



# Metamorphosis and Drawing

## Learning Objectives:

- To describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals;
- To give reasons for classifying plants and animals based on specific characteristics;
- To describe the differences in the life cycles of an insect.

## Science Skills:

- Observing closely;
- Making accurate observational drawings.

## Resources:

- PowerPoint Maria Sibylla Merian
- **ART 1.** on the STEM Sisters Site: Observational Activities, Drawing Template and PowerPoint
- Drawing paper
- Art pencils
- Watercolour paints, brushes and water pots
- Access to the internet to search for images or real specimens of insects to draw
- Hand lenses, if real specimens are used

### What you should know before you start

Maria Sibylla Merian was born in Frankfurt Germany, in 1647. She was born during the time of some of the early scientific discoveries such as Robert Hooke discovering cells using a microscope and the founding of the Royal Society in the late 1600s. Modern science, based on evidence and testing rather than believing in untested ideas, was just emerging.

For example, Linnaeus published his system for classifying plants and animals into groups after Maria had died. So, Maria was studying in a time before animals and plants had been properly categorised. Linnaeus looked closely at living things and used their features to group them. He sought to find which features were important in this grouping. Maria was working in a time before that, when people believed sheep came from cotton plants because they were both fluffy.

Insects were not thought interesting at this point in history - most people still believed that witches were real and that insects were born out of the ground. Maria was studying insects before entomology (the study of insects) even had a name!

Maria was a trained artist. After the death of her father in 1650, Maria's mother remarried. Maria's stepfather, Jacob Marrel, was a well-known painter and he encouraged young Maria to paint. She learned to draw accurately and mix pigments to make paints of exactly the right colours. She began by painting flowers, like her stepfather.

At the age of thirteen, Maria became curious about insects. She noticed that caterpillars metamorphosed into butterflies and she set about collecting all the caterpillars that she could find in order to see what they turned into. Then she would draw the animal at its different stages. She published a book about the subject in 1677. This was one of the first times that metamorphosis had been documented.

In 1699, when her daughter had moved to a Dutch colony in South America, called Surinam, Maria set sail from Amsterdam to visit her. She was sponsored to go and study, and paint, the animals and plants in Surinam – now known as Dutch Guiana. She toured Dutch Guiana and English and French Guiana for two years, observing and collecting insects and plants. She made a huge collection of paintings which she later used to make 60 copperplate engravings. These were used to print the pictures published in a book called ‘Metamorphosis Insectorum Surinamensium’ in 1705.

You can see an original copy of this book here:  
<https://www.youtube.com/watch?v=vzTheyO4gqI>

## WARM UP – Observational Skills

Put up *Slide 1* of the ‘Maria Sibylla Merian’ PowerPoint and ask the children to look at it. The image will remain there for just a few seconds.

Ask:

- What did you see on the slide?

Put up *Slide 2* and ask the children to look again. The image will remain for 8 seconds. Ask:

- What else did you see? They should have noticed more details at this point.

Put up *Slide 3* then *Slide 4*. The image won’t disappear this time. Let them really look. They should be paying close attention at this point.

Ask:

- What did you **observe**?

Listen out for the much smaller details such as the coral under the water, the red jacket one of the people is wearing and the planks which make up the walkway.

## INTRODUCTION Expeditions in the 1700s

Ask the children:

- Imagine you were going somewhere that none of your friends had been and you saw something completely new. What would you do? Elicit that we tend to take photographs.
- Imagine that you saw an animal that you’d never seen before and your friends were unlikely to believe you if you described it because it was so bizarre. What would you do?

Show *Slide 5* (zebra)

Tell the children:

The camera wasn’t invented until 1816 but people were exploring the world long before then. Scientists would bring back live animals if they could. If they couldn’t bring them back alive, they would bring back the skin or the skeleton. Or they would bring back a drawing. Scientists were not necessarily trained artists. They might take an artist with them but that artist wouldn’t necessarily know what was important to capture in the drawing if they weren’t a scientist.

Maria Sibylla Merian was a trained artist. She was also interested in insects. In a time when most people thought that insects grew out of the earth on the ground, Maria took an interest in caterpillars. She kept them and observed them and noted all the stages of their lifecycle. Not only that, she drew them. She drew with such accuracy that her drawings could be used by later zoologists and botanists to identify particular species.

She then took an interest in other insect species and drew their lifecycles.

Show *Slide 6*. (There are lots of different cockroach nymphs on the pineapple.)

Tell the children:

In the time of this STEM sister, the process of metamorphosis was not fully understood. Maria was one of the first to observe it. The cockroach has lots of different stages to its lifecycle. It undergoes incomplete metamorphosis which means it has lots of different nymph stages (instars) which have legs and they shed their skin between each instar to allow them to grow. The adult often looks just like the last instar, but with wings. Ants, in contrast, undergo complete metamorphosis, like a butterfly. There are only four stages, egg, larva, pupa and adult.

Watch this video:

[https://www.youtube.com/watch?v=HObBdRBuV\\_0](https://www.youtube.com/watch?v=HObBdRBuV_0)

Tell the children:

You can collect insects and other small animals and transport them back to where you came from, but in the time when Maria Sibylla Merian was travelling, 1699, it took a long time to sail across an ocean and it was difficult to bring a plant or insect specimen home alive. You could transport dead insects and pressed flowers, but they soon lost their colour. However, Maria, a skilled painter, could accurately capture the colours in and details in her paintings. They were so good that you can use them to identify live animals and plants.

Have a go!

Show slides 7 -13. Use the evidence to work out which photo matches the species in the drawing.

Remind the children that although Maria was interested in insects, she also drew other animals and plants. The butterfly is an insect but the spider is not. Insects have 6 legs and three body parts whilst spiders have 8 legs and two body parts.

**MAIN TASK – accurate observational drawing. USE the ART 1. Observational Drawing templates, step by step guide and PowerPoint or the following.**

You will need to provide either real insects to draw or access to the internet to allow children to choose their own insect or invertebrate to draw.

Hand out A4 sized paper. Use good quality drawing paper if you have it. Likewise, provide drawing pencils to allow shading and watercolours to add colour, if you have them.

If you can draw confidently, then demonstrate how to draw from the picture or specimen, beginning by forming the overall shape, looking closely and adding accurate details.

If not, you can show how to do this using a video on how to draw insects, such as this one:

<https://www.youtube.com/watch?v=zomfrHyCMhw>

## EXTENSION

Ask the children to draw their chosen insect in different stages of their lifecycle like Maria's cockroach picture. Ask them to compose a drawing with all the stages represented in one composition in the same way.

## FINALE

Some historians note that Maria also made observations about which plants could be used to create pigments for paint. After checking for any poisonous plants on site, you could ask the children to collect leaves (which are not poisonous) and crush them to see what kind of colours can be harvested from them, if any.

There is lots of information on this site:

<https://www.fix.com/blog/natural-plant-dyes/>

## REVIEW

**ALL:** Children observe their photo or specimen closely, noting details.

**MOST:** Can use their observations to create an accurate drawing and care is taken to match the paint colours to the insect.

**SOME:** Can draw several stages of that insect's lifecycle and arrange them on a plant in the same way as Maria Sibylla Merian.

