

# Flower Power: what would we see if we could see like a bee? ppt

## 1. Title slide

**2. Q. What is a flower? Q. Why do plants have flowers?** We like to grow flowers in our gardens, to enjoy their colours, shapes and scents but the plant isn't growing flowers just for our benefit.

A flower is the reproductive part of the plant – the part that produces seeds which will eventually grow into new plants. To produce seeds, a flower needs to be pollinated (receive pollen from another flower). (Re-cap parts of a flower if appropriate to prior learning).

The petals of a flower are an advert to bees and other pollinators. They are the plant's way of communicating to a pollinator that the flower contains food (nectar and pollen) and where to land to get some. Flowers are enticing pollinators to do the job of transferring pollen between (pollinate) them by promising edible rewards.

**3.** There are many different types of animals, birds and insects that can act as pollinators for different plants, but one pollinator most people think of when talking about insect pollinators are bees.

## **Q. How are bees involved in pollination?**

Bees are attracted and land on the flower to collect nectar and pollen for food. In doing so some pollen from the flower gets stuck to the bee's hairy body. When the bee visits the next flower for food, some of the pollen that was stuck to it rubs off. The bee has transferred pollen from one flower to another, just what the plant wanted it to do! This is the starting point for a flower to be able to produce seeds which will eventually grow into new plants.

(Which parts of the flower produce and receive the pollen? Re-cap if appropriate).

As well as colourful petals, what else might the plant use to help attract and guide bees to it? E.g. scent.

Scientists in Cambridge are studying flowers to better understand how they attract and guide their bee pollinators. They have looked closely at some of the flowers growing in the Botanic Garden.

**4.** In the UK there are around 250 different types of bee! Only 1 of those is the honey bee. The others are bumblebees and solitary bees and include the tree bumblebee, the hairy-footed flower bee, and the small scissor bee to name just 3!

**5.** Take a close look at the bumblebees in the following slow motion videos.

### See if you can spot:

- The bee's proboscis (tongue) which it uses to suck up nectar from the flower.
- Pollen grains stuck to the bee's body.
- The claws on the end of the bee's leg that help it grip onto the flower.
- The pollen sacs full of red pollen on the legs of the honeybee.

6. Video 1: Bumblebee. Proboscis (tongue) probing flower for nectar. Claws on the end of the legs used to grip onto the flower.

Video 2: Bumblebee. Pollen grains stuck to the body of the bee. Claws on the end of the legs used to grip onto the flower.

7. Video 3: Honeybee. Pollen sacs on the back legs are visible and full of red pollen.

Video 4: Bumblebee.

8. This is a photo of the Bee Borders at Cambridge University Botanic Garden. It's a very popular spot for bees and visitors! It has been planted with some of the plants that bees love best.

Bees visit flowers for food – nectar provides sugars for energy whilst pollen provides proteins essential for growth and development of larvae.

Some flowers provide plentiful nectar, some provide lots of pollen, and some provide both. To ensure a steady supply of food for bees all season long the Bee Borders contain plants that flower from early in the bee foraging season (March/April) through until late in the autumn (around October). Outside this window most bumblebee and solitary bee species are in hibernation, while honeybee colonies can live off their stored honey.

**Q. Look at the picture of the Bee Border plants - what colour flowers can you see? What colour flowers are not present?**

The colour scheme for the Bee Borders is mainly blues, mauves and violets with complementary yellows, as bees can see these colours best. Bees are unable to see bright red very well – one of the reasons you don't see red flowers in this photo of the Bee Borders.

9. Have you ever wondered how other creatures might view the world? They might see things differently to us.

**Look at the person sitting next to you, are their eyes like a bees eyes?** No they're very different! Bees have eyes which are made up of lots of small simple eyes working together, bees and many other insects have what we call compound eyes. This means bees see things differently to us.

The plants growing in the Bee Borders at the Botanic Garden have flowers that are mainly blue, mauve and violet as bees can see these colours best but Bees can also see in different types of light that we can't see at all! They can see Ultra Violet light (UV).

So, what would we see if we could see like a bee? What would the world, and The Bee Borders look like?

Scientists are investigating what the world looks like for bees and how plants create patterns on their flowers and use different ways to attract and communicate to them.

**10.** Sunlight is made up of all the colours of the rainbow, which together make white light.

We can see this by using a glass prism. When light passes through a prism the light bends. As a result, the different colors that make up white light become separated. This happens because each colour has a particular wavelength and each wavelength bends at a different angle.

You can use a prism to break a single beam of white light into these separate wavelengths of light and see the seven colours of the rainbow. When we see a rainbow in the sky, water droplets in the air are acting as prisms and bending the light from the sun into the different colours. But as well as the seven colours of the rainbow which we can see, there are also wavelengths of light there that we *can't* see.

When we talk about light, we usually mean visible light which is the kind we can see with our eyes. Because human vision and bee vision is different, bees and humans can see different wavelengths of light and so can see different colours. Bees can't see some colours, such as red, as well as we can which is why bee friendly flowers aren't usually red. But they can see ultra-violet light (UV) which is a wavelength of light that we can't see at all!

**11.** Some flowers have patterns on their petals that help guide the bee to the centre of the flower. These are called Nectar Guides and are like signs communicating to the bee where to go. It's important for the plant to get the bees to the right place for pollination to take place. Nectar guides can be spots, stripes or bullseye patterns!

**12-15.** Remember, bees see the world differently to us and can see ultraviolet. As well as patterns that we can see, there are patterns that a bee can see that we can't. If we put flowers under an ultraviolet light and take a picture with a special camera, we can get an idea of what a bee might see when it looks at the flower. Are you ready? Let's put on our bee glasses!

These flowers have produced patterns that us humans can't see without using a special camera because we can't see ultraviolet light but the bees can see them! Where are they signalling the bee to go? Which part of the flower are they highlighting?

These plants are making sure there are lots of nectar guides and bullseye patterns on their flowers to attract and direct the bees to the right spot to make sure they get pollinated.

**16.** But that's not all.

Beetles use it, birds use it. Plants use it too. Iridescence is the shimmery colour effect that makes things eye-catching.

Some plants produce flowers that have tiny bumps and grooves on the petals that we can't see unless we look at them under a microscope. Sometimes when a flower has bumps on its petals it makes it look a bit iridescent like the tulip in the picture, shimmery and shiny it seems to catch the light. But to a Bee it looks really shiny and multi coloured a bit like the back of a CD.

If we zoomed in really far, the surface of the tulip flower and the back of the CD both have grooves. These grooves are what make them look iridescent.

Scientists think that bees can spot iridescent flowers more easily than non-iridescent flowers so some flowers use this trick to really stand out to bees.

**17.** So bees really like shimmering iridescent flowers, but why? As well as being easy to spot for the bee, scientists have found out there's another reason. Remember that just like the back of a CD, it's the tiny bumps and grooves on a flower petal that make it iridescent. Let's zoom in a bit further....

These two pictures are of flower petals viewed under a high powered microscope. Petal surfaces vary between flowers.

In the image on the left, the petal surface is really bumpy. The surface of the petal is made up cone cells, so named because of their shape – we can't see them with the naked eye, only using a microscope.

In the image on the right, the petal surface has cells that are flat and produce a smooth surface – again, we can't see them with the naked eye, only using a microscope. We know that a bumpy surface makes the petal more iridescent but....

**Q. Which petal surface do you think would be easier to grip onto for a bee?** (Think back to the claws you spotted at the end of the bee's leg in the slow motion video).

Bees like shimmering iridescent flowers, not only because they're easier to spot but because they have teeny tiny bumps on the surface of the petals that they can hold onto with their claws when they land. Not all flowers have bumpy petal surfaces but flowers that want to attract bees are more likely to have them.

**18.** So now you know all about how flowers use patterns and colours and bumps to attract bees to pollinate them!

Have a go at decorating your own flower with patterns to attract bees and communicate where to go to get nectar and pollen. How will you attract them and direct them to visit your flower?

**19.** Think about:

- Guiding lines and dots: nectar guides.
  - Bullseye patterns marking the centre of the flower.
  - Bright and colourful petals to stand out against a green background.
  - Bumpy petals which look iridescent to attract the bee and which make it easier for the bee to hang on!
  - A mix of colours, some we can see and hidden ultraviolet markings that we can't.
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## 20. Why are bees important?

- We have bees and other pollinators to thank for every third mouthful we eat! They pollinate many of our food crops.
- They're also vital for the survival of other wild plants that support so much of our wildlife.

Wild bee populations are thought to be in decline worldwide due to a complex range of factors thought to include climate change, pests and diseases, and a decline in wildflowers and habitat due to intensive agricultural practices. And yet, bees are vital to our food chain as pollinators of crops accounting for about one third of our diet. Bees are essential to fruit-set in crops such as tomatoes, coffee, grapes, beans, apples and strawberries. They also ensure seed production for oils such as Rapeseed and sunflower.

21. By understanding more about how flowers communicate to bees and which flowers bees are attracted to most, scientists may be able to help inform how best we can look after our bees and other pollinators.

### What can you do to help the bees?

5 simple actions you can take:

[https://www.youtube.com/watch?time\\_continue=9&v=2wtktAjeLB4&feature=emb\\_logo](https://www.youtube.com/watch?time_continue=9&v=2wtktAjeLB4&feature=emb_logo)

- Plant for pollinators
- Let your garden grow wild
- Put away the pesticide
- Leave the lawnmower
- Build a bee hotel

Many of the bee plants in the Bee Borders at the Botanic Garden are readily available from garden centres and many are straightforward to raise from seed. Why not have a go at making your school grounds or outdoor space at home more bee friendly by planting some plants loved by bees?

A complete list of plants in the Bee Borders at Cambridge University Botanic Garden can be downloaded from the bottom of this page: <https://www.botanic.cam.ac.uk/the-garden/gardens-plantings/bee-borders-2/>

## 22. Find out more:

<https://www.wildaboutgardens.org.uk/>

[https://www.wildaboutgardens.org.uk/sites/default/files/2018-08/Wild%20about%20gardens\\_wild%20bee%20action%20pack.pdf](https://www.wildaboutgardens.org.uk/sites/default/files/2018-08/Wild%20about%20gardens_wild%20bee%20action%20pack.pdf)

<https://www.plantlife.org.uk/uk/discover-wild-plants-nature/say-no-mow>

<https://www.wildlifetrusts.org/wildlife-and-wild-places/saving-species/save-bees-and-pollinators>

<https://www.bumblebeeconservation.org/bees-needs/>

<https://friendsoftheearth.uk/bee-count/great-british-bee-count-activities-children>

### 23: Other activities:

- Use the results of your survey to create different graphs.
- Create a poster encouraging people to plant bee friendly plants and tell them why bees are important.
- Grow your own bee friendly flowers.
- Create a sign to place next to some flowers translating for humans what the flower is saying to prospective pollinators!
- Learn more about light and have a go at splitting a beam of white light into a rainbow of colours using prisms or mirrors and water.
- Use sunprint paper to capture different flower and nature shapes using the ultra-violet light from the sun
- Make a mini flower press: <http://bitly.ws/9eAf>