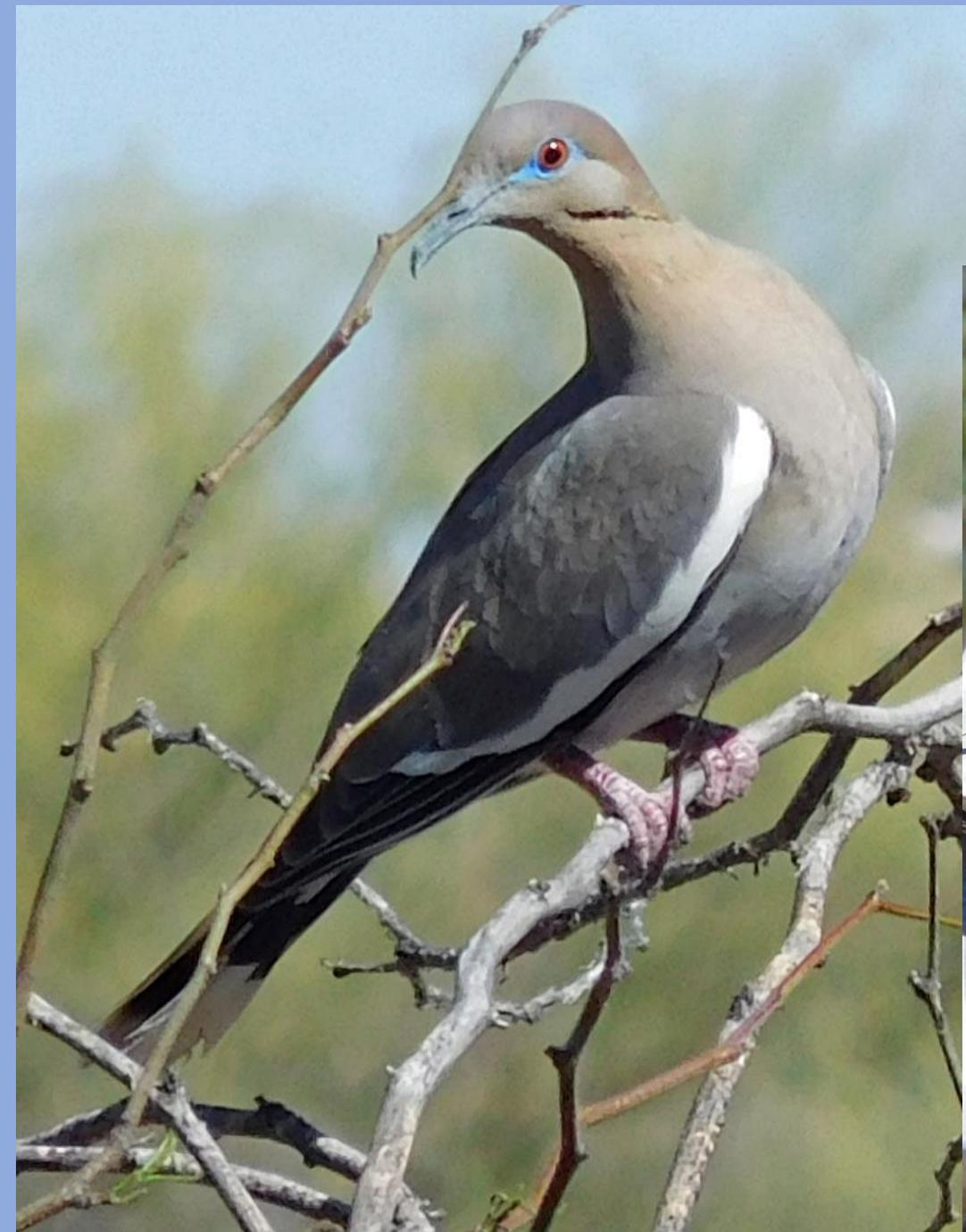
White-winged Dove : *Zenaida asiatica*





White-winged Dove : *Zenaida asiatica*

White-winged Dove : *Zenaida asiatica*

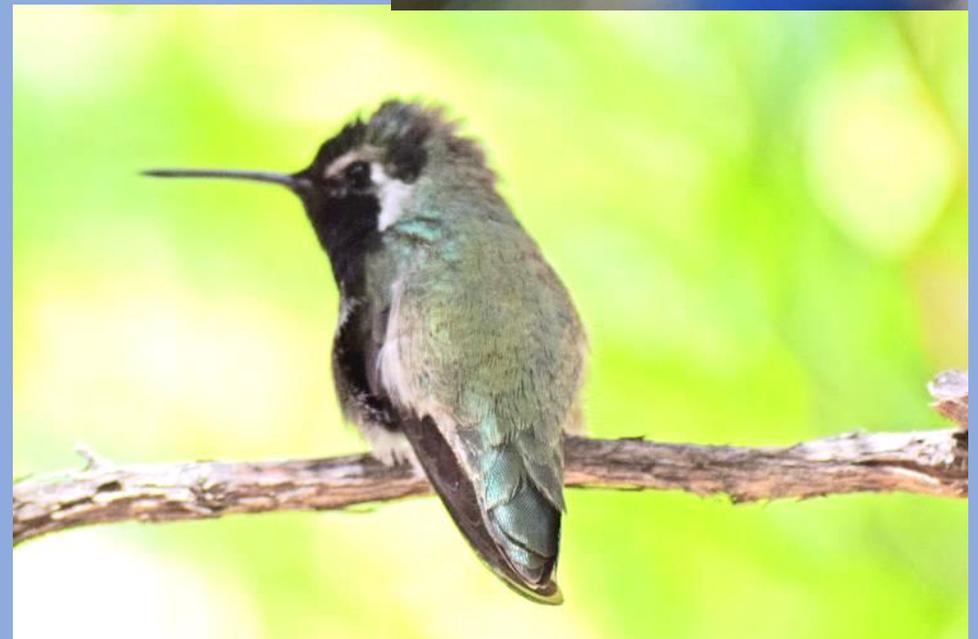




Humming Birds



Humming Birds





Humming Birds

Humming Bird in  
spider web nest



## Gambel's Quail:

