

Wonders of Feathers (and the birds that wear them)

Introduction

Among the living animals, only birds have feathers. Seems like an obvious statement but, as with many of God's creations in nature, there may be a lot that we are taking for granted in making such a simple assertion. Let's take a brief look at feathers, at some of their characteristics, and understand a little more about the extraordinary qualities of the feathers that birds wear.

As we do this, we can remember that Jesus chose sparrows—the most widely distributed and common bird found around the world—to illustrate the value God places on his creatures, including us. Not a single sparrow falls to the ground without the knowledge and permission of God, and not one of them is forgotten by God (see Matt 10:29-30; Luke 12:6). Just as sparrows (and all living things) have intrinsic worth, so do humans; being made in the image of God, however, humans are worth much more than sparrows. Nevertheless, we can be amazed by the marvels of God's creation as revealed in the feathers of sparrows and other birds.

Perhaps birds can teach us something about praising God, too. Songbirds (usually males in temperate climates; the reverse is true in tropical zones) often start singing before dawn, each adding its voice to the dawn chorus. While little is known about why this happens, birds sing thousands of songs each day using a syrinx, an organ located where the trachea splits into two bronchial tubes. Each side of the syrinx is controlled independently, allowing birds to produce two unrelated pitches at once (see Note 1 for more about the syrinx). Imagine if human vocalists had such an ability! (see Note 2). If we consider Psalm 148 that commands all of creation, including the birds, to praise the Lord, and Psalm 150:6 that directs 'everything that has breath' to praise the Lord, then we can appreciate that the birds' songs are praising the Lord, beginning very early in the day! Do our songs (our lives) praise Him, the creator of all nature?

Finding a feather

The next time you see a feather on the ground, take a few minutes to check it out. Pick it up (it is safe - see Note 3) and run it between your fingers; does it feel light and soft or does it have a sturdy quill? Do you know what type of feather it is? Where on the bird it would have been located? Do you know who dropped the feather? As you ask such questions, don't forget to consider the ecological context of your environment (a city street? a coastal beach? a forest? a prairie grassland?). Answering these questions can be challenging, and some questions we might ask may not have answers yet—mystery remains!

Bird Feathers

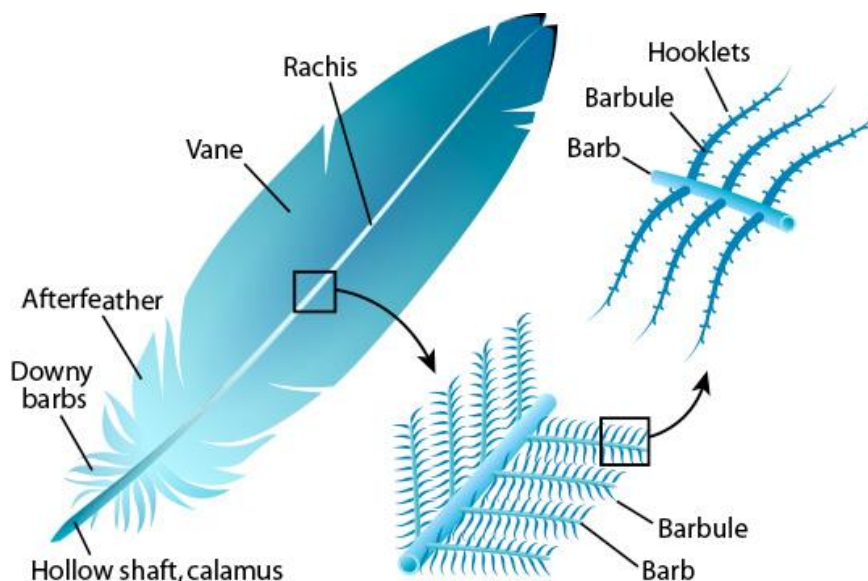
Each feather on a bird's body is a finely tuned structure that serves an important role in the bird's activities. Feathers allow birds to:

- fly (flight feathers for aerodynamic power)
- show off (colours for communication and courtship displays)
- blend in (camouflage)
- stay warm and control body temperature (insulation keeps body temperature of most birds at about 40° C)
- keep dry (waterproof) and in one case absorb water to transport to chicks
- repel parasites and help with cleanliness
- produce sound
- help with hearing
- protect internal organs
- have access to nesting material.

Feather Structure

Just like your own hair, fingernails and toenails, bird feathers are all made of keratin (actually beta-keratin, a harder structural protein) which is light, strong, flexible and tough. In addition, feathers are resistant to solar radiation (UV light) and water, so they last for a long time.

The most complex feathers—those that are stiff and mostly flat—have a central, hollow shaft (rachis) with vanes on either side. The vanes are made of thousands of branches (barbs) that, in turn, branch into barbules with small Velcro-like hooks that interlock with adjacent barbules. This structure forms a wind and waterproof barrier that allows birds to fly and stay dry.



<https://askabiologist.asu.edu/explore/feather-biology>

Downy feathers look fluffy because they have a loosely arranged branching structure with flexible barbs and relatively long barbules that trap air close to the bird's warm body. Many feathers have both fluffy regions and more structured regions.

Types of feathers

As in the diagram below, feathers may be categorized into seven types, based on their structure and where they are located on the bird's body. Birds care for mature feathers through regular preening; worn feathers are replaced during the seasonal molt.



Thomson, M. 2014. <https://academy.allaboutbirds.org/feathers-article/>

Wing feathers: uniform windproof surfaces; note the shorter, less flexible leading edge that prevents midair twisting (has little insulating value); usually 10 primary flight feathers that provide forward thrust on the downstroke of the wing.

Tail feathers: interlocking microstructure, similar to wing feathers; typically, 6 pairs of feathers are arranged in a fan shape to support precision steering and braking in flight. Tail feathers also provide bracing support for woodpeckers.

Contour feathers: cover the bird's body and streamline its shape; overlapping like shingles, the tips are waterproof while the fluffy part is tucked close to the body. On wings, contour feathers (coverts) smooth and shape the wing into an airfoil.

Semiplume feathers: provide an insulating layer underneath other feathers on the body (no hooks on the barbules).

Down feathers: relatively short with loose branching structure; closest to body to trap heat (thermal insulation)

Filoplume feathers: short tuft, with a few barbs; used to sense and monitor the position of contour and flight feathers (8 to 12 filoplumes per flight feather), triggering muscles to make fine adjustments to the feather position.

Bristle feathers: stiff shaft with a few barbs, usually found only on a bird's head for both sensory and protective purposes. Bristles around mouths of Nighthawks act as an insect net and possibly, like a cat's whiskers, as sensors of tactile information. Consisting of bristle feathers, the nostril coverings of woodpeckers, jays and crows provide a protective function.

Feather Quiz (Calgary birds)

If you haven't been able to find a feather on the ground (or even if you have!), here are some photos of bird feathers found in Calgary to which you might like to apply these questions.

- a) What type of feather is this?
- b) Where on the bird would the feather have been located?
- c) Do you know who dropped the feather?





Did you know?

- there are about 450 bird species found in Canada and over 900 bird species living in Canada and the United States
- recent research has indicated that there are about 18,000 species of birds in the world, nearly twice as many as previously thought.
- during winter, the difference between the outdoor air temperature and the cozy space inside a golden-crowned kinglet's feather coat can be as much as 60° C (140° F). To date, no synthetic insulation is as light and efficient as feathers.
- peregrine falcons are the fastest diving birds; maximum for an adult is about 390 km/h (their feathers do not break during flight). A bald eagle flies at 120-160 km/h and can reach heights of 3.05 km (10,000 feet). Blue jays typically fly about 32-40 km/h, while ducks can fly at about 95 km/h.
- the number of feathers a bird has depends on its size: there are roughly 1000 on a ruby-throated hummingbird and more than 25,000 on a tundra swan. Generally, small songbirds sport between 1,500 and 3,000 feathers, eagles and birds of prey have 5,000 to 8,000, and swans wear as many as 25,000. Penguins have perhaps the densest (warmest) feather coat with about 100 feathers per square inch (per 6.45 square cm).
- blue jays aren't really blue! The pigment in blue jay feathers is melanin, which is brown. The cobalt blue colour is caused by tiny sacs in the feathers that scatter light, making it appear blue to our eyes.
- herons, nightjars (such as the nighthawk) and barn owls have miniature combs on their middle toe that are used in grooming their feathers.
- Canada has no official national bird, but each province and territory has a designated bird that is used in ceremonies, emblems and other official symbolism. Alberta's bird is the Great Horned Owl.

Notes

1. An excerpt from David G. Haskell, *The Voices of Birds and the Language of Belonging*. *Emergence Magazine*, Issue 5

"Song spills from open beaks, flowing from the birds' chests. There, at the confluence of windpipes, sitting directly over the heart, sits a sound-making organ of unique and marvelous design. This syrinx is only the size of a lentil or bean. Into this tiny space are interwoven a dozen rings of bone and two dozen muscles, all connected to membranes and lips of soft flesh. The muscles are among the fastest known, capable of contracting

up to 200 times per second. As the exhale flows through, the syrinx's lips squeeze and membranes tremble, imparting song to air. This sound is sculpted by precise tugs and tweaks from muscle and bone, on a timescale of milliseconds. Birds are quick-fingered jewelers of air, crafting dozens of ornamented gems every second. In their modulations of pitch, amplitude, and timbre we hear the vitality of their blood, muscle, and nerve."

[Here we can echo the words in Psalm 104:24 "Lord, you have made so many things! How wisely you made them all!"]

2. Check out this video, *Birds got Swing*, as jazz composer Maria Schneider challenges vocal virtuoso Theo Bleckmann to match the voices of some of Maria's favourite birds. Their musical experiment can help us tune in to the music that God placed in nature: "you'll never think of a sparrow or a toilet plunger in the same way again!). A word to the wise: Maria says that "once you tune into this world, you can't tune it out!").

<https://academy.allaboutbirds.org/features/birdsong/birds-got-swing>

3. Is it safe to pick up feathers? The Cornell Lab of Ornithology says that it is safe to handle feathers, as long as you are not in an area where there have been cases of the avian flu virus. The virus has been detected in poultry and in more than 100 different species of wild birds, mostly waterfowl and shorebirds. But the North American avian flu is different than the Asian avian flu, which has caused serious illnesses in humans. The North American lineage flu virus has very rarely infected people. If you want to bring the feathers indoors, you can find instructions on sanitizing them on the web, such as: <https://www.wikihow.com/Clean-a-Feather>.

Kid's version:

1. How to make a flying bird
[simplekidscrafts]

https://www.youtube.com/watch?v=l0bi9eKcwK4&feature=emb_title

2. Make a bird feeder out of a pinecone: Spread it with peanut butter and cover it in birdseed. Hang it in a place outside that you can see from a window. Then sit down and watch the birds. While watching, point out that the birds mentioned in Ps 84:3 made their homes near God and that is what we should do. The birds knew that near God is where they would be the safest. The same is true for us.

Bible Verse: Psalm 84:3