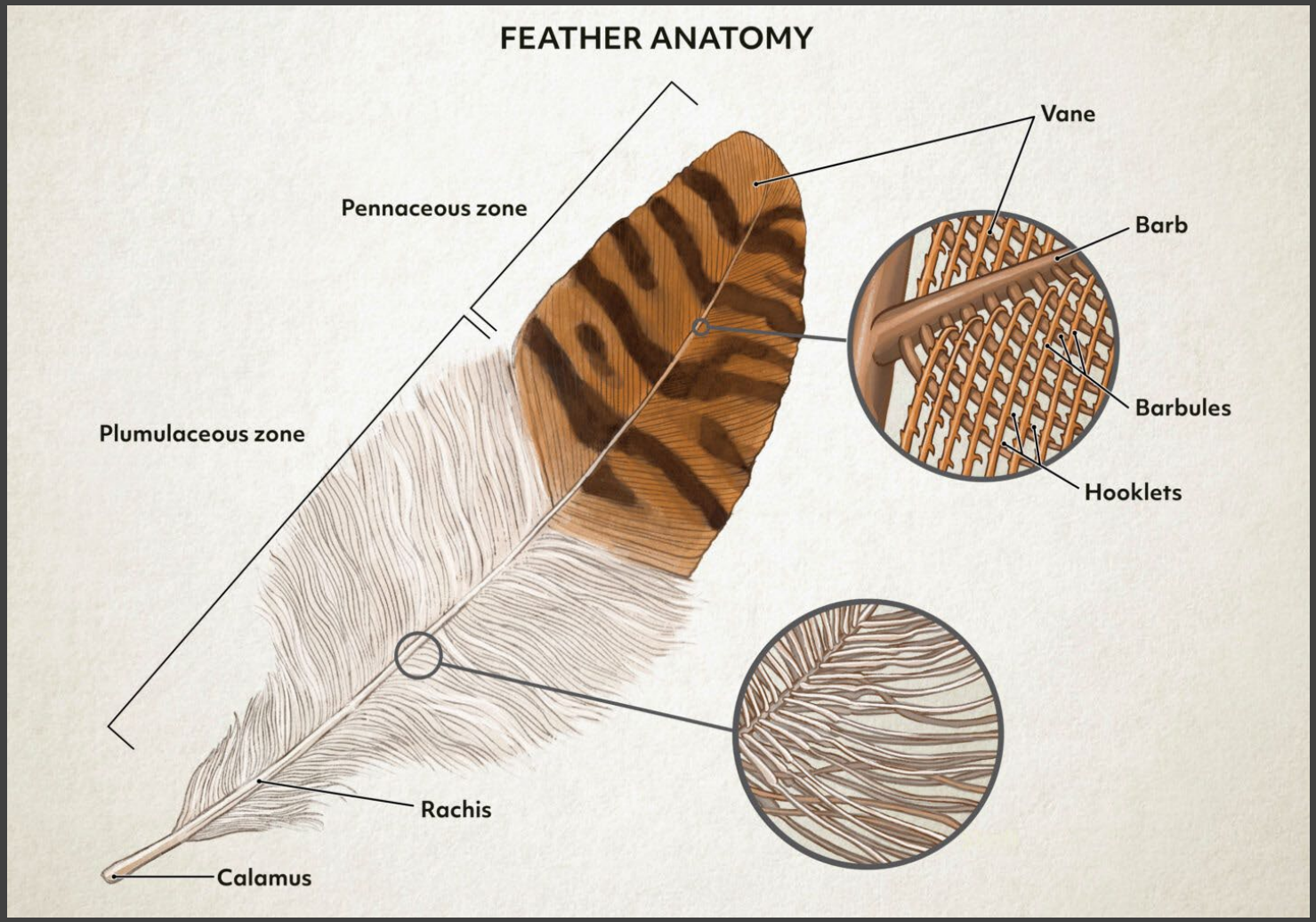
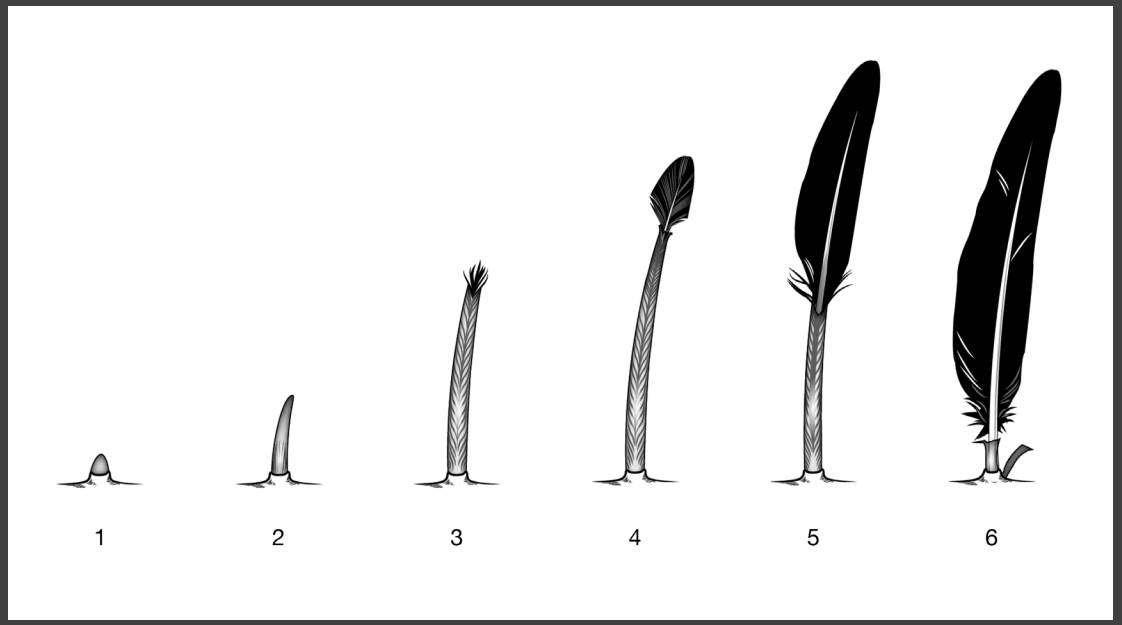
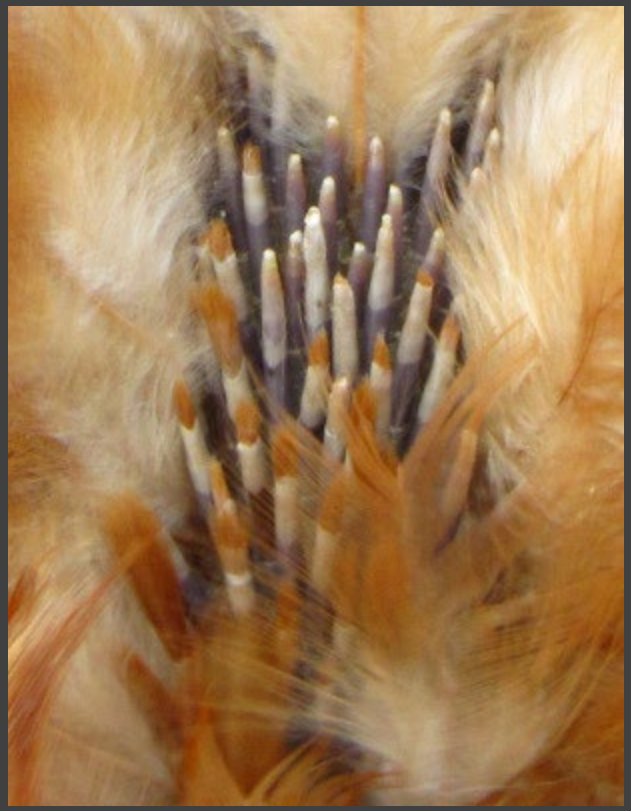
Feathers and Molt

Feather Structure



Feather Growth





Feather Types

- Flight feathers:
  - Remiges (wing primaries and secondaries) — provide thrust and lift[1].
  - Rectrices (tail feathers) — steering and braking.

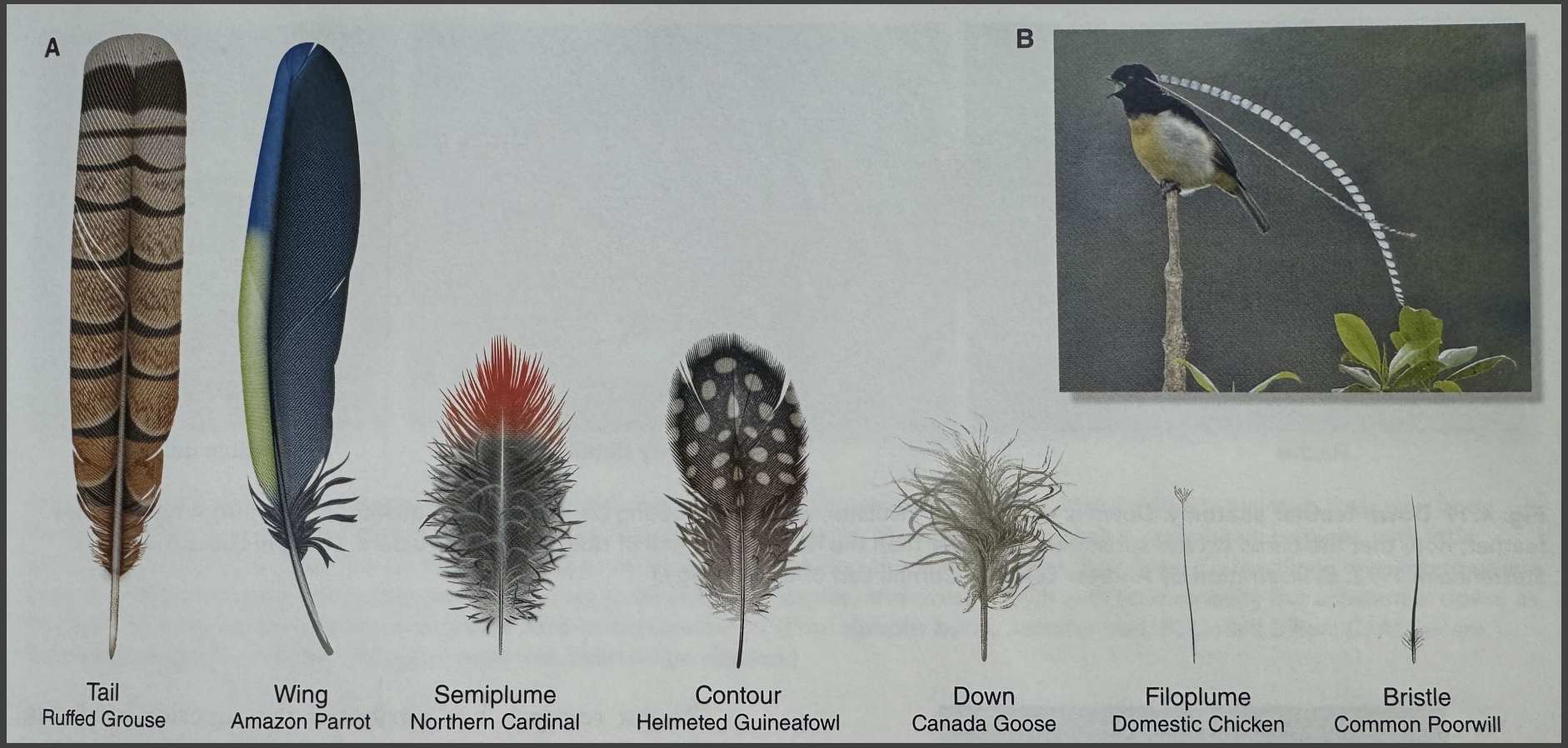
- Contour feathers: shape and streamline the body, provide some waterproofing.

- Down and semiplume: insulation and under-layers for contour smoothing.

- Filoplumes: sensory feathers that monitor feather position.

- Bristles: tactile/ protective feathers around bill and eyes.

Feather Types

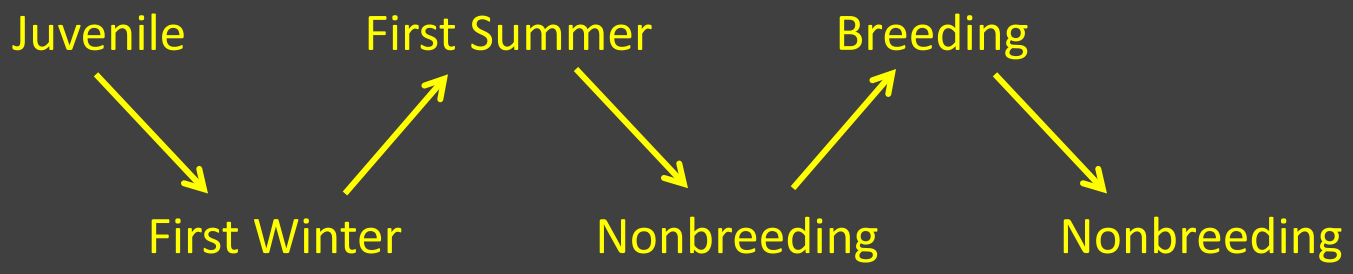


Feather Molt

- Molt is a cyclic process driven by hormones
- All birds have a complete molt once a year – the prebasic molt
- Many birds have a second partial molt – the prealternate molt. Contour feathers only.
- The first year of life is different

Molt and Plumage Terminology

- The *life-year system* describes the appearance of a bird at different seasons or life stages
- Plumage = appearance of the bird



Molt and Plumage Terminology

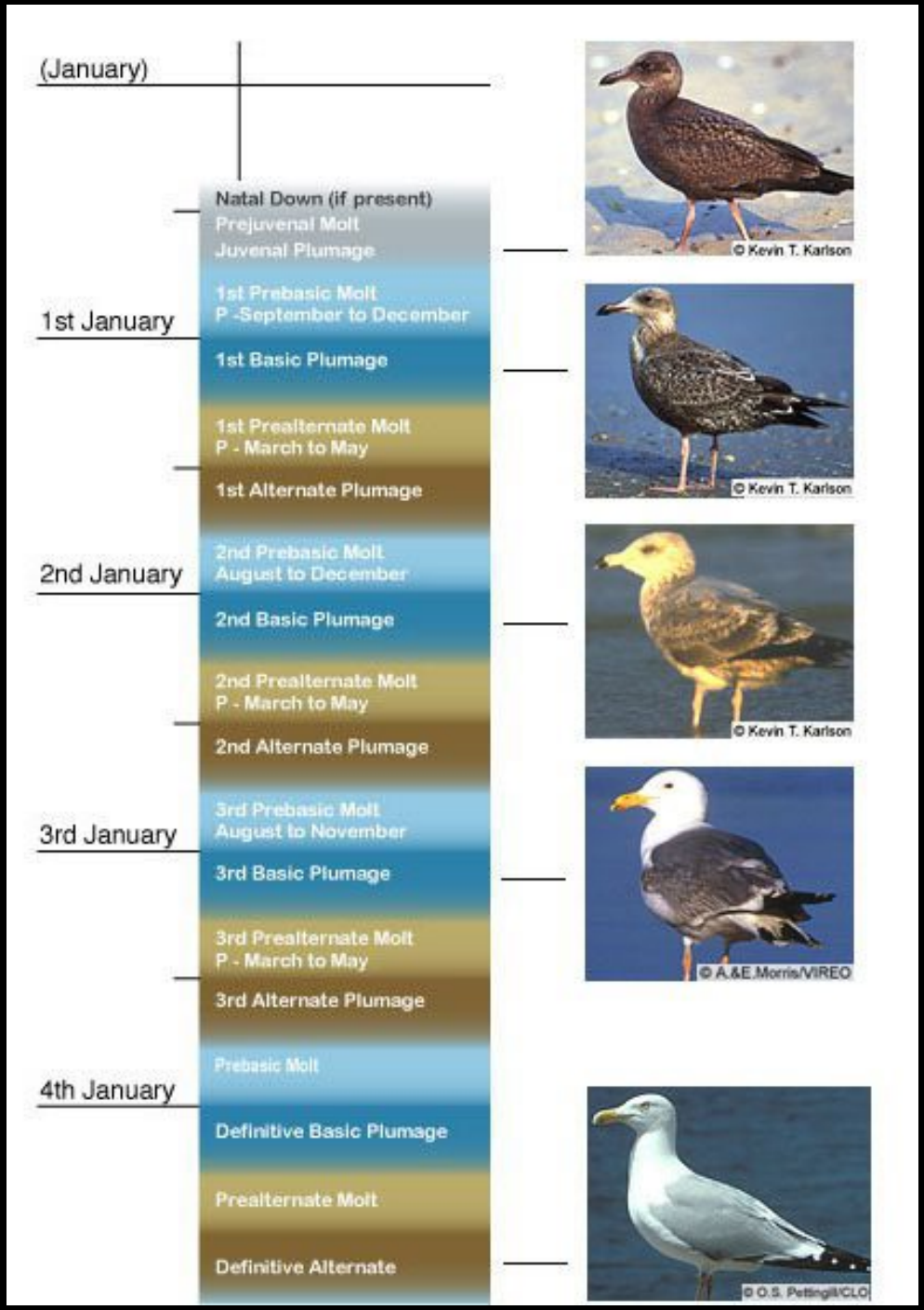
- The *Humphrey-Parkes system* describes plumages based on the molt that produced them
- Plumage = a generation of feathers from one molt

Molt and Plumage Terminology

Natal Down
Prejuvenile molt
Juvenal plumage
1st Prebasic molt
1st Basic plumage
1st Prealternate molt
1st Alternate plumage

Prealternate molt
Alternate plumage
Prebasic molt
Basic plumage
etc.

Humphrey-Parkes System



Shorebird Molt

- Molt requires adequate food
- Shorter-distance migrants often molt on breeding grounds, molt quickly
- Long-distance migrants molt on wintering grounds, more protracted
- Some molting may occur in stopover sites

Feather Coloration

- Birds' eyes are sensitive to a greater portion of the electromagnetic spectrum that humans (both lower and higher wavelengths)
- Bird's eyes have more types of color receptors than humans
- Birds see a wider portion of the spectrum, and can also discern more colors within the spectrum

Feather Coloration

- Feather colors can be due to pigment, structures, or a combination of both
- Pigment colors – colored substances that absorb white light and emit only certain wavelengths.
- Structural colors – arise from microscopic arrangements of keratin, air, and melanin that scatter light in a way that only certain wavelengths are reflected.

Feather Coloration

Feather Coloration

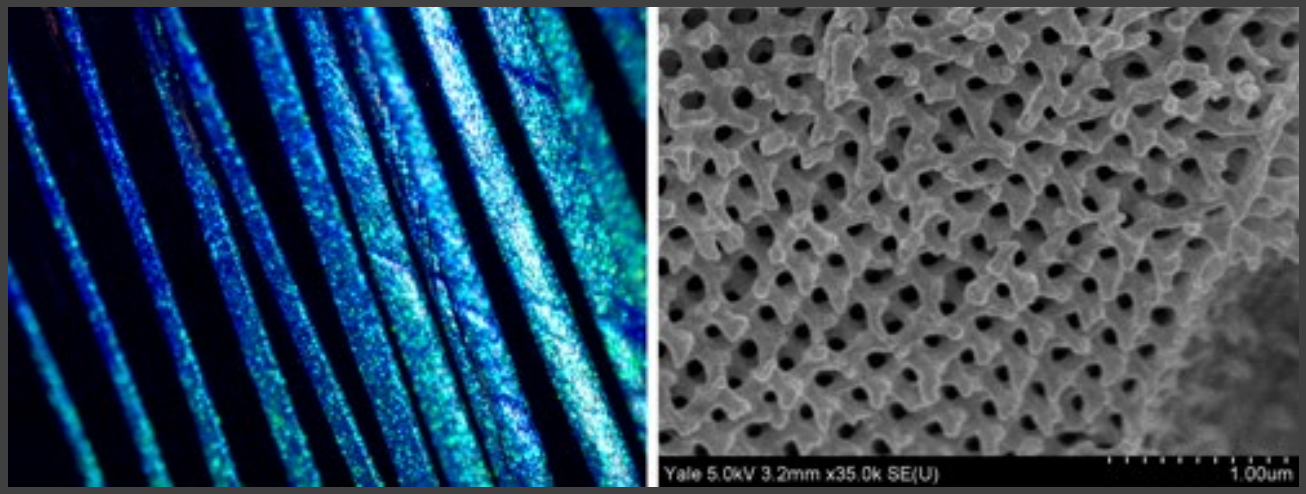
- Melanins – complex molecules found in all vertebrates, most abundant pigments in birds.
- Manufactured within cells, can create intricate patterns.
- Earth tones, black, gray, brown, reddish brown, pale yellow.

Feather Coloration

- Carotenoids – pigments produced only in plants, acquired in diet
- Produce bright reds, orange, yellow

Feather Coloration

- Structural Blues – air bubbles within feather's keratin are in a specific ordered distribution, scattering shortest wavelengths back out



Feather Coloration

- Melanins and carotenoids often layered with structural blues to create vivid hues

Feather Coloration

- Iridescence – produced when melanin inside barbules is more highly ordered, changing colors with viewing angle.