

**LIZ BONNIN:** Hi, I'm Liz Bonnin. It's strange to think it but technically speaking we are in the middle of an ice age right now. Fortunately though, it's a relatively warm part of one. During Earth's 4.5 billion year history, ice ages have come and gone, with the ice sheets sometimes reaching as far as the equator.

And where that's occurred, it's created some of the most spectacular landscapes on the planet. So let's look at how glaciation has created a climbers paradise in Yosemite National Park, in California. Oh and this clip comes with a warning. Watching it might require a head for heights.

**IAIN STEWART:** Around 3 million years ago, the continents of North and South America collided. The result? A warm ocean current that flowed around the equator was cut off. So now the warm water travelled north. Today we know this current as the Gulf Stream. Strange as it may seem, it was this warm current that tipped the planet into an ice age.

As the warm waters evaporated, this supplied more moisture to the cold northern regions of the planet, so more snow fell. And slowly, the northern hemisphere iced over, triggering a global cooling. Over the last 3 million years, the ice has advanced and retreated more than 50 times.

In a cycle governed by small changes in Earth's orbit. If I was standing here 20,000 years ago, there would be over a kilometre of ice above my head. And even though much of that has melted and retreated away, permanent ice still covers 10 percent of the planet's surface. So ice is still well and truly with us. Although a few million years is just the blink of an eye in the planet's life, this recent ice age has had an extraordinary influence on our world and on us. As we'll discover, it changed the climate across the planet, and in doing so, it drove human evolution. And it carved out many of the most dramatic landscapes we know today.

If you head to Yosemite National Park, in California, you get a good idea just how effective ice is at shaping the landscape on a gigantic scale. Glaciers are responsible for carving out many cliffs, but few are as epic as this one: El Capitan.

It's ice that has made El Capitan into the greatest challenge in rock climbing. And for Leo Houlding, one of the world's top climbers, nothing quite matches it.

**LEO HOULDING:** We call El Cap the 'Big Daddy'. This is 1000 metres high and it's damn near vertical the whole way. Your initial reaction is terror. Just the scale of

it is really intimidating even to extremely experienced climbers. There's basically no easy way up it, it's the hardest cliff to climb in the world.

**IAIN STEWART:** 2 million years ago, Yosemite Valley looked very different. A landscape of steep V-shaped valleys carved out by rivers. But then glaciers formed in these mountains. Slowly they flowed down the valleys, grinding sideways into the hard granite rock. Gradually steepening the sides of the valley.

When the ice retreated, it left behind a deep U-shaped valley. The classic signs of glacial activity are everywhere. There are huge boulders plucked from the cliffs and carried for kilometres by the ice. Waterfalls reveal where ancient river valleys were cut off midstream. Sheer cliffs like this are absolutely typical of recent glacial activity. The rock face is almost vertical. The ice took a mountain of granite and over tens of thousands of years, cut one side of it away, which is why this cliff is so steep.

The glacier moved across the granite, grinding it with a force of over a hundred kilograms on every square centimetre. It polished the rock up a treat.

**LEO HOULDING:** Whoa, I'm slipping, I'm slipping. Right at the limit of friction. Urgh! (*Gasps*) Urgh! It's just so smooth and slippery, urgh. You have to keep your weight close in to the wall.

**IAIN STEWART:** But when bad weather closes in... This rock face becomes a climbers nightmare.

**LEO HOULDING:** It's getting really wet and ... this glassy rock is just turning into an ice rink. In fact I might fall off here. Oh, my god. Like, there's quite a good chance I'm gonna fall.

**IAIN STEWART:** It would be reckless to keep on climbing.

**LEO HOULDING:** Urgh! Jesus Christ.

**IAIN STEWART:** Leo must find one of the few refuges that El Capitan has to offer.

**LEO HOULDING:** We might have to ... It's alright, we're nearly there. Even when it's raining it's just such an awesome sensation to be up here. (*To climbing partner*) Okay, Dean, I'm safe! Brilliant. What an awesome climb. Magical place. It's like mother nature created this place for rock climbers.

**LIZ BONNIN:** Well this is all about physical geography and that was both. A bit of geography and a lot of physical.