

# SECRET LIVES OF STARS

TEACHER GUIDE

LAUNCH



# PLANNING

Here's a suggested schedule for this kit! The activities are designed to be completed in order, but you can decide when to do them over time. Required times are estimated.

ACTIVITY INFORMATION	SECTION (S)	TIME REQUIRED	DAY/ LESSON
<b>ACTIVITY 1: HOW'S THE (SPACE) WEATHER?</b> Learn how weather from space affects people on Earth. <b>Time required: 1h</b>	<input type="checkbox"/> Magnetic Storms and Sunspots	60 minutes	Day 1
<b>ACTIVITY 2: INSIDE STORY OF A STAR</b> Find out what the Sun is and how it releases radiation to Earth. <b>Time required: 3 h</b>	<input type="checkbox"/> Sun and Earth	90 minutes	Day 2
	<input type="checkbox"/> Problematic...		Day 3

**ACTIVITY 3: STAR LIFE CYCLE**  
 Compare the properties...

SAMPLE

Full schedule available with purchase

# 1

activity

## HOW'S THE (SPACE) WEATHER?

Your student will learn how weather from space affects people, objects, and events on Earth.

### MAGNETIC STORMS AND SUNSPOTS

#### CONTENT

- Several instances of space weather affecting activities on Earth are described.
- The vocabulary terms sunspots and space weather are introduced.
- One type of evidence for space weather events on Earth in the past (before recorded history) is ice cores with signature rock layers that result from the increased magnetic activity during the events.



#### THINK ABOUT IT!

**Question 1: How much do you think space weather could affect your life?**

**Explain.**

**Answer:**

- Answers will vary.
- Students will likely mention communications or electronic devices.

**How to Help:** Encourage your student to consider what would happen if a magnetic field was near their personal devices.

**Question 2: What other objects in space might send space weather radiation to Earth?**

**Answer:** Answers will vary but might include things like planets, other stars, and galaxies.

**How to Help:** Stars other than the Sun do have their own space weather but are too far away for it to affect Earth.

**Question 3: What properties of the Sun do you think make it so that solar weather can happen?**

**Answer:** Your student may not know all these properties, but they may know that the Sun is a star, the Sun does nuclear reactions, the Sun is very hot, and the Sun is fairly close to Earth.

**How to Help:** These properties are detailed in Activity 2.

# 2

activity

## INSIDE STORY OF A STAR

Why does the Sun have weather – what is happening within the Sun that causes it to send electromagnetic radiation toward Earth?

#### LEARNING GOALS:



I can use evidence to develop a model that describes the life span of the Sun and shows how nuclear fusion in the Sun's core leads to the release of energy that reaches Earth as radiation.

**? Question 2: If a star is 10 light-years away, how long would it take us to know about changes to the star that affect the energy released? Explain.**

**Answer:** The light would take 10 years to reach Earth because it would travel one light-year in one year.

**How to Help:** Review the definition of light-year as needed.

**? Question 3: Why do you think the Solar System planets appear brighter in the night sky than the brightest stars do?**

**Answer:** The planets in the Solar System are much closer than all the stars (except the Sun), so their apparent magnitude is brighter than the stars even though their absolute magnitude is much lower.

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### Star Scatter

• In this “dry lab,” your student will analyze data related to several stars by making scatter plots.

## MULTIPLE AGES AND ABILITIES:

**If your student prefers to create graphs digitally, they can do this exercise in spreadsheet software instead. They would just need to copy the data into four columns of the sheet and use it to make a scatter plot with lines. This is also a great option for advanced students because they will get a chance to work on their statistics skills, such as making a trendline and adjusting the axes labels.**

- They should notice some correlations between certain sets of data.
  - Plot 1: Distance from Earth on the x-axis and absolute magnitude on the y-axis should show a correlation (this is not causation – please see the answers explanation)
  - Plot 2: Temperature on the x-axis and absolute magnitude on the y-axis should show a correlation
  - Plot 3: Mass on the x-axis and absolute magnitude on the y-axis should show a correlation
- The answers are shown below.
  - The trendlines and  $R^2$  values are included for your reference only, and the student is not required to use them.
  - The distance vs. absolute magnitude plot shows a correlation because of our observation bias. The plot includes mainly stars that are bright from Earth, and the brightest stars are generally the ones that have the greatest absolute magnitude and the shortest distance to Earth.
  - This is correlation but not causation; the absolute magnitude of a star is not affected by its distance to Earth.



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