

# BLOCK 4



WINTER'S NOT  
SO BAD



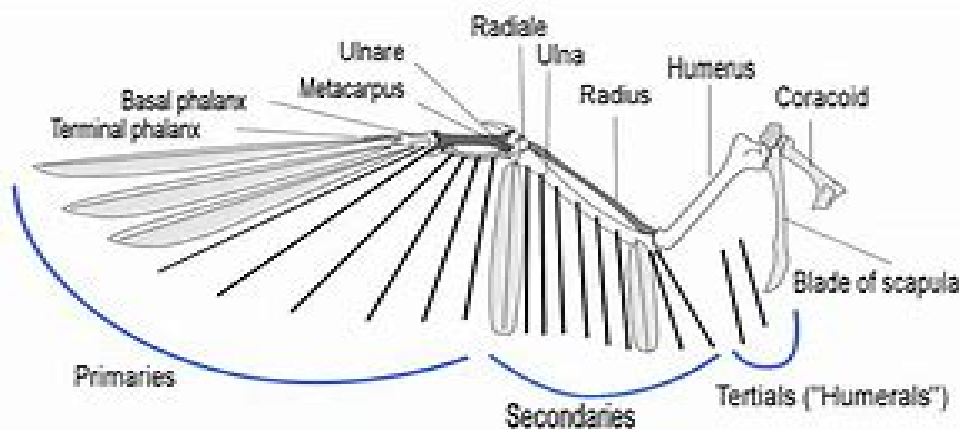
## BLOCK 4.

# WINTER'S NOT SO BAD

Basic anatomic and morphologic features of birds, just as of all animals, are determined by the environment where they live and by the way they move. The most specific features of birds' anatomy are wings, which allow them to fly. Bird's body is almost completely covered with feathers, which have various functions:

- they enable flying,
- they form a thermal insulation layer,
- they protect against moisture and water,
- feathers' coloring protects birds (camouflage) and plays a signaling role during the mating season.

How feathers are arranged and how they look like, so called plumage, can vary with bird's age, sex, social status, or season of the year. The flight feathers on the wings, called remiges, create a bearing surface and are embedded in the skin covering the front limb. The primary remiges are supported by bones located in the section corresponding to mammals' hands (bones of fingers and metacarpal bones). The number of bones in this section has been strongly reduced



compared to the number of mammalian bones, as the gripping function of this limb segment is reduced. The secondary remiges are connected with the ulna bone, and the tertiary remiges, so-called humeral's, are connected with humerus bone (fig. 1).

FIG. 1. THE CONSTRUCTION OF A WING. AUTHOR: MAREK KOŁODZIEJCZYK.



An important role is played also by tail flight feathers, so called rectrices, which are used as rudders and ballasts during the flight, „brake” at the time of landing, support when moving on trunks of trees, or in a decorative version during mating rituals (e.g. peacock’s feathers). Rectrices are embedded in the skin covering the so-called pygostyle, which is a bone plate formed from the vertebrae at the base of the spine.

Remiges and rectrices are important feathers belonging to the group of so-called vaned feathers. Other vaned feathers, which cover the entire body of the bird, are referred to as contour feathers and they play a significant protective role, and – thanks to the specific coloring – they also allow identification and signaling during the mating season.

Birds stand out with a very high metabolism, which means that they produce a large amount of heat. Retaining this heat in the body allows them to function efficiently even when it is very cold, i.e. in the winter. It is possible thanks to an appropriate insulation layer. This role is played by another category of bird’s feathers, so-called down feathers, which thanks to their „fluffiness” limit the exchange of heat with the environment (Fig 2).



FIG. 2. TYPES OF BIRDS’ FEATHERS. 1. REMIGE 2. RECTRICES 3. CONTOUR FEATHER 4. DOWN FEATHERS 5. BRISTLE FEATHERS. AUTHOR: MAREK KOŁODZIEJCZYK.



Feathers are an insulating layer, and birds, depending on the situation, can set them at the appropriate angle. Probably all of us are familiar with the sight of birds with strongly raised (fluffy) feathers when the temperature is low. The additional layer of air between the feathers effectively reduces heat losses. When the air is warm, the feathers closely adhere to the bird's body; the bird starts to pant and hides into the shade or in the water. Panting increases evaporation, which cools the bird. Thanks to thermoregulation, i.e. the ability to maintain the body temperature in the optimal range, birds are active in various climatic zones and during various seasons, which, combined with the ability to fly, gives us the chance to meet them in almost all corners of our globe.

## CONSTRUCTION OF FEATHERS

**A CONTOUR FEATHER** consists of a flexible axis, to which a vane is attached. The upper part of the axis is called a rachis, and the bottom part, which is immersed in the skin, is a calamus. The vane forms the bearing surface of the feather and consists of barbs growing from both sides of the rachis, from which the barbules grow. The barbules are connected with each other with hooklets. The system of interlocking hooklets on neighboring barbules allows the birds to quickly restore the correct arrangement of the surface of the feather if it gets distorted. Feathers grow from the skin at an acute angle and their ends are directed towards the rear of the bird.

**DOWN FEATHERS** have a thin axis and long and soft barbs whose barbules do not connect with each other. They have no hooklets, so they do not form a compact surface of the vane. They poorly conduct heat and form a layer that protects the bird from the loss of organic heat.

Birds devote a lot of time to grooming their feathers; they comb them with a beak which puts hooklets on the barbules. They also distribute on feathers the greasy secretion of the uropygial gland (aquatic birds) creating a layer that protects the feathers from water and moisture. The secretion also gives the feathers flexibility and kills bacteria which may destroy the feathers. Herons, who cannot bend their neck to the side and cannot reach the uropygial glands with their beaks, have **POWDER DOWN FEATHERS**. These feathers disintegrate and create a powder, which spreads over other feathers and protects them from moisture. The powder down feathers are located mostly on the sides of the body and on the breast, because heron can easily reach these areas with its beak and legs. Additionally, the powder also gives the color (a grayish bluish coating on pigeons is just a powder). Thanks to these above-mentioned mechanisms, birds' plumage in healthy individuals very rarely absorbs water and effectively protects them from soaking.

Swifts, nightjars and flycatchers have also bristle feathers, located on the head near the nose and eyes, which help them catch insects during the flight. They are made of bare, hard rachis and have almost no barbs.



## COLORING OF FEATHERS

Coloring of birds' feathers is much diversified, due to two types of color:

- pigment colors, resulting from the presence of dyes, mainly melanin (brown and black) and lipochromes (yellow to red);
- structural colors, resulting from the microscopic structure of feathers, causing interference and refraction of light, which causes a specific color effect, and above all, the color shade which may depend on the viewing angle.

Colors of feathers on the body, wings and tail (plumage) create for each species a characteristic pattern, which is very helpful in identifying them. In many species, the plumage differs between the sexes, especially during the mating season. Also young and adult individuals can differ a lot in color.

All this certainly does not make it easier to assign the observed birds to the same species. As the coat also varies by season, identifying the species may not be easy for an untrained observer. That is why very useful are field guides and bird identification charts, which contain pictures or photos of birds in various coats together with a description of the features of their appearance important for a given season, age and gender.

Young observers should be aware of the reasons why the coloring of feathers differs. One of the reasons is the type of feather – remiges have a different color and shape than rectrices. To identify feathers, one should consider not only the color, but also the shape. Consider the shape of the vane of the feather: whether it is symmetric to the rachis or not, whether the barbules connect over the entire length of the vane, and how the top of the feather is shaped.

## WHERE DO FEATHERS COME FROM?

Feathers develop in the bird's skin just like the hair of a mammal. They are built from a protein called keratin. The feather buds appear at a very early stage of the bird's development – many species hatch already with juvenile (down) feathers, which later on get exchanged for adult feathers. As long as a feather is growing it is nourished by the skin's blood vessels, and after it finishes growing it becomes a dead structure. Feathers are not the only keratin body parts of birds. This group includes also beaks, claws, and plates and scales covering their legs. Keratin is hard and durable, and builds, among others, also human nails, hoofs of animals, or horns of domestic cattle.

Knowing how important and diverse is the role of feathers in a birds' life, we realize that damage and contamination of feathers can have negative consequences for them. The most dangerous are the catastrophes of sea tankers, during which petroleum leaks into the sea water. During such catastrophes, birds die because their feathers get stuck together with petroleum



derivatives, and they get poisoned with the harmful petroleum substances which they swallow as they attempt to clean their feathers. The most vulnerable are seabirds, but also those birds which prey on coastal beaches where the petroleum accumulates. After the disaster at the entrance to the English Channel of the Amoco Cadiz tanker in 1978, about 60 million marine organisms died, including 37 thousand birds.

Feathers undergo natural wear processes (they rub off, crumble, break). For this reason, they are periodically replaced: new feathers grow in the place from which an old feather fell out. This process of exchanging feathers is called moulting. During moulting all or only some of the feathers are replaced. Often, replaced are only the large feathers of wings or tail, or small cover feathers. Birds can change their feathers twice a year (e.g. tits, finches) or (as in herons, cranes) once every two years. Usually, moulting takes place after the nesting season, before the autumn migration to wintering grounds.





This material was prepared as part of the project „We live in harmony with nature. The educational program for teachers of pre-school and primary education”. The project involved selected non-governmental organizations involved in the protection of birds associated as part of the international BirdLife International federation. In addition to the National Society for Bird Protection, which ran the project, the Spanish Ornithological Society (SEO), the Slovak Ornithological Society (SOS), the Macedonian Ecological Society (MES), the Czech Ornithological Society (CSO) and BirdWatch Ireland (BWI) were involved. The University of Gdańsk became the substantive partner of the project responsible for creating materials for teachers.

BirdWatch Ireland is a non-governmental organization with a public benefit status, dealing with the protection of wild birds and the places where they live. The aim of the Society is to preserve the natural heritage for the benefit of present and future generations. BirdWatch Ireland is the Irish partner of the global federation of bird protection societies - BirdLife International.



BirdWatchIreland



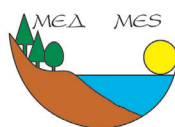
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