BHP Unit 4 Overview | OER Project

While the Universe got its start 13.8 billion years ago, our Solar System and Earth are relatively young by comparison. In this video, Rachel will explain how clouds of gases eventually came together under the force of gravity to create new complexity including our pale blue dot of a planet. But the early Earth wasn't exactly a cool place to live, at least not yet. In fact, it was more of a super hot ball of lava!

0:12

Text scrolls over an animation of Earth.

Far out in the uncharted backwaters of the unfashionable end of the western spiral arm of the Galaxy lies a small unregarded yellow sun. Orbiting this at a distance of roughly 92 million miles is an utterly insignificant little blue green planet whose ape-descended life forms are so amazingly primitive that they still think digital watches are a pretty neat idea. Douglas Adams, The Hitchhiker's Guide to the Galaxy

Host Rachel Hansen.

Yikes. If aliens are ever going to visit us we need better tourism marketing. I mean, come on, take a look at this it lights up how neat is that!

1:05

Hi, I'm Rachel Hansen. And this is Unit 4, our solar system and Earth.

Image of Earth.

Our Earth is a very, very small part of the universe, but it probably seems familiar to you. You've been here your whole life, after all. But don't get too comfortable.

Video of molten magma.

What if I told you that the ground you stand on is constantly moving? What if I insisted that our homes, our nations our continents, everything rests uneasily on a surging sea of molten magma. You'd probably say, "Duh, Rachel. Plate tectonics. Everyone knows that." Congratulations you paid attention in your Earth science class. But you also had several thousand years of collective learning on your side.

1:53

The meteorologists Alfred Wegener wasn't so lucky.

Image with caption "Alfred Wegener, 1880-1930".

Illustration of the continents drifting apart.

He claimed that 300 million years ago all the continents were kind of smushed together and they've been drifting apart ever since.

Image of man standing over a crevasse.

He used interdisciplinary evidence to support his theory, which you'll learn about in this unit. But the world wasn't ready to listen. His colleagues mocked his theory. Most geologists continued to believe that the continents were fixed in place and that the ocean floor was smooth.

Image of an American warship with caption "Harry Hammond Hess, 1906-1969".

But 20 years later, a geologist named Harry Hammond Hess happened to be captaining an American warship in World War II. His ship had new sonar technology that could locate enemy submarines.

Animation of a ship with sonar.

But Harry was a geologist at heart and he kept the sonar on continuously, creating a detailed map of the ocean floor. What he found was far from smooth. Valleys, trenches, and volcanoes surged beneath the waters.

Sequence of illustrations of ocean floor and tectonic plates.

By the end of the 1960s we understood that the Earth's crust was divided into dozens of huge plates. Drifting in on the molten mantle of the Earth, causing Earthquakes and eruptions, excavating ocean trenches and raising mountain peaks.

3:07

Montage of images of significant moments in the 1960s.

Plate tectonics wasn't an accepted scientific concept until the 1960s. Think about that. By the 1960s humans had nuclear weapons capable of ending life on this planet, The Beatles were the most popular band in the world. I mean, humans had been in space, we were about to set foot on the moon. And still, we didn't understand a fundamental part of our home. We didn't know how mountains were made.

19th century map of the world.

Stop me if this sounds familiar. Wegener built on the theories and collective learning of past generations. Other scientists had proposed something similar during the 19th century. And it took maps made by early explorers, sailing across oceans before people began to notice that parts of the Americas look like they fit together with Afro-Eurasia like puzzle pieces.

Illustration of Leonardo DaVinci and a document he made.

And earlier thinkers, including Leonardo DaVinci, often wondered why they found the fossils of sea creatures on the tops of high mountains.

4:06

Animation of the continents drifting apart.

Plate tectonics tells us how mountains rise and continents move. It also reveals more about the earliest days of the solar system and the birth of our planet 4.56 billion years ago. The molten core of our Earth and the sea of super hot magma our thin crust of continents and oceans moves around on are reminders of our planet's earliest days, and how ridiculously lucky we are that life developed here at all.

Animation of the universe.

In Unit 3, the universe got a whole lot brighter when stars lit up. It also got a lot more complex as some of those stars died and released new chemical elements.

Graphics of Threshold 2 and Threshold 3.

We also crossed over two thresholds in the last unit. As the first stars formed and then as stars began to die, generating the intense heat and pressure needed to create new elements and more complexity.

Graphic of the periodic table of elements.

We examined how scientists have dealt with the complexity of all these elements by organizing them into this handy table that every science teacher has hanging in their classroom. And we discovered how those elements are the building blocks for everything in our lives, including us.

5:14

Graphic of Threshold 4 alongside an animation of the solar system.

In Unit 4 we'll cross over a new threshold. You'll learn how new chemical elements came together under the force of gravity to create new stars and planets, like our solar system and Earth.

Text definition of and animation of Accretion.

That's all thanks to a process called accretion. Gravity pulls together space gases and clumps of matter into a spinning disk. As this disk spins, its center gets hotter and hotter until gases fuse together and light up a new star. But, since we now have heavier elements in matter in the disk this matter crashes together and the force is so strong that these chunks get bigger and bigger until they form planets that orbit around the star.

5:56

Graphic of Big History timeline with thresholds.

The universe was over 9 billion years old by the time enough space stuff had accumulated in our little slice of the milky way to form Earth. And it took a while for Earth to become a place that could support life.

Animations of comets and volcanoes with caption defining the Hadean Eon.

For the first few million years pummeled the planet as fiery collisions combined with extreme radiation and heat to make the early Earth a lava death trap. Scientists call this lovely time the Hadean Eon, after the Greek God of the underworld Hades. Luckily for us, and everything else on the planet, Hades didn't stick around too long. But it did leave behind a lot of molten lava lying beneath the relatively thin layer of rock your school sits on right now. That's the stuff that spews from the top of volcanoes and moves the Earth's crust around. We spend our entire lives, all of human history, surfing on lava.

6:50	Now there's a nice tourism slogan. We'll end this unit by discussing how scholars like Wegener and others from different disciplines piece together the origins of our planet and solar system. The plate tectonics developed by Wegener and Hess is yet another example of the collective learning that helps us understand the history of our planet and how it impacts our lives.
Animation of the solar system with captions read by host.	How about "Earth: It's been surfs up for hundreds of millions of years." Or, "Earth: so hot right now."
Animation of solar system continues, with two UFOs flying in.	Y'all, I think this is a real career opportunity for me. Extraterrestrial Tourist Liaison I've got work to do. Posters to make. Bob, how many more of these videos do we have to make? Six?!