The Water of Leith is the main river running through Edinburgh. Its drainage basin has an area of 150km², with its source in the Pentland Hills to the south. But why does it flow the route that it does? Why are some parts of the valley floor flat and others characterised by steep-sided rocky gorges? The answers lie in the varied geological history of the Edinburgh area and its past environments at times hundreds of millions of years ago.

Today many of these geological processes still occur and they are producing new material that may one day become rock. In April 2000, the Water of Leith flooded dramatically (estimated to be a 1 in 200 year flood). When the river was in full spate it carried more material and also larger items than it normally does. When the flow returned to normal the river deposited this material in the form of flood-gravels. These can be seen in the river bed by the Water of Leith Visitor Centre in Slateford when the river is low enough.

The story that these rocks reveal shows that Scotland has not always been located where it is today. Scotland has slowly drifted northwards from just south of the equator to its present location over a period of 550 million years. The Water of Leith is the main river running through Edinburgh. Its drainage basin has an area of 150km², with its source in the Pentland Hills to the south. But why does it flow the route that it does? Why are some parts of the valley floor flat and others characterised by steep-sided rocky gorges? The answers lie in the varied geological history of the Edinburgh area and its past environments at times hundreds of millions of years ago.

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1 Introduction

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2 Deep Seas
Let's travel back in time 430 million years to a time called the Silurian (named after a Welsh tribe). You are swimming in a deep ocean, and the climate is warm and getting warmer. The ocean you are in is gradually becoming shallower as sediment fills the basin. A few million years later and you are standing in shallow tropical seas, like those in the Bahamas today. The sea is full of life, including sea-lilies, corals, starfish and shellfish.

Now let's return to the present. Those animals and plants that you saw 430 million years ago are now fossils and can be found in sandstones and mudstones in the Water of Leith drainage basin just to the south of Threipmuir Reservoir in the Pentland Hills.

3 Deserts and Volcanoes.
Let's do some more time travelling; this time we'll go back 415 million years to the beginning of a period called the Devonian (named after Devon where rocks of this age were first studied). You are now standing on dry land and there are eroding mountains to the north and south and numerous erupting volcanoes.

The Devonian period produced many rocks that have economic importance. These have been mined and quarried nearly, as at Hailles Quarry Park where sandstones were quarried for building stane and flagstone. Mudstone was extracted to make brick. Over 70 mills, most of which were built from Carboniferous sandstone, harnessed the power of the Water of Leith to produce paper, snuff, flour and fabric.

4 Lakes, Trees and Swamps.
Ready for some more time travelling? Let's go back 300 to 345 million years to the period known as the Carboniferous (meaning coal-bearing).

Everywhere you look, you see many trees all densely packed together. You're also near the coast and the land is relatively flat. As well as forests there are large muddy brown swamps and extensive lakes.

There's a battle on; it's a fight for supremacy between the land and the sea. The sea has flooded the land and is providing shallow tropical water for the growth of coral colonies and other marine plants and animals. But the land is fighting back, and large rivers are building deltas out into the open sea and into inland lakes. All is settled until the sea floods back and the whole cycle starts again.

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5 Ice Ages
This time we will only travel back in time 25,000 years - bring your coat though! You are now standing on what looks to be a never-ending field of ice like the Antarctic. It is extremely cold and the ice you are standing on covers the whole of Scotland and extends out beyond our present coastline.

Back to the present day now. Parts of the old course of the Water of Leith have been blocked up by all of that material left by the glacier. A buried channel now lies just south of Murrayfield. The ice cut off deep rock gorges such as the one upstream from Balerno, and then the meltwater was directed down it and deepened it further, creating the steep valley sides present today.

Think where the sea level is today. Well as the ice melted, the land began to rise because the weight of the ice had been removed. Back then, the sea level was 30 to 40m higher so it formed beaches just like those forming today. These beaches are now raised at levels up to 35m above that of the present sea-level. They are built over in northern parts of Edinburgh around Leith. Around 5500 years ago the sea level was still 8 or so metres higher than today’s, and more beaches were formed. The northern parts of Leith are built on one of these raised beach flats.

As the sea-level continued to fall, the Water of Leith had to cut down deeper and deeper. In Colinton Dell you can see terraces formed of river sand and gravel in the banks of the river. These were formed as the river cut down to adjust for falling sea level. You can see terraces particularly well near the walled garden at Redhall.

Meltwater channel above Balerno, cut 15 thousand years ago.
At the base, the power of the ice is so immense it acts like sandpaper to grind out a rocky landscape and deep rock scours. However, 8,000 years into the future and it is starting to warm up causing the ice to melt. The meltwater is very erosive and powerful and is cutting large channels which transfer water from the Water of Leith drainage basin to that of the River Esk’s and out towards the distant sea. As the ice melts it is leaving behind all of the unsorted material that has been collected, which is known as glacial till.

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