

# Wing feathers of birds



Biology

Microscopy / Cell Biology

Basics of Microscopy &amp; Work Technology

Biology

Microscopy / Cell Biology

Humans &amp; Animals

Biology

Animal Physiology / Zoology

Birds

Nature &amp; technology

From the very small &amp; the very big

Nature &amp; technology

Plants &amp; animals



Difficulty level

easy



Group size

1



Preparation time

10 minutes



Execution time

30 minutes



## Teacher information

### Application



Detail of a flight feather

Like reptile scales, bird feathers are made of  $\beta$  keratin, while human hair and nails are made of  $\alpha$  keratin. The quill can be divided into the coil (lower part) and the shaft (upper part). Together with the other contour feathers, the wing feathers give the bird firmness and are almost impermeable to air, which is an essential requirement for flying.

## Other teacher information (1/3)

**PHYWE**  
excellence in science

### Prior knowledge



Bird feathers give the bird firmness and enable it to fly. The stability is on the one hand due to their chemical structure. They consist of the same resistant material as the scales of reptiles, the  $\beta$ -keratin. On the other hand the flag forms an almost impenetrable surface.

### Scientific principle



Bird feathers are an architectural masterpiece of nature. A maximum of stability and a weight reduced to the minimum allow the bird to fly.

## Other teacher information (2/3)

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### Learning objective



The students learn about the structure and the individual components of the wing feathers of birds. They should try to understand the function of the individual characteristics.

### Tasks



1. keel survey
2. Examination of the feather vane
3. Explanation of the phenomena

## Other teacher information (3/3)

### Materials procurement

Bird feathers should be obtained from a chicken farmer or an ornamental bird breeder. As they can be kept for years, they should not be missing in the biology collection.



## Safety instructions

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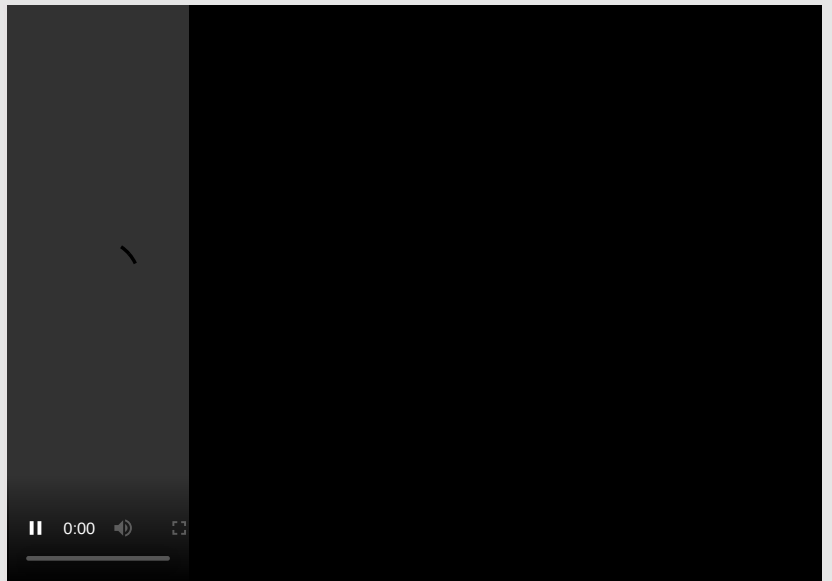
- The quills are pointed and should not be able to get into the eyes.
- Feathers can cause allergic reactions in susceptible students. Teaching staff should be informed in advance of any allergies.
- Extreme caution is required when handling the scissors due to the risk of injury.
- The general instructions for safe experimentation in science teaching apply to this experiment.

# Student Information

## Motivation

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Bird feathers give the bird the opportunity to fly. The stability is on the one hand due to their chemical structure. They consist of the same resistant material as the scales of reptiles, the  $\beta$ -keratin. On the other hand the flag forms an almost impenetrable surface.



## Tasks



1. Check the keel.
2. Check the vane.
3. Explain the phenomena.

## Equipment

Position	Material	Item No.	Quantity
1	PHYWE Binocular student microscope, 1000x, mechanical stage	MIC-129A	1
2	Microscopic slides, 50 pcs	64691-00	1
3	Cover glasses 18x18 mm, 50 pcs	64685-00	1
4	Magnifier, plastic, 5x, d=35mm	88002-01	1
5	Scissors, straight, pointed, l 110mm	64623-00	1

## Procedure (1/3)

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### (1) Inspect the keel

- Cut the keel with the scissors.
- Take a good look at the structure.

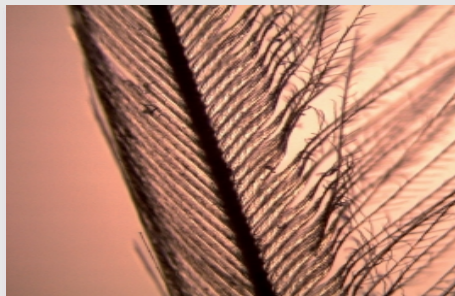
## Procedure (2/3)

### (2) Examine the vane

- Destroy the closed vane by stroking down once with your fingers. Now stroke from bottom to top. What do you observe?



close vane



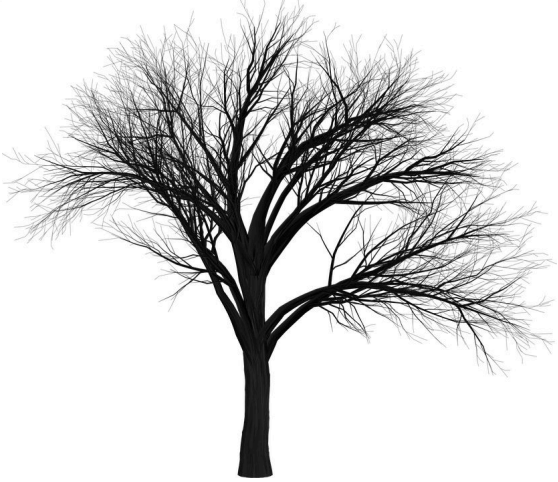
Partially closed vane



Open vane



## Procedure (3/3)

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Compare a piece of branch with the feather

### (3) Explanation of the phenomena

Examine a single branch and a piece of vane with a magnifying glass and a microscope. What differences do you notice?

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## Report

## Task 1

**WORK IN PROGRESS****PHYWE**  
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Look at the **bold** printed words. Some are right, some are wrong. Click all **bold** printed words that are correct.

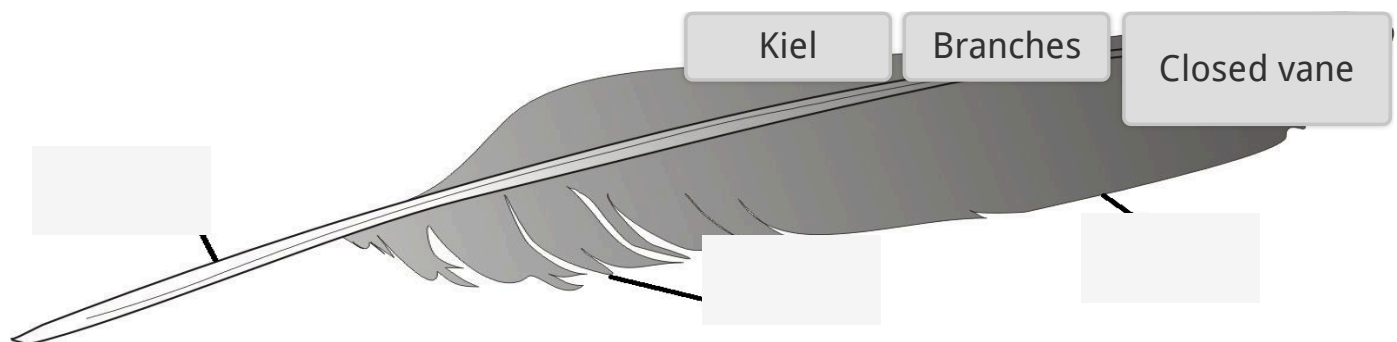
The keel is from inside **filled** / **hollow** . Therefore the spring is very **light** / **heavy** and **stable** / **unstable** . Due to its characteristics a quill pen was a popular quill in earlier centuries. **\*Writing tool\*** / **Toys** . The internal **Content** / **cavity** holds the **Liquid** / **\* Ink\*** and hands them in as you write .

 Check

## Task 3

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Components of the spring

 Check

## Task 2

Drag the correct words into the boxes.

The vane becomes  again when it is raised. This is what  do regularly by stroking the  through their beaks. Separating a single  is not so easy. You can see that something is interlocking. The explanation of this phenomenon is given by looking at the microscopic structure. The hook and loop beams coming from the branches interlock like  fasteners.

birds

feathers

Velcro

uniform

branch

 Check

Slide	Score/Total
Slide 15: The quill pen	0/4
Slide 16: Components of the spring	0/3
Slide 17: The Flag	0/5

Total amount  0/12 Solutions Repeat