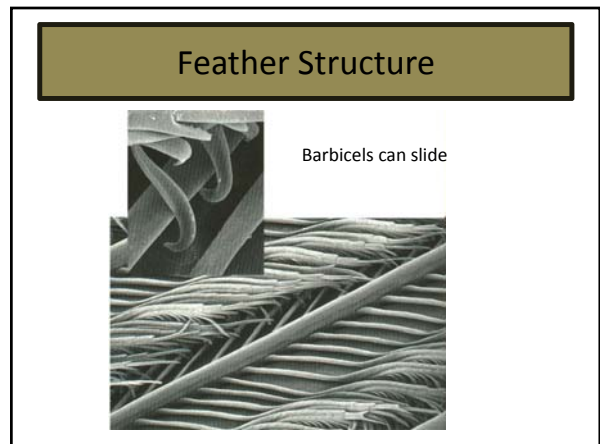
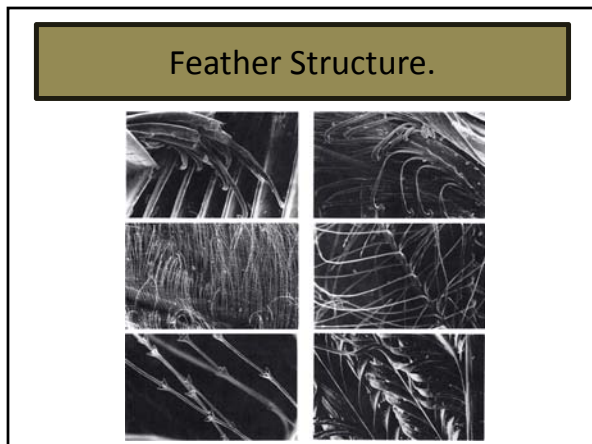
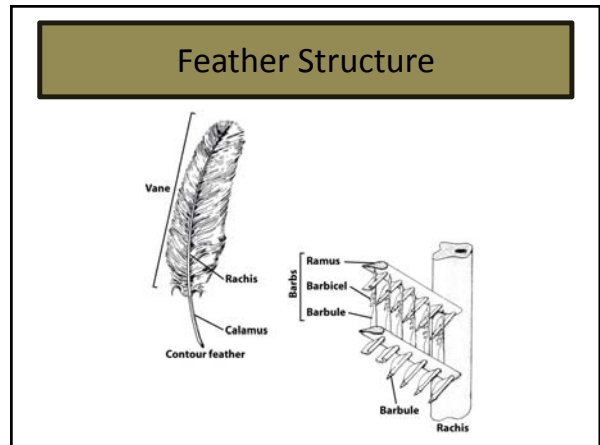


Feather Functions.

- Thermoregulation
- Flight
- Communication
- Camouflage
- Swimming
- Sound Production
- Hearing
- Protection
- Cleanliness
- Waterproofing
- Water Transport
- Tactile Sensation
- Support

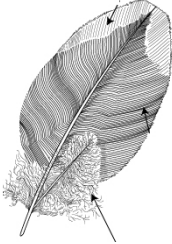
Molecular Feather Structure.

- Beta-keratin
 - Protein
 - Found only in Reptiles and Birds
 - Harder than alpha-keratins (hair, fingernails, skin)



Afterfeathers.

- Aid in insulation



Other Feather Modifications.



© Tim Laman



© Don Roberson




© graham

Holds water →



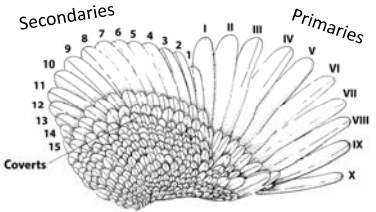
Vaned Feathers.

- Contour (body) feathers, flight feathers (in **wings** and **tail**)
- Flight feathers in **wing**
 - Remiges (1 = remex)
- Flight feathers in **tail**
 - Rectrices (1 = reatrix)



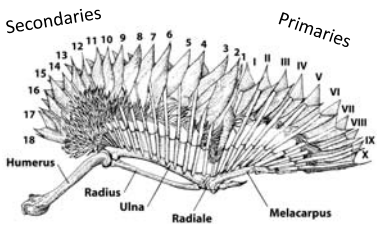
Vaned Feathers

- **Wings**




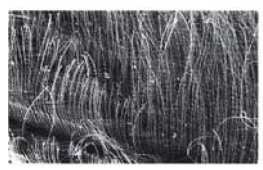
Vaned Feathers

- **Wings**



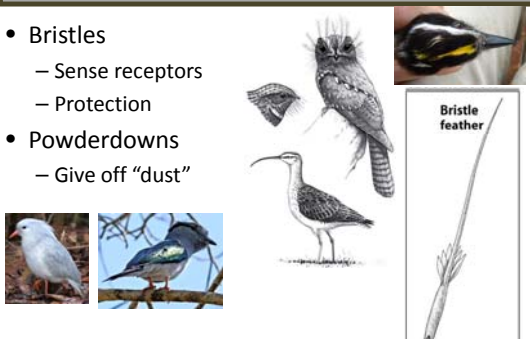
Vaned Feathers.

- **Wings**
 - **Primaries**
 - Attach to the hand bones
 - Provide forward thrust on downstroke
 - Most birds have 10
 - Leading edge is narrow
 - asymmetrical vanes
 - Friction barbules
 - Muffling

Non-vaned Feathers.

- Bristles
 - Sense receptors
 - Protection
- Powderdowns
 - Give off “dust”



Feather Growth.

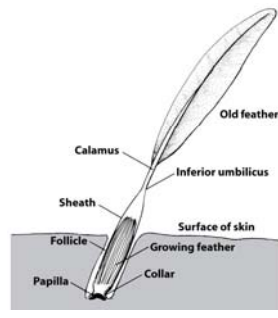
- Feathers are dead
- Replacement is the only way to repair damaged feathers
- Feathers grow from a follicle
 - Contains follicle collar = feather stem cells
 - Can differentiate into different feather types

Feather Growth.

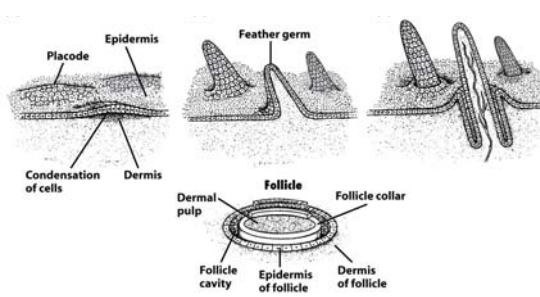


John Jennings Guido Bohn

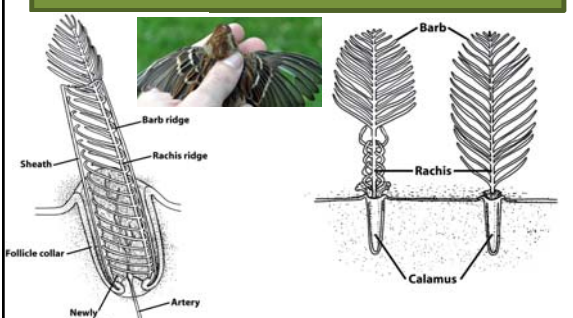
Feather Growth



Feather Growth



Feather Growth.




Feather Colors.

- Derived from 2 things:
 - Pigments
 - Structure
- Pigments
 - Absorb some wavelengths, reflect others
- 3 main types (melanins, carotenoids, porphyrins)

Feather Colors


- Pigments
 - Melanins
 - Earth tones: grays, blacks, browns, and buffy colors
 - Melanoblasts deposit these pigments

Eumelanins	Pheomelanins
Regularly shaped	Irregularly shaped
Blackish	Reddish or light brown




Feather Colors.

- Pigments
 - **Melanin Function**
 - More resistant to wear
 - Protect from bacterial degradation
 - May facilitate drying




Feather Colors.

- Pigments
 - Carotenoids
 - Bright colors: red, orange, yellow, some purple and UV
 - Come from diet





Feather Colors.

- Pigments
 - Porphyrins
 - Reddish or brownish
 - Chemically unstable (degraded by sunlight)




Feather Colors.

- Pigments can signal quality




Feather Colors.

- **Structural Colors**
 - Scattering of light
 - White, blue, green, red
 - White = incoherent scattering
 - Other colors = coherent scattering



Feather Colors.


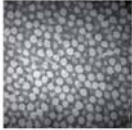
- **Structural Colors**
 - Cellular air bubbles in unpigmented feathers = white



Jan Forseth


Feather Colors.

- **Structural Colors**
 - Melanin granules (melanosomes) in feather barbules (can be air filled) = iridescent colors
 - Arranged in a regular pattern

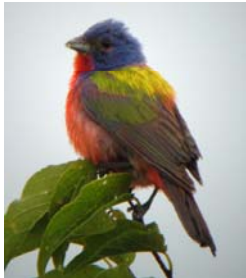
Feather Colors.

- **Structural Colors**
 - Air-filled cavities within keratin of cells in the rami = non-iridescent colors
 - Not arranged in a regular pattern

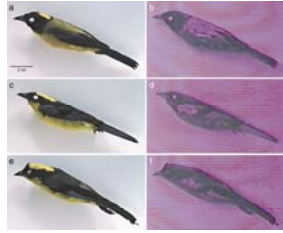



Feather Colors.


- Birds can have a combination of pigment and structural color



UV.

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www.glenncbarber.com




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www.glenncbarber.com

Birds have 4 cones, therefore they can see UV


Genetics of Feather Color.

- Predictable combinations



Feather Coat.

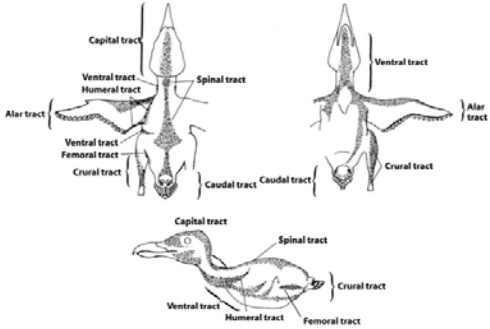
- Thousands of feathers
 - Tundra Swan = 25,000 feathers
 - Songbirds 2,000 to 4,000
- Weigh more than the bones



Feather Coat.

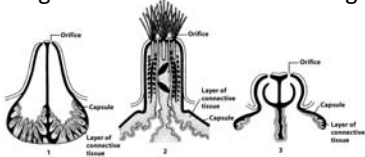
- Not distributed evenly
 - Areas with feathers = Feather Tracts
 - Without = Apteria
- Function: heat loss during flight
 - Muscles can move feathers

Feather Coat





Feather Care.

- Feathers are dead
- Need daily maintenance
- Uropygial (preen) gland
 - Waxes, fatty acids, fat, and water
- Discourages harmful bacteria and fungi



Feather Care.

- **Feather Parasites**
 - Mites, lice, louse flies
 - Damage structural integrity of feathers

Feather Care.

- **Preening**
 - Also includes mechanically fixing and arranging feathers




Feather Care.

- **Poisonous Birds**
 - Pitohuis in New Guinea


Plumage Patterns.

- **Crypsis**



Plumage Patterns.

- **Countershading**



Plumage Patterns

- **Display**

