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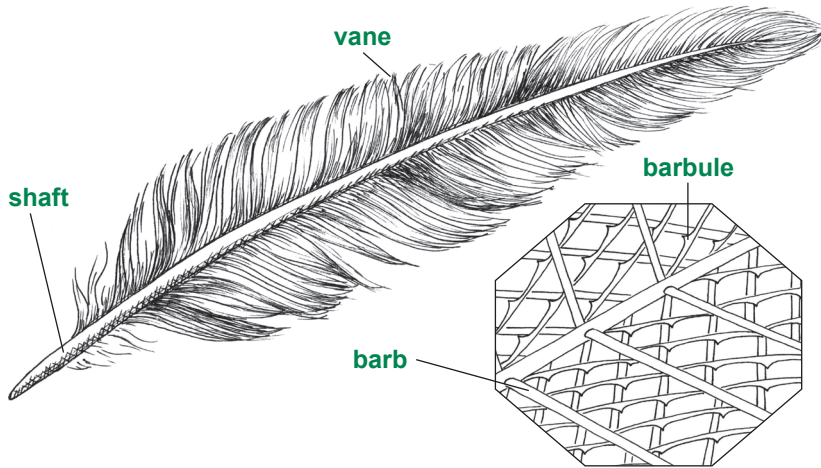
# FEATHERS

Let's take a moment to visualize all of the different animals with feathers. If you find that you are struggling, that's because birds are the only ones. It's categorically true that bats, insects, and birds fly, so flight is not what distinguishes birds. Some birds are actually incapable of flight. Feathers are what set birds apart from any other creature. Some feathers are gorgeous, like those of the Indian Peafowl (*Pavo cristatus*), but others are humble, like the Willow Ptarmigan (*Lagopus lagopus*), with feathers that allow it to blend in with its environment in every season. Feathers allow birds to fly, stay warm during winter, hide from predators, and attract a mate. They sometimes even provide nest material.

Have you ever looked closely at a feather? Feathers are made of **keratin**, a fibrous protein-containing compound that plays an important role in the structure and protection of cells, making them strong, lightweight, and flexible. Keratin is also found in the hair, hooves, claws, and horns of other mammals and reptiles, as well as a bird's legs, feet, and bill.

There are four main parts of a feather: the shaft, vane, barb, and barbule. The **shaft**, also known as the rachis, is like the spine of the feather. It is surrounded by the **vane**, which is made up of hundreds of **barbs** that are like

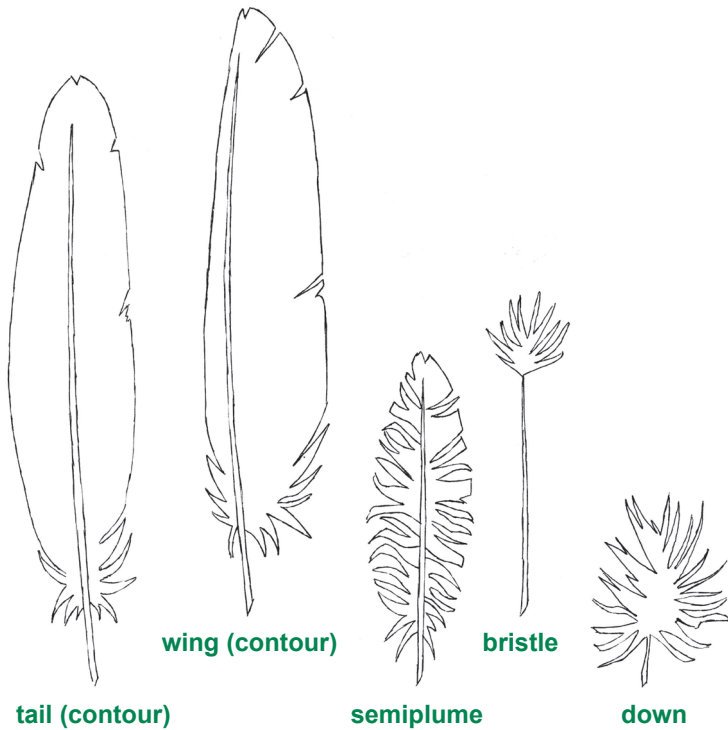
tiny branches. Barbs are covered in even tinier branches called **barbules**, which are covered in little hooks called barbicels. The barbicels interlock, forming the firm vane. Some adult birds might look fluffy instead of sleek and smooth. This is because their feathers lack barbicels, which allow their feathers to remain loose.



There are several different types of feathers, all of which serve a different purpose. The outer layer consists of **contour feathers**, which form the main shape of a bird and allow flight. **Flight contour feathers** include the tail and wings and are typically longer and firmer than other feathers. Looking at a flight contour feather, you might notice that the feather is a different shape on one side of the rachis than on the other; this shape is called asymmetry and provides the bird with aerodynamic lift. **Body contour feathers** are shorter, with softer barbs closer to the base of the rachis to help with insulation.

Hidden deep beneath the contour feathers are **down feathers**. Down feathers protect birds from extreme temperatures, keeping them warm in the snow. Certain birds of prey, owls, and aquatic birds have

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highly developed down feathers. Other birds, such as woodpeckers, generally lack any amount of down feathers. Down feathers have short rachis, if any, and barbs without barbules.

Between the contour and down feathers are **semiplume feathers**. Semiplumes have large shafts but downy barbs, providing extra support to the contours while further insulating the body.

You might think that baby birds are covered in down feathers, since precocial birds are so fluffy when they hatch, but baby birds are actually born with a special type of fine, soft, fluffy feather called natal down. Surprisingly, **natal down** is composed of the same material as contour feathers and is generally shed within a few weeks of hatching. Owls and birds of prey are born with a thick set

of natal down, but quickly shed this for regular or adult down feathers before even leaving the nest or acquiring their contour feathers.

Some birds have a powder down. These are the only feathers that remain on the bird its entire life, as they grow continuously and are never molted. Powder down is special because the tip disintegrates into a powder. This powder is thought to clean, condition, and waterproof surrounding feathers.

Another type of feather that you might not as readily notice are **bristles**. Not all birds have them, but for those that do, they can be found around the eyes, nostrils, and mouth and look similar to hair. Bristles are believed to function similarly to the way whiskers do for mammals, providing birds with a sense of touch. They may also serve in protecting their eyes.

A bird's overall coat of feathers is its **plumage**. Have you ever tried counting the hairs on your head? Well, you would not want to count a bird's plumage either! A general rule is that the larger a bird is, the more feathers it has. The Ruby-throated Hummingbird (*Archilochus colubris*) has about 940 feathers. The Tundra Swan (*Cygnus columbianus*), however, has about 25,220 feathers.