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Key for symbols in ‘Your turn’ questions

- 🔍 Literacy
- 🔧 Numeracy
4.1 Your place ... 20 000 years ago!

Find out what your place was like, and why, 20 000 years ago!

It's time to travel

Climb into your time machine. Press the button. And whoosh! Travel back in time, to see your place ... as it was 20 000 years ago. What will you find? It depends on where in the UK you live!

If you live in the white area on the map below, you'll find a thick sheet of ice, when you arrive. There are no humans or other animals. No grass. No trees. It's bitterly cold.

Why was it like that?

Why was your place like that, 20 000 years ago?
Because around 110 000 years ago, Earth got colder and colder. A new ice age began. (There had been many others before it!)

Over time, an ice sheet spread over much of northern Europe, and most of the British Isles. Look at the map and key.

It did not reach the grey areas. But these were still very cold. The ground was frozen deep down. The surface thawed only in summer, giving thin boggy soil. Then small plants grew. This type of environment is called tundra.

About 10 000 years ago, Earth warmed up again. The ice age ended. The ice over the British Isles melted away.

If you live in the grey area, there's no ice sheet. But it has been snowing, and it's very cold. There are no humans – but you may see woolly mammoths, and bison!

There was more land then!

During the ice age, water levels in the ocean were much lower than today. (Up to 120 m lower!) That's because so much water was locked up in ice. The water drained away from shallow parts of the ocean floor. They became land.

Look at map B. It shows that when water levels were low, the British Isles were joined to the rest of Europe!

What about people?

20 000 years ago, there was nobody in the British Isles.
We had turned up earlier in the ice age – 40 000 years ago. We had walked here from other parts of Europe. But as the ice sheet spread, it got too cold for us, so we left.
Then about 12 000 years ago, when the ice sheet was shrinking, we came back to the British Isles again.

The animals

But there were animals here, 20 000 years ago. There were woolly mammoths and bison and Arctic foxes, which could survive the tundra winter.
And in summer, when plants grew in the tundra, large herds of reindeer and antelope arrived from other parts of Europe, to feed.

When the ice age ended

As Earth warmed up again, the ice melted. The water levels rose again, and cut us off from the rest of Europe.
But the ice had changed the landscape – and we can still see the results today. You'll find out more on later pages.

Your turn

1 What is: a an ice age? b tundra? (Try the glossary?)
2 How long did the last ice age last? And when did it end?
3 a Look at map B. It shows that the British Isles were joined to the rest of Europe. In the last ice age: Why was this?
b Then they separated from the rest of Europe again. Why?
c Suppose they had not separated. How would your life be different today?
4 Get ready! You will travel back 20 000 years, in your home place – and stay for three days. You can take only 20 items.
a First, pick out where you live, on map A. Is it in the white part or the grey part? (The map on page 139 may help.)
b Now write a list of what you will take with you. Beside each item, explain why you will take it.
c Good. You’ve arrived! What’s it like there? Write a blog for us!
Where are the glaciers?

As you’d expect, glaciers are found in Earth’s coldest places.

Key
- glaciers
- land
- water

1. Far from the Equator, at the top and bottom of the world, ice sheets cover Antarctica and most of Greenland. Between them, they have over 99% of Earth’s ice. They are more than 4 km thick in places. Picture that!

2. Earth’s other glaciers are much smaller. Most are high up in mountains, where it is also very cold. Most of Earth’s big mountain ranges have glaciers. We call them mountain glaciers in this chapter.

Glaciers depend on snow

Rivers depend on rain falling from the sky. Glaciers depend on snow!

In those cold places, snow falls layer upon layer. Over time, the layers below get compacted to ice, like when you squeeze a snowball very hard. It could take over 10 metres depth of snow to make a layer of ice 1 metre thick.

As it gets thicker, the ice gets heavier and heavier. And eventually it starts to flow, under the pressure of its own weight. A glacier is born!

Did you know?
- Glaciers are only on land.
- The ice that forms when an ocean freezes over is called sea ice.
- Earth is flatter at the North Pole … because of the weight of Antarctica’s ice.

Glaciers flow

Glaciers don’t just sit there. They flow.

How can ice flow? First, ice flows inside the glacier, because the ice crystals slide over each other, under pressure. And second, the ice at the bottom of the glacier may melt; then the whole glacier slides along on the water.

Ice sheets flow just a few metres a year. Mountain glaciers flow faster, down their slopes – 300 metres a year or more.

Where do they flow to?

A mountain glacier flows down the side of the mountain, in a valley. And eventually it reaches a place where it melts.

In ice sheets, the ice flows out to the thinnest parts, like when you pour syrup. In Antarctica, it flows into the ocean in places, and floats as an ice shelf. Bits of the ice shelf break off now and then to form icebergs.

Your turn

1. What is a glacier? b. an ice sheet?
2. The UK has no glaciers today. Why not?
3. See if you can name five countries that have mountain glaciers today. The map on page 140 might help!
4. Image A was taken by a satellite high above Earth. Which part of Earth was it over, when it took the shot? a. the North Pole b. the South Pole c. the UK Explain your choice.
5. You are a scientist. Your job is to study the glacier in photo B. a. How could you prove that it was flowing? Tell us! b. How would you work out how fast it was flowing? c. The middle of a glacier flows faster than the edges. Think of a way to prove this too, for your glacier.
6. Crevasses can open up quickly – and close up quickly too. Imagine that’s you, in photo C above. How are you feeling? What will you do?
### 4.3 Glaciers at work

In this unit you’ll find out how glaciers shape the landscape.

**Glaciers work as they flow**

As you saw on page 65, glaciers don’t just sit there. They flow. And as they flow, they scrape and shape the landscape, like giant bulldozers.

They do three jobs:
1. They pick up erode material.
2. They carry it away, or transport it.
3. Then they drop or deposit it.

Let’s look at these in more detail, for mountain glaciers.

1. **Erosion**

Glaciers pick up material in two ways.

- **Freeze-thaw weathering helps**
  Plucking is easier when rock has been broken up by freeze-thaw weathering. First, water freezes in cracks in the rock. As it freezes it expands, so the cracks get bigger. Then the ice thaws. The cracks fill with water. It freezes again. The ice thaws again. And so on ... until the cracks are so big that the rock breaks up.

2. **Transport**

The glacier then carries away the material it has eroded. This drawing shows a slice through the glacier. Look how the material is carried.

***Answer***

- Which term refers to material carried on top?
- Which term refers to material carried inside the glacier?
- Which term refers to material frozen into the glacier?

### 3 Deposition

As you go down a mountain, it gets warmer. So eventually the front of the glacier reaches a place where it melts.

Look at this photo.

As the glacier melts, the load it is carrying falls to the ground. It is a mixture of rocks, stones, sand, and clay. It is called glacial till.

The water from the melting ice is called meltwater. It runs off, and will feed a river or lake.

Meanwhile, higher up the mountain, snow keeps on feeding the glacier. So the glacier keeps on flowing down to the place where it melts.

**Glacial landforms**

The result of all this work by glaciers is glacial landforms. (Landforms are features in the landscape.)

The UK has glacial landforms in the areas that were glaciated during the last ice age. You can see them in England, and Scotland, and Wales, and Northern Ireland. (Look at the white areas in map A on page 62.)

There are many good examples in the Lake District in England. So we will visit it often in the rest of this chapter.

### Words to remember

- **glacial** – to do with glaciers
- **glaciated** – covered and shaped by glaciers, now or in the past
- **glaciation** – the process or results of being covered by glaciers

*We’re studying glaciation this week.*

### Your turn

1. A glacier is like a great big bulldozer. Explain why.
2. a. Write these six terms as a list, in the order that matches the glacier’s journey:
   - glacial till
   - striations
   - melting
   - abrasion
   - meltwater
   - plucking
   b. Then beside each term do a drawing, to show that you really understand what the term means.
3. Look at photo A. What does it show? Describe it as fully as you can. Use the correct terms from this unit.
4. Look at all the debris on top of the glacier, in photo B. How did it get there?
5. Now look at photo C.
   a. What is this stuff called, and what’s in it?
   b. Why was it dumped here?
6. Freeze-thaw weathering breaks up rock.
   a. See if you can write a set of bullet points to explain how it works. Add drawings if you like!
   b. It makes erosion easier, for the glacier. Why?
7. Now it’s time to start your glossary about glaciation.
   - You’ll need at least two pages. To make your glossary:
     a. List all the words you met about glaciation so far
     b. Beside each word, write its definition.