

UNIT 1

TEACHING THIS
INVESTIGATION

Framing problem/ question	Why do we look at things from far away and close up?	
Why do historians, scientists, and others care about this question?	<p>All historical events are placed within such frames of time and space. Like a picture frame, these frames define the boundaries of when and where something occurred. Historians often refer to the time or geographic frames as <i>historical scale</i>. Of course, there are many scales that historians could use to “frame” a study of the past. Most history courses use only a few scales of time and space, and typically do not look beyond the limits of our planet.</p> <p>Big history tries to use all scales of time and space. Our geographic frame ranges from the entire Universe to your own house and to tiny places within the cells of your body. Our time frame moves across 13.8 billion years and into the future. Shifting along these multiple, big scales of time and space is one of the things that make big history different. Deciding on which scale to focus and when and how to change scales is one central feature to doing big history.</p>	
Why should teachers and students of big history care about this question?	<p>This investigation introduces students to the idea of scale and to the ways that we have structured investigations. We selected the texts and the activities to help students think about the value and the challenges of shifting from faraway views to close-up views of our lives.</p> <p>The investigation includes a chart to help students as they work with texts and ends with students creating a list of why it is useful to consider both faraway and close-up views of time and space.</p> <p>If you like, have students write an essay around that question, using the documents and their own ideas to make their case. Use the rubric for investigations to evaluate your students’ work.</p>	
What texts are in the Investigation Library?	Primary Sources	<ul style="list-style-type: none"> • Christian on historical scales • Braudel on historical scales • <i>Powers of Ten</i> (Optional)
	Secondary Sources	<ul style="list-style-type: none"> • Different geographic scales • Different scales of time • Randell, Which scale should we choose? • Worksheet on scale (Optional)
What is the students’ project or prewriting task?	Create a list: We ask students to create a list of reasons, with support, for why it is useful to consider both a faraway and a close-up view of things.	
What is the students’ writing task?	Write an explanation: As a writing assignment, have students take their list and turn it into a two- to three-paragraph essay explaining the benefits of both a faraway and a close-up view. Remind students to use relevant disciplinary or big history concepts, to reference documents, and to acknowledge opposing viewpoints in their essays.	

Analysis of texts in this investigation

Text Name	Lexile Measure ¹	Common Core Stretch Grade Band ²	Mean Sentence Length	Flesch Ease ³
Introduction	1080	6–8	20.0	63.4
Steps in the Investigation	780	4–5	12.5	67.3
TEXT 01 Christian on historical scales	1130	6–8	19.57	62.6
TEXT 02 Braudel on historical scales	990	6–8	14.54	55
TEXT 03 Different geographic scales	960	6–8	14.33	46.3
TEXT 04 Different time scales	780	4–5	12.5	72
TEXT 05 Randell: Which scale should we use?	1150	6–8	19.07	67.7
TEXT 06 Optional: Scales worksheet	560	2–3	7.75	74.2
TEXT 07 Optional: <i>Powers of Ten</i>	750	4–5	12.22	71

¹ Lexile measure indicates the reading demand of the text in terms of its semantic difficulty and syntactic complexity. The Lexile scale generally ranges from 200L to 1700L. The Common Core emphasizes the role of text complexity in evaluating student readiness for college and careers.

² We are using the Common Core “stretch” grade bands. The Common Core Standards advocate a “staircase” of increasing text complexity so that students “stretch” to read a certain proportion of texts from the next higher text complexity band.

³ In the Flesch Reading Ease test, higher scores indicate that the material is relatively easy to read while lower scores indicate greater difficulty. Scores in the 50–70 range should be easily understood by 13- to 15-year-olds, while those in the 0–30 range are appropriate for university graduates.

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INVESTIGATION

Why do we look at things from far away and close up?

Have you ever looked at something from a great distance, such as from a mountain top or an airplane, and then looked at the same thing from close up? If so, then you already have some experience with big history, because that is what we do. We look at things from both far away and from close up, and from everywhere in between.

Big history, says David Christian, uses all scales of time and space. In big history, we will look at our lives from far away in both time and space. In the next unit, for example, we will jump back over 13.7 billion years to think about the beginning of the Universe.

Sometimes, however, we will use small intervals of time, such as a second or a year, to look at changes that happened in a much smaller space, such as our planet, or a country, or even a single-celled organism.

Is there an advantage to looking at things from far away and from close up? That is what we want you to think about in this first investigation.

The Investigation Library has some pictures, texts, and activities for you to use to develop an answer to the question, “Why do we look at things from far away and close up?”

THE STEPS IN THIS INVESTIGATION

Why do we look at things from far away and close up?

EXPLORE	When beginning an investigation it is good to start with your <i>conjectures</i> . A conjecture is a speculation or a guess we make without having lots of evidence. So why do you think it is useful for you to take a <i>faraway</i> look and a <i>close-up</i> look at something? Can you think of a time when this helped you? Or when it did not help?
RESEARCH	Read the materials in the Investigation Library. What do the pictures, texts, and activities teach you about the value of a <i>faraway</i> and a <i>close-up</i> view? Use the table on the next page to help capture your information and organize your thinking. We've also provided a worksheet in Text 06 to help you use different scales to examine your own life. After reading all the documents, your initial conjectures, your notes, and any other information you have, try to figure out an answer to the investigation question.
SHOW YOUR THINKING	It is now time to show your thinking. Use what you learned to list all the reasons why you think both <i>faraway</i> and <i>close-up</i> views are valuable. Include in your list texts that helped you reach each conclusion. If your teacher assigns it, write a two- to three-paragraph essay explaining the benefits of both views. Investigations do not end with your answer. Read or discuss your classmates' lists to compare their thinking with yours. Do their ideas support, extend, or challenge your thinking?

Why do we look at things from far away and close up?

	Main point of the text	This texts supports using a:
TEXT 01 Christian on historical scales		<input type="radio"/> Faraway view <input type="radio"/> Close-up view <input type="radio"/> Both views
TEXT 02 Braudel on historical scales		<input type="radio"/> Faraway view <input type="radio"/> Close-up view <input type="radio"/> Both views
TEXT 03 Different geographic levels		<input type="radio"/> Faraway view <input type="radio"/> Close-up view <input type="radio"/> Both views
TEXT 04 Different time scales		<input type="radio"/> Faraway view <input type="radio"/> Close-up view <input type="radio"/> Both views
TEXT 05 Randall: Which scale should we use?		<input type="radio"/> Faraway view <input type="radio"/> Close-up view <input type="radio"/> Both views
TEXT 06 Scales worksheet (Optional)		<input type="radio"/> Faraway view <input type="radio"/> Close-up view <input type="radio"/> Both views
TEXT 07 <i>Powers of Ten</i> (Optional)		<input type="radio"/> Faraway view <input type="radio"/> Close-up view <input type="radio"/> Both views
ADDITIONAL EXAMPLES		<input type="radio"/> Faraway view <input type="radio"/> Close-up view <input type="radio"/> Both views

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INVESTIGATION LIBRARY

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TEXT 01

DAVID CHRISTIAN ON HISTORICAL SCALES

David Christian is a professor at Macquarie University in Sydney, Australia. Originally a scholar of Russian history, Christian developed the idea of “big history” in the 1980s and wrote about it in the award-winning book *Maps of Time*. He worked with Bill Gates in launching the Big History Project to offer big history to high school students. He encourages historians and history students to use all scales of time and space to study the past. In this essay, Christian explains why he thinks this approach is so valuable.

It may be easiest to consider the issue by thinking of history writing as the construction of diagrams or “maps” of the past. Maps, like diagrams, are different from the objects they describe. A map that was on the same scale as the real world wouldn’t be much use because, to find out what was a mile away from you on the map, you’d have to walk as far as you would in the real world. Maps are helpful precisely because they are normally on smaller scales than the real world. Maps, like diagrams, compress information. But to do this they have to select, excluding most of the real world, and including only what is important for their particular purposes.

This process of choosing what is and what is not important forces mapmakers (and historians) to think carefully about the questions they are asking, and the sort of knowledge they want to convey. It also gives mapmakers (and historians) great power, because it means they can shape the questions that other people ask, as well as the images of the world that other people carry around in their heads. And those images matter. Anyone who has been seriously lost knows that having a good map can be a matter of life or death.

Unlike mapmakers, though, historians have to worry about scales in time as well as space. They may choose to write about the past of a particular village or an entire continent or even...of the entire world. They may choose to write about a single decade, or a few hundred years, or even...of the entire period during which humans have been on earth. The choices they make determine the sort of history they write, so historians ought to think as hard as mapmakers when choosing the scale of their “maps of the past”...to see what the past looked like when viewed on multiple scales up to those of the Universe....

Source

Slightly modified from David Christian, “Scales,” in *Palgrave Advances in World Histories*, ed. Marnie Hughes-Warrington (New York: Palgrave Macmillan, 2005) 64-89.

TEXT 02

FERNAND BRAUDEL ON HISTORICAL SCALES

French historian Fernand Braudel (1902–1985) studied history at the Sorbonne in Paris and later taught in Algeria. He was teaching history in France when World War II began. Braudel joined the French military to fight the Germans but was captured in 1940 and spent almost five years in prison camps. Working mostly from memory, Braudel wrote his first major work, *The Mediterranean and the Mediterranean World in the Age of Philip II*, while imprisoned. He snuck his 600-page book out of the prison by sending composition book after composition book to another historian living on the outside. Braudel used this book to introduce his influential view that history has many different levels, or scales of time and space. He maintained that people should look at history and their own lives from different scales. For example, he divided his first book into three parts: geographical time, social time, and individual time. In the text below, he writes about each level.

This book is divided into three parts. The first part is devoted to a history whose passage of time is almost imperceptible, or almost impossible to see. It is man's relationship to the environment. This is a history in which all change is slow, a history of constant repetition and ever recurring cycles.

On a different level from the first there can be distinguished another history. This history has slow but perceptible rhythms. One could call it *social history*, the history of groups and groupings. This history includes economic systems, states, societies and civilizations.

The third part of this book gives a hearing to traditional history — history, one might say, on the scale not of man, but of individual men. It is the history of events: surface disturbances, crests of foam that the tides carry on their strong backs.

The final effect of this book then is to divide historical time into geographical time, social time, and individual time. I hope too that I shall not be reproached or attacked for my excessive ambitions, for my desire and need to see on a grand scale.

Source

Modified from Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, vol. 1, trans. Siân Reynolds (New York: Harper and Row, 1946) 20–21.

TEXT 03

DIFFERENT GEOGRAPHIC LEVELS

Human geography is the study of how people and cultures interact with their environments. The following chart is from *The Dictionary of Human Geography*, a book that geographers regularly update. Many students, professional geographers, and other scholars use it to understand how our environment influences us and how we influence our environment.

The chart below shows the different levels that geographers might use to describe where people live. Can you use it to describe the different places and spaces in which you live?



Source

Derek Gregory et al., *The Dictionary of Human Geography* (New York: Blackwell, 2009).

TEXT 04

DIFFERENT TIME SCALES

History also has different time scales and we use different size timelines. For example, you might use a timeline that has 13.7 billion years of time on it. Or you might use a timeline with on 100 years on it. Or you could use a timeline that has only 20 years on it.

Below we use a 24-hour day as a timeline. In the first we ask you to fill in your typical day. In the second we place major events from the Big Bang through to the development of human cities.

A typical 24-hour weekday, for you	
_____	Midnight
_____	4:00 am
_____	8:00 am
_____	10:00 am
_____	Noon
_____	2:00 pm
_____	4:00 pm
_____	6:00 pm
_____	10:00 pm

In a 24-hour day, if the Universe had begun at midnight	
The Big Bang occurs and the Universe begins at _____	Midnight
The first single-celled organism would appear on Earth at around _____	4:00 am
The first sea-plant would appear at about _____	8:30 am
Plants and animals would get to land at about _____	10:00 am
Dinosaurs would disappear at about _____	11:39 pm
Humans would appear less than two minutes to midnight _____	11:58 pm
Agriculture and cities would appear a few seconds before midnight _____	11:59 pm

TEXT 05

WHICH SCALE SHOULD WE USE?

Lisa Randall studies cosmology and physics at Harvard University. She is one of the most influential scientists living today. *Time* magazine named her one of the “100 Most Influential People” and *Rolling Stone* called her an important “Agent of Change.” Not only does Dr. Randall work on solving the problems of the Universe, she also likes to write music, goes rock climbing, and is a very good skier.

In this text, Randall is asking us to think about when we need to use a faraway view or a close-up view.

For almost anything you see, hear, taste, smell, or touch, you have a choice between examining details by looking very closely or examining the “big picture” with its other priorities....

Of course, the degree of precision you want or need determines the scale you choose...

Although the precise choice of scale might differ among individuals, no one would display a map of the United States in order to find a restaurant. The necessary details won't be resolvable on a computer screen displaying such an overly large scale. On the other hand, you don't need the details of a floor plan just to know that the restaurant is there in the first place.

In her book, Randall showed three pictures of the Eiffel Tower at different scales and labeled one “too small,” another “too big,” and the third “just right.” What would make one picture “too small”? What would make another “too big”? Could you think how the “too big” picture could be just right? And, when might the “too small” picture be just right?

SCALE TOO SMALL



SCALE TOO BIG



SCALE JUST RIGHT



Sources

Excerpts taken from Lisa Randall, *Knocking on Heaven's Door: How Physics and Scientific Thinking Illuminate the Universe and the Modern World* (New York: Harper Collins, 2012) 13–14.

Photographs of the Eiffel Tower courtesy of Lesley Feldman.

TEXT 06 SCALES WORKSHEET (OPTIONAL)

Use this chart to “map” your life on three or more different faraway and close-up scales. Record what you’re able to observe when you view yourself from each scale you choose.

Level or scale	At this scale, we can focus on:	Time scale	What can we see from this scale? What questions can we ask? What can I say about myself at this scale?
Individual people	Particular individuals or events	A few days to a lifetime	
Social scale/ groups of people	Groups of people within a nation, civilization, or region	Decades	
National scale	Nation states/ countries	Decades and centuries	
Civilization scale	Agrarian & industrial civilizations	The last 5,000 to 10,000 years	
Human history scale	Human beings as a species	The past 100,000 to 4 million years	
Planetary scale	Formation of the Earth and the biosphere	The past 4.6 billion years	
Universe scale	Galaxies, clusters, and the Universe	The past 13.7 billion years	
Big history	All of these scales	The past 13.7 billion years	

TEXT 07

OPTIONAL: *POWERS OF TEN*

Powers of Ten is a short film written and directed by Ray Eames and her husband, Charles Eames, that was first produced in 1968 (there have been different versions of it since). The film shows the relative scale of things in the Universe in factors of 10. It begins with overhead view one meter high and one meter across of a man sleeping outdoors on a blanket, surrounded by food and books. The camera zooms out for 10 seconds to a view from 10 meters above which is 10 meters across (10^1 m), revealing more of the area surrounding the man. Every 10 seconds the view is 10 times higher and 10 times wider. At 100 meters high and across (10^2 m), we see more of the city surrounding the man, but cannot see him. And so it goes until the camera has zoomed out to 10^{24} meters, or the size of the entire observable Universe. Remember, the camera remains aimed at that man in the park. It then zooms in past our original view from one meter high to penetrate the skin in the man's hand all the way to the nucleus of a carbon atom within him.

Your teacher may show you the movie or may give you some of the images from the movie. As you watch the movie or look at the images, remember your question: Why is it useful to take a long-range view and a short-range view of something? For each change in scale ask: What comes into view? What goes out of view? What can you see? What can't you see? What are the advantages and disadvantages of each view?

Powers of Ten

<http://www.powersof10.com/film>



One meter square, or 10^0



Ten meter square, or 10^1



At 10^5



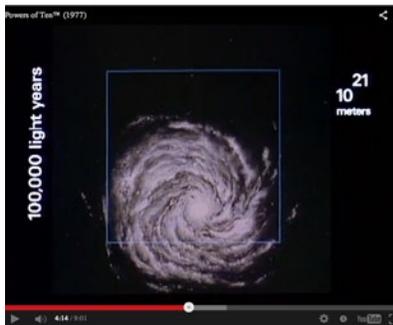
At 10^7



At 10^8



At 10^{12}



At 10^{21} : In the Milky Way



At 10^{-1} : His hand



At 10^{-4} : A white blood cell