



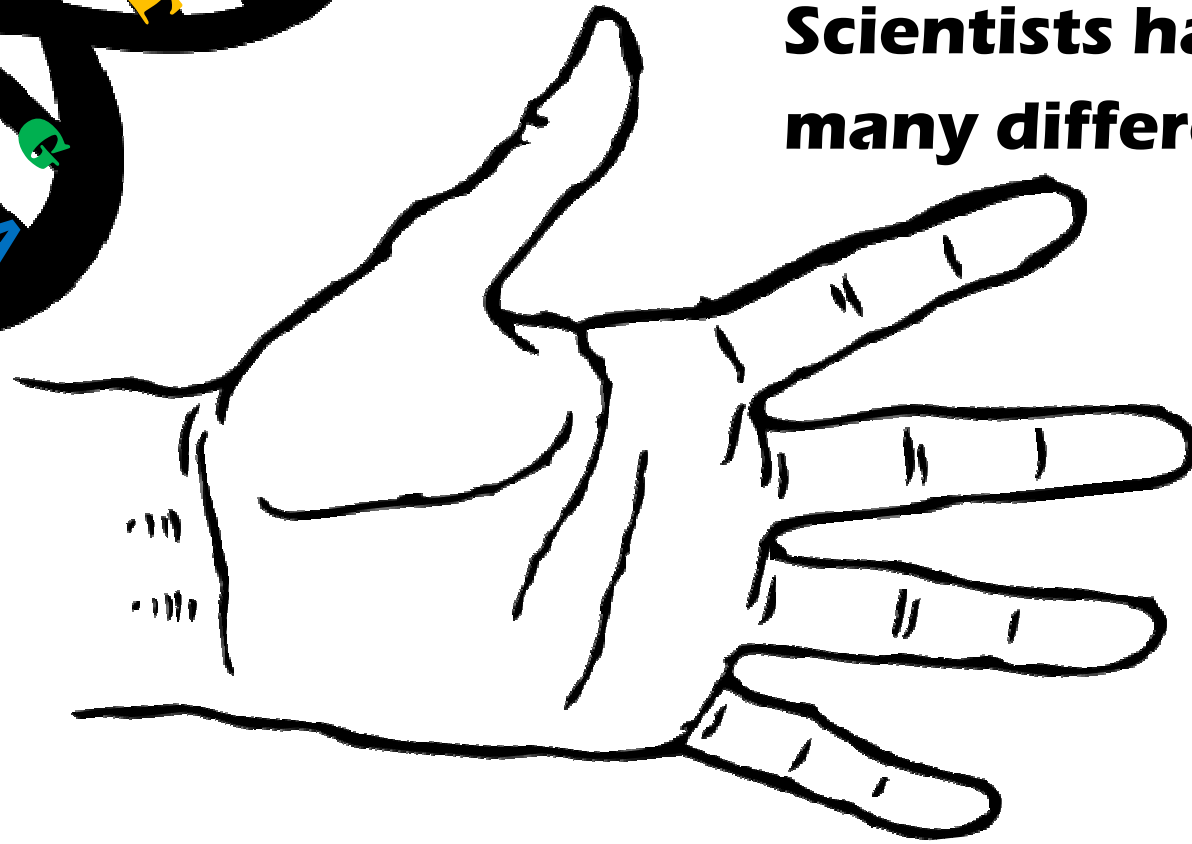
**DNA** contains the code for who and what we are, all locked up in the building blocks of DNA called bases.

Scientists have been mapping the DNA codes of many different organisms from

**Humans** to

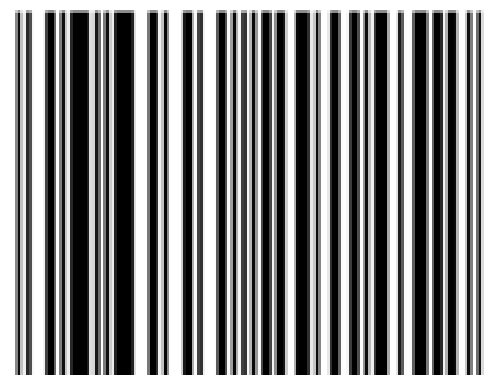
**Bees** to

**Plant pollen**

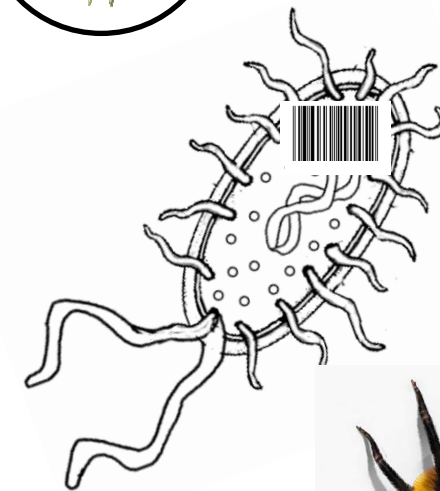


**DNA Barcoding uses small sections of DNA code that differ between species to identify organisms.**

**Just like a barcode in a shop.**



ATTGGGAAAC



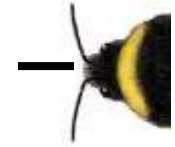
**Want to Learn more?**

# Which bee is eating what?

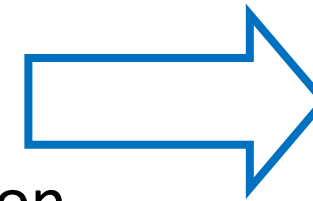
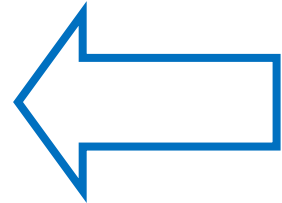
## Use DNA barcodes to find out

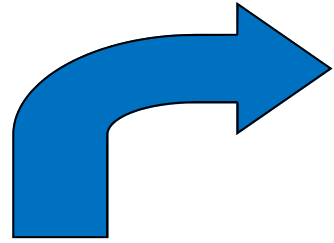
1. Extract the DNA sequence from the pollen grains stuck to the bees
2. Match it to a plant DNA sequence
3. Join the bee to what it has been feeding on using the string, creating a pollinator food web

*The DNA codes for the plants are sections of the real DNA sequences used by scientists to identify plants from their pollen!*

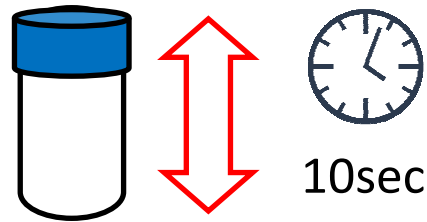


As you go down you need a longer and longer tongue to get to the nectar

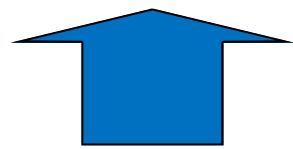




2. Spit into a 50ml tube, add 1ml of salt solution and gently mix for 10 sec.



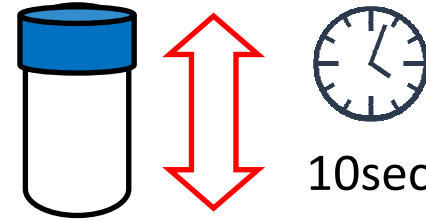
The salt helps your DNA to come out of solution



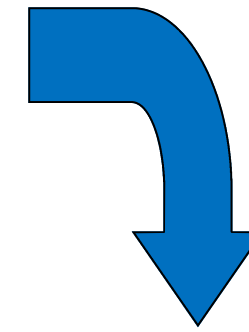
1. Take about 10ml of bottled water in a cup and swill around your mouth for 1 min!

We want any loose cheek cells to come out for DNA extraction

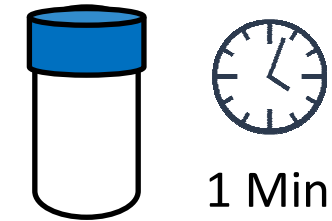
3. Add 1ml of liquid soap solution and gently mix for 10 sec.



The soap breaks down the fatty outer membrane of your cells letting the DNA out



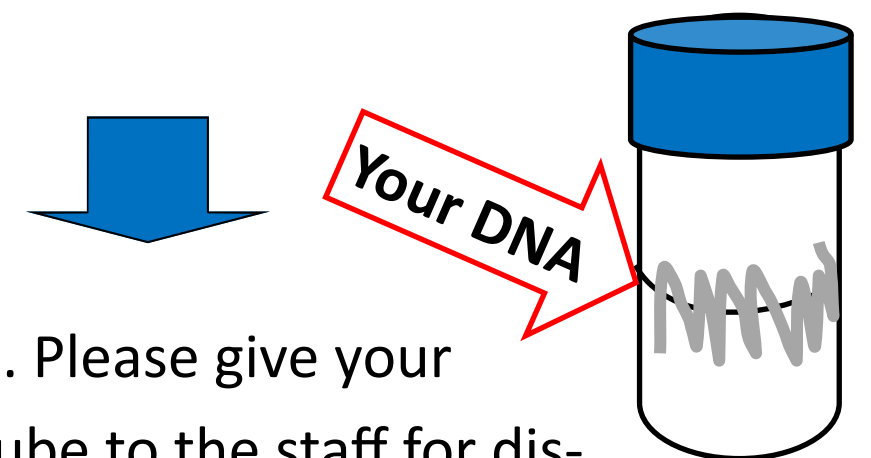
4. Add 5ml of ethanol, gently down the side of the tube and hold it still.



Ethanol is less good at dissolving DNA so the DNA comes out of solution

**The white stringy bits that you see in the middle of the tube are your DNA!**

**See your own DNA**



5. Please give your tube to the staff for disposal!

# Bumblebee Barcode Bracelets

1. Pick the bumblebee you want to make a DNA bracelet of

*Bombus terrestris*



TTTATTTTTTGCTATA

*Bombus muscorum*



GTTTATATTTTAATTT

2. Make your DNA code bracelet by adding beads to your string matching the sequences



3. Tie a knot or get an adult to help you.

4. DNA has two strands.

Go back the other way pairing your beads to the string above.

Just like this:

C (cytosine) is always with G (guanine)

A (adenine) is always with T (thymine)

This is how your body makes new DNA too!

5. Tie a knot and you have finished your bracelet

DNA is made up of 4 bases:

A (adenine), C (cytosine),

G (guanine), and T (thymine)

Now DNA bases always come in pairs

C (cytosine) is always with G (guanine)

and

A (adenine) is always with T (thymine)

These are real DNA sections from the Cytochrome Oxidase gene (COI) from Gen Bank used by scientists to identify Bumblebees

TTTATTTTTTGCTATA

AAATAAAAACGATAT

