

# CAUSATION – STAR FORMATION PART 1

## Purpose

Historical events rarely have a single, proximate cause. Some causes happen right before the event; some long before; others, a really long time before. Some play a central role; some merely contribute to the event; others trigger the event. Some causes are essential while others are less significant. And, the significance of each cause may change depending on the timeframe within which you choose to examine a historical event. Or, the significance may change depending on the questions you ask about that event. Understanding cause and effect and how to use them as analytical tools is central to understanding change over time. It also helps us establish connections between events over time, which gives us the opportunity to connect historical events to our own lives. In this activity on causation, we'll ask students to identify the causes, effects, and triggering events for star formation. This will help clarify the process of star formation, but also establish a pattern related to causal thinking that will be essential later on.

## Practices

### *Scale*

Using causation as an analytical tool for studying history helps us add dimension to one of the core pillars of BHP—scale. Causation is another way of examining historical events from different perspectives, and the scale or periodization at which we examine those events informs how we analyze them.

## Process

In this activity, students will learn about and identify causes, effects (both short- and long-term), and triggering events. Students will use this knowledge to fill out a causal map about the formation of stars.

### *The triggering event*

Review the process of how stars are formed with your students. If needed, have your class rewatch *How Stars Are Formed*, the video from earlier in this lesson. Once you have reviewed the causes, hand out Causation—Star Formation Part 1 Worksheet. Show them the bubbles on the worksheet and tell them that this is what is considered a causal map, and they will learn how to make these as part of their work of analyzing historical causes. Historians think of them as helpful tools, and your students will use causal maps to outline the relationships among causes. Note that this first map is intentionally very, very, simple, with a single cause and a clear progression. This won't be the case later.

Point out to students that there is one cause missing in the causal map—the *triggering event*. Explain that a triggering event is the most immediate cause of an event. It's sometimes very specific, as in the case of stars, but they'll learn that sometimes it can be much harder to pin down.

If you want to hammer home the concept of triggering events, try using this example: If you have a line of dominoes standing on end and knock down the first one, the rest of them fall. It's pretty clear that the triggering event was you knocking down that first domino. However, if you look at the situation more broadly, you might change your mind about the triggering event. Let's say you're at the house of a friend who loves constructing long series of dominoes, taking days and days to set up complicated designs, just for the pleasure of knocking them down. That friend, who never lets anyone else knock down the first domino, steps out of the room. You try really hard, but you can't resist the temptation to knock down that first domino, which causes them all to fall. So, would you still say the triggering event is you knocking down the first domino? Or, is it that your friend left the room? Or, was it your long-standing desire to be the one to knock them down? It gets complicated.

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Invite the students to identify the triggering event here, reviewing *How Stars Are Formed* one more time, if needed. So, one more time: What's the triggering event in star formation? The triggering event is when the temperature of a cloud of atoms reaches 10 million degrees Celsius, which leads to fusion beginning and the stars lighting up.

As you talk about star formation with your class, what other triggering events do they suggest? Use this as an opportunity to distinguish between triggering events and other shorter-term causes.

## ***Identifying causes and effects using a causal map***

Tell students that now that they've homed in on the triggering event, they'll take some time to expand their thinking by identifying other causes and effects related to star formation. Have them identify these on the causation tool and/or the worksheet. If they need a little help, tip them off to the fact that some causes are effects and some effects are causes. This might be confusing at first, but it's really important that they get it. When we get to humans, a little later in the course, students will really need to understand and be able to identify causes and effects, so you might as well take the time to hammer away on the concepts now!

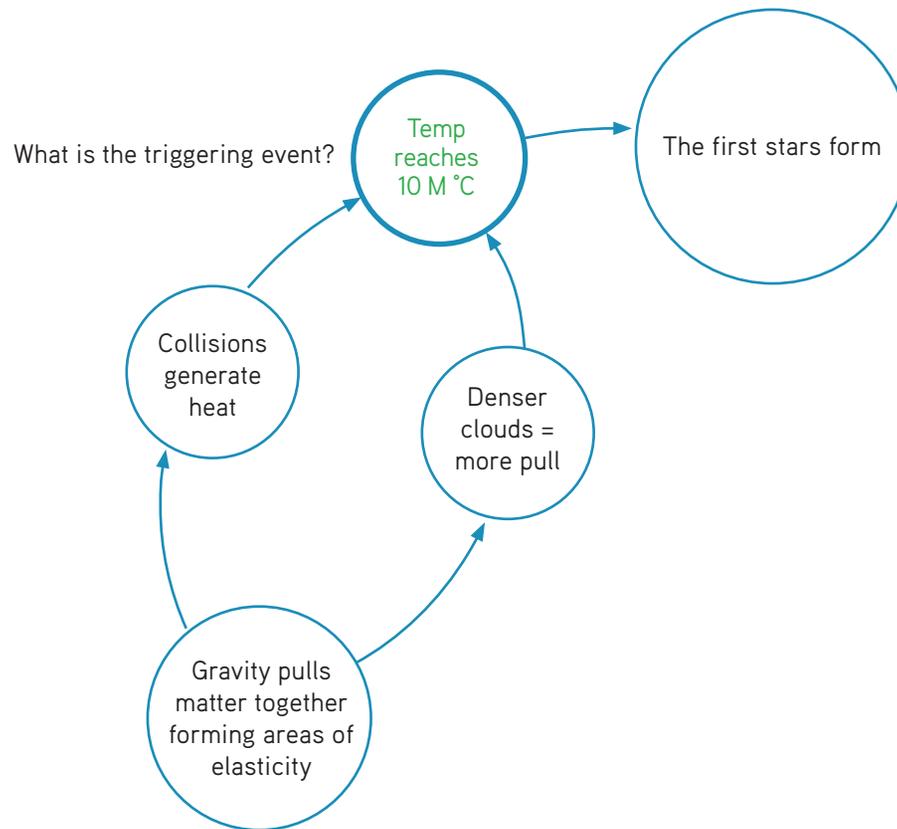
Review the worksheet results with students.

## ***Considering longer-term causes***

Our map starts with gravity pulling atoms together in dense clouds. But, the chain of causes didn't start here. Invite students to take a moment and think about Threshold 1. What were the causes that brought us to this point? Students will think more about this in the activity, Causation – Star Formation Part 2.

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**Directions:** After reviewing the process of how stars formed, write the triggering event in the circle next to the question. Next, look at each circle and determine if the contents of the circle are a cause, an effect, neither, or both!



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## Practices

### *Scale*

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## Process

In this activity, you'll learn about and identify causes, effects (both short-term and long-term), and triggering events. As part of this, you'll start to fill out a causal map about the formation of stars.

### *The triggering event*

Remember the process of star formation? If you don't, no biggie—you can just rewatch *How Stars Are Formed*, the video you watched a little earlier in this lesson.

Now that you're up to speed, take a look at your Causation—Star Formation Part 1 Worksheet. This worksheet includes a causal map on which one cause is missing—the *triggering event*. As you may have guessed, a triggering event is the most immediate cause of an event. It's sometimes very specific, as in the case of star formation, but later in the course you'll see that it can be much harder to pin down.

Want an example of a triggering event? Of course you do. If you have a line of dominoes standing on end and knock down the first one, the rest of them fall. It's pretty clear that the triggering event was you knocking down that first domino. However, if you look at the situation more broadly, you might change your mind about the triggering event. Let's say you're at the house of a friend who loves constructing long series of dominoes, taking days and days to set up complicated designs, just for the pleasure of knocking them down. That friend, who never lets anyone else knock down the first domino, steps out of the room. You try really hard, but you can't resist the temptation to knock down that first domino, which causes them all to fall. So, would you still say the triggering event is you knocking down the first domino? Or, is it that your friend left the room? Or, was it your long-standing desire to be the one to knock them down? It gets complicated.

Look at your worksheet: What do you think the triggering event is in this situation? Once you think you have it figured out, add it to the blank bubble on your worksheet.

