

## Terrible lizards

Dinosaurs are very much part of popular culture today. In this project, we are going back 200 years to when Mary Anning was living in Lyme Regis in Dorset. Scientists were only beginning to understand what they were finding.

First of all, you will use scratch to make your own animation to explain how fossils are formed. Then, like the Annings, you are going to start with a skull before looking at what leg bones can teach us: what they are made from and how they help us to imagine what a creature looked like. With the advantage of two centuries of research, you will finish by creating a timeline and investigating one theory for the mass extinction of the dinosaurs.

Technology



Explain fossilisation

Engineering



Create a skull

Chemistry



Investigate bones

Biology



Investigate height

Maths



Create a timeline

Physics



Investigate craters

We would love to see photos so please share with [#CSGatHome](#).





## Terrible Lizards Fossilisation

### Equipment

• website: [scratch.mit.edu](https://scratch.mit.edu)

### Instructions

- Watch this animation from the Natural History Museum <https://www.nhm.ac.uk/discover/how-are-fossils-formed.html>
- Can you make your own version using scratch?
- Go to [scratch.mit.edu](https://scratch.mit.edu) and click 'Create'.
- You need to create backgrounds and costumes to show:
  - the creature is alive
  - the creature dies
  - the creature is buried
  - the fossil is found
- Hover over the blue background or sprite icons and click the paintbrush to create your own designs.
- You may want to use these blocks from the purple Looks menu.  
If you are new to scratch, try remixing this project: <https://scratch.mit.edu/projects/412762923>



### Story

Mary Anning lived near the coast in Lyme Regis. She made money from selling fossils like ammonites and belemnites to tourists. When these sea creatures had died, they were quickly covered with mud. Over time, the mud was squashed into rock. As the skeleton dissolved, it left a hole in which minerals crystallised to form a fossil of the same shape. Eventually, these fossils became exposed for fossil hunters to find.

### Glossary

**Igneous rocks** (e.g. granite or basalt) are formed when molten rock cools and solidifies.

**Sedimentary rocks** (e.g. sandstone or limestone) are made from broken rocks that have been transported by water before being deposited, compacted and cemented together into layers.

**Metamorphic rocks** (e.g. marble or slate) are made from other rocks that have been changed by heat and pressure.

### Questions and Research Ideas

- Can you draw a flow chart to show the fossilisation process? This will help you with your animation.
- How long does it take to make a fossil?
- Where are most fossils found today?
- What were those places like when the creatures were alive?
- Are fossils found in igneous, sedimentary or metamorphic rocks? (see Glossary)

### Further tasks

-  Create a skull
-  Investigate bones
-  Investigate height
-  Create a timeline
-  Investigate craters



## Terrible Lizards

### Create a skull

#### Equipment

- 2 litre or 4 pint plastic milk bottle (with lid)
- Marker pen (for cutting guidelines)
- Scissors
- Masking Tape
- A patient grown up to help
- optional: newspaper, glue and paint

#### Instructions

This is something that we tried during lockdown.  
 If we can do it, you can! This [video](#) may help:



Cut the sides of the bottle in half to make the jaw hinge. Cut off the ends and save them for later.

Cut around the handle shape, cover it with tape and stick it to the top.

To make the snout, cut some slits and tape them together.

Use the pieces from the neck of the bottle to make eyelids and nostrils.

Cut zigzag shapes for the teeth.

Cut the lid in half and attach to make the eyes.

#### Story

In 1811, Joseph Anning discovered a complete fossilised skull. A few months later, his sister, Mary, found the rest of the fossilised skeleton. By looking at the fossils, we can imagine what an animal might have looked like.

You are going to transform a plastic milk bottle into a T-rex skull.

#### Glossary

The **skeleton** is for support, protection, movement and to make red blood cells.

**Ligaments** hold the bones together.

**Tendons** attach the **muscles** to the bones.

#### Questions and Research Ideas

- What do the milk bottle and the masking tape represent in this model?
- Research the habitat of a tyrannosaurus rex. Does a predator need camouflage?
- Cover your skull with tape or paper maché and then paint it.

#### Further tasks

-  Explain fossilisation
-  Investigate bones
-  Investigate height
-  Create a timeline
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## Terrible Lizards

### Investigate bones

#### Equipment

- Two Chicken Bones, thigh or drumstick.  
 Make sure they are clean of any tissue (meat etc.)
- needle
- jar with lid
- tea towel or kitchen roll
- nail
- vinegar
- rolling pin
- oven tray

#### Instructions

Test the properties of the bones

(N.B. DO NOT destroy your bone samples, be gentle)

- Can you bend them?
- Can you scratch them with a needle?
- Can you make a dent in them with a metal nail?

Bone 1

- Put the bone into the jar and cover with vinegar.  
 (Use a lid to prevent smells!)
- Check on the bone every day for about a week,  
 releasing any gas made in the jar.

Bone 2

- Bake in the oven at 200°C for an hour.  
 (CAUTION the bone will be extremely hot after it  
 comes out of the oven, and also a little smelly.  
 DO NOT handle until it has cooled down.)

When both bones are ready, look at the surface. Do they  
 look different? Repeat the tests. Has anything changed?

#### Story

Initially people thought that the skeleton that  
 Mary Anning had discovered was from a  
 crocodile. However, they later decided to call it  
 an ichthyosaurus or "fish lizard". We now know  
 it was neither a fish nor a lizard!

The name "dinosaur" comes from the Latin for  
 terrible lizard. Yet the only dinosaurs to have  
 survived the mass extinction were birds. Find  
 out more here:

<https://www.nhm.ac.uk/discover/why-are-birds-the-only-surviving-dinosaurs.html>

#### Glossary

1 (soft)	talc (1)	The <b>hardness</b> of a material tells you how difficult it is to scratch.
2	fingernail (2.5)	
3	copper coin (3.5)	
4		The Mohs scale compares hardness.
5	bone(5)	
6	steel nail (6.5)	A steel nail can scratch bone but a copper coin cannot.
7		
8		
9		
10 (hard)	diamond (10)	

#### Further tasks

-  Explain fossilisation
-  Create a skull
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#### Questions and Research Ideas

- What materials make bones strong?
- Carefully wrap the bones in kitchen roll or a tea towel  
and hit with a rolling pin. What happens?
- Are the bits of dinosaurs we find in the ground today  
made of the same material as the chicken's bone?
- How do palaeontologists use acid in the processing of  
the fossils they find?



# Terrible Lizards

## Investigate height

### Equipment

- Tape measure
- Pen or pencil
- Paper
- Some willing victims volunteers

### Instructions

- Measure the length of your foot (toe to heel).
- Measure the length of your leg (hip to floor).

Leg Length (/cm)	Foot Length (/cm)	Leg/Foot

- The final column asks you to divide your leg length by your foot length. This is called a ratio.
- Collect data from other people.
- Once you have data from 5 - 10 people, find the mean of the numbers in the final column

### Story

When Mary Anning was alive, scientists had to guess what the creatures looked like based on small fragments of their skeleton. Today, analysis of fossils has changed how we think dinosaurs lived. By comparing human and dinosaur skeletons, you can show that both animals must have shared a common ancestor. There are similarities between the size, shape and construction of the bones and the skeletons that we can investigate ourselves.

### Glossary

The **mean** is a type of average. It gives you an idea of what value to expect.

To calculate the mean add the values together and divide by the number of values.

$$\text{mean} = \frac{\text{sum of values}}{\text{number of values}}$$

### Questions and Research Ideas

- What do you notice about the ratio of leg length to foot length?
- This ratio is also true for bipedal (two legged) dinosaurs. What would be the leg length of dinosaurs with these footprint?



### Further tasks

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-  Create a skull
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## Terrible lizards Timeline

### Equipment

- 2.3 m or 4.6 m of string
- ruler
- paper
- pegs

### Instructions

- Distance along your string represents time, starting from now (0 m) to 230 million years ago.
- Cut strips of paper to the correct length to show how long each of the dinosaurs roamed the Earth.  
**Hint:** work out how many cm represent 1 million years

- Attach the strips to the correct place on your string

Tyranosaurus Rex 66 - 68      Iguanadon 120 - 129

Albertosaurus 66 - 70      Hypsilophadon 125 - 129

Velociraptor 72 - 75      Diplodocus 145 - 155

### Questions and Research Ideas

- There are 3 geological ages in which the dinosaurs lived. Can you find out
  - What they are called?
  - What times these ages corresponded with?
  - Where these go on your timeline?
- When did the first humans (Homo Erectus) evolve? Where do these go on your timeline?
- Could a T-Rex have eaten early humans? Why?
- How long would your string have to be to show when
  - the earliest fossils were formed?
  - the Earth was formed?

### Story

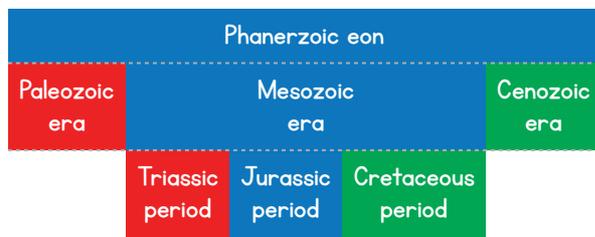
As the climate and geography of the Earth kept changing, dinosaurs of all shapes and sizes were evolving and going extinct. Mary Anning lived in an area that is now known as the Jurassic Coast. The sedimentary rocks found there were formed nearly 200 million years ago.

### Glossary

Geologists split the billions of years since the Earth formed into **eons**. The Phanerozoic eon started about 542 million years ago.

Eons are divided into **eras**. Dinosaurs lived during the Mesozoic era. We are now in the Cenozoic era.

Eras are divided into **periods**. The Mesozoic era is split into the Triassic, Jurassic and Cretaceous periods.



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## Terrible lizards Craters

### Equipment

- Plastic ice cream tub or similar high sided tray.
- Flour or moist play sand
- Tape measure
- Ruler
- Balls of various diameters  
e.g. squash, table tennis, golf, bouncy, ball bearing

### Instructions

- Fill your container 3/4 full with the sand or flour.
- Drop a ball into the tray from about 20cm.
- Use a ruler to measure the diameter of the crater.
- Measure the depth of the crater
- Experiment by changing a variable to see how it affects the size of the craters. You could change:
  - The height of the drop
  - The size of the ball
  - The density of the ball
  - The material the ball lands in (or how wet that is)

### Questions and Research Ideas

- Is it sometimes, always or never true that as the height of the drop increases, the size of the crater increases?
- Is it better to drop or throw the ball?
- Optional extra investigation (WARNING VERY MESSY!) Does the angle of impact affect how the crater looks?
- Try layering with two different types of material (e.g. flour and cocoa powder).  
How far does the debris travel?  
(This is really a one shot experiment as after impact resetting is almost impossible)

### Story

During Mary Anning's time, people did not know why dinosaurs were no longer around. One idea was that they had become so large that there was not enough food so they had migrated to an undiscovered land. Today, our best hypothesis suggests that one of the causes of their extinction was an asteroid striking the Earth. In this experiment, we are going to model what happens when objects impact into the Earth.

### Glossary

A small, non-spherical, rocky object orbiting a star is called an **asteroid**.

If it is knocked out of orbit, it can enter the Earth's atmosphere. It is then called a **meteor**. Sometimes people call meteors "shooting stars".

Once a meteor has landed, it is called a **meteorite**.

### Further tasks

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