

A woman with brown hair and glasses, wearing a blue sweater, is smiling. She is positioned in front of a dark background with several light blue rectangular outlines.

Unit 2: The Big Bang

A horizontal bar with segments of red, orange, yellow, green, and blue.

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BHP Unit 2 Overview | OER Project

This unit is all about the origins of our Universe—the Big Bang. But how do we know about these origins and what types of experts contributed to our understanding of this scientific theory? This video introduces the Big History concept of collective learning. It's through the contributions of generations of scholars that we now understand the origins of the Universe. But we also have more questions that need to be answered. The only way to find these answers is for scholars in a variety of disciplines to continue contributing to collective learning.

0:05

*Host Rachel Hansen
holding a kitchen timer.*

Animation of a worm hole.

Hello! This is a time machine. And for today's lesson I'm going to take us back.
Back 13 billion years.

Unfortunately, the maximum it can go is four seconds, so I'll just be really
descriptive.

0:35

*Text "Unit 2: The Big
Bang".*

*Image of the universe taken
by the Hubble Telescope.*

Hi, I'm Rachel Hansen. And this is Unit 2 The Big Bang.

Check this out. This picture may be the closest thing we have to a time machine
because it's showing us something from 13 billion years ago. How? Well, not by
using an ordinary camera. This image was taken by the Hubble Space Telescope
in 2003. There are 10,000 galaxies in this picture. Some of those tiny red ones are
so far away that the light from them that's reaching us today is from, yes, 13 billion
years ago. This picture lets us peer back into the earliest days of our universe.
And this is only a sliver of our night sky.

*Montage of images of
night sky, universe, and
the Moon.*

If you were standing on earth and looking up this image occupies a space just one
tenth the size of the full moon.

1:32

*Image with caption
"Hubble Space Telescope".*

To make this one tiny picture of our unimaginably huge universe it took hundreds
of scientists and engineers, 400 orbits around earth, four months, and one
awesome telescope. But it also took thousands of years and generations of
thinkers taking chances, making mistakes, and progressing our understanding of
the size nature and origins of the universe.

*Image with caption
"Edwin Hubble (1889-
1953)".*

Edwin Hubble, that's the guy who the telescope is named for, first proved in 1924
that other galaxies existed.

Image of galaxy.

He showed us that the universe was so much bigger than we thought. But he didn't
stop there.

*Image of Edwin Hubble,
text definition of Hubble's
Law.*

In 1929, he formulated Hubble's Law. Not the kind of law where you get in trouble
for breaking it, but one of those "This is just how it is" laws. Hubble's law helped
provide evidence that the universe is expanding.

*Image with caption
"Georges Lemaitre (1894-
1966)".*

His work supports a theory proposed by Georges Lemaitre just two years earlier.
The Big Bang Theory.

2:33

*Image of a statue of [insert
Roman].*

That probably sounds like way too much science for a history class. But that's like
saying that a history of Rome has too many Romans. Science is a part of history.
And history can help us explain how we know what we know. It shows us how
science changed over time. And it can reveal how changes in our knowledge
transformed our societies.

Image sequences of early 20th century astronomers.

Illustration of Ptolemy's geocentric model of the solar system with caption "Claudius Ptolemy (c. 100-170CE)".

3:36

Image of Copernicus' heliocentric model of the solar system with caption "Nicolas Copernicus (1473-1543)".

Various illustrations and images of astronomers.

Image with caption "Stephen Hawking, theoretical physicist (1942-2018)".

Image of galaxy taken by Hubble Space Telescope.

4:19

Text definition of Big History.

Text definition of Scale switching alongside images of sand and Earth.

Text definition of Origin story alongside images of articles from Unit 1 flashing on screen.

Claim testing graphic.

Take Edwin Hubble. It's thanks to his discoveries that we understand the size and origins of our universe. But he built on the ideas and discoveries of other astronomers in the early 20th century. like Henrietta Levitt, Albert Einstein, Harlow Shapley, and Georges Lemaitre.

And these scholars built on the work of scholars from centuries earlier Ancient Greeks like Claudius Ptolemy asserted that the universe revolved around the earth. Generations of Arab, Persian, Chinese, and other astronomers improved on Ptolemy's calculations.

Then, in the 16th century, Nicholas Copernicus asserted that, actually, the sun sat at the center of the cosmos. Everyone was like, "Wait, what?"

From there, step by step, discovery by discovery we moved closer to the understandings that allowed Hubble to make his breakthrough.

And his breakthroughs allowed later astronomers to improve on his work, and develop new ideas and discoveries, refining our understanding of space-time, the earliest days of our universe, and how to capture a picture like this.

Even today, our understanding of the beginning of time in our universe continues to evolve with each new discovery.

In Unit 1, we defined Big History. It's the modern scientific origin story backed by historical and scientific evidence that tells the history of the universe and our place in it. You learned that this class is about the history of human thought. If this were a science class, we'd teach what scientists discovered and how they did it. But this course, this history course, is about learning how our knowledge of the universe and everything in it has changed over time. That means that, sometimes, we'll need some knowledge of scientific concepts. So, while this unit may seem like it's all about the Big Bang, it's really about the way humans have answered the question: Where did we come from?

In the first unit, we also examined the concept of scale and how our perspective changes whether we're zooming in on a tiny grain of sand or out to an entire planet.

Then we explored how different human societies explain the origins of our world.

We also learned about claim testing and how you can evaluate the narratives you encounter.

*Course timeline with
Thresholds.*

5:52

*Text “What is the Big
Bang?”, “How do we
know that the Big Bang is
our origin story?”.*

*Text definition and
animation of the Big Bang.*

6:36

*Illustrations and images of
Famous astronomers.*

*Text definition of Collective
learning.*

7:23

*Text definition of
Discipline.*

*Course timeline with
Thresholds.*

8:05

Claim Testing graphic.

And finally, we met eight new friends, the thresholds of increasing complexity. Each threshold marks a moment in time when just the right ingredients came together under just the right goldilocks conditions to create something more complex in our universe. The Big Bang is the first threshold of increasing complexity.

What is the Big Bang? And how do we know that it’s the origin story of our universe? Those are the two big questions you’ll tackle in this unit.

The Big Bang is a scientific theory. It claims that the universe started out incredibly, unimaginably small, hot, and dense. Then, for some reason we still don’t know, it rapidly expanded. This was the beginning of time and space and everything else in our universe. All the ingredients for stars, planets, mountains, polar bears, daffodils, and your lunch were born in this instant.

But, how did scientists come up with the theory? It took centuries of careful observations, the development of new technologies, and new ways of thinking to get a 21st century model of our universe.

In this unit, they’ll travel back in time to meet scholars like Ptolemy, Nasir al-Din al-Tusi, Copernicus, Galileo, and Hubble. You’ll ask how each explained the origins of the universe and how each built on older knowledge to update our modern scientific origin story.

The way that humans build and improve on knowledge over time is called collective learning, and you’re going to hear a lot more about it throughout this course.

And guess what, we still don’t know everything. Each generation of scholars continues to build on the past.

In this unit, you’ll also see how different disciplines study the origins of the universe in different ways. Scholars from a wide variety of disciplines such as physics, astronomy, cosmology, chemistry, geology, biology, and history have all helped us understand the universe and our place in it.

That’s a lot of information in one short video. So let’s do a quick recap. Big History is organized around eight thresholds of increasing complexity. And the first is, say it with me, the Big Bang.

Now, we don’t know a lot about what happened before the big bang, but we do have a lot of evidence about what happened in the moments just after as the universe was born, expanded, and cooled over time.

We also have centuries of scholarly works on the history of the universe. These scholars are legitimate authorities, who used evidence to develop ideas that were then shared, tested, and improved upon by other scholars over time.

I don’t want to brag, but I just name dropped not one, but two claim testers, evidence and authority, to help explain the Big Bang. As you go through the lessons in this unit, think about the evidence that supports the Big Bang Theory. Also think about the authorities who support, extend, or challenge this evidence.

Then, as you move through the unit put the evidence and authority together with your intuition and logic to evaluate the Big Bang Theory. When you use all four of the claim testers to evaluate a particular topic you're well on your way to becoming a big historian.

9:13

I wonder if this thing can go four seconds into the future.

Host with kitchen timer.

Animation of a worm hole.

It worked! What did I miss?



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