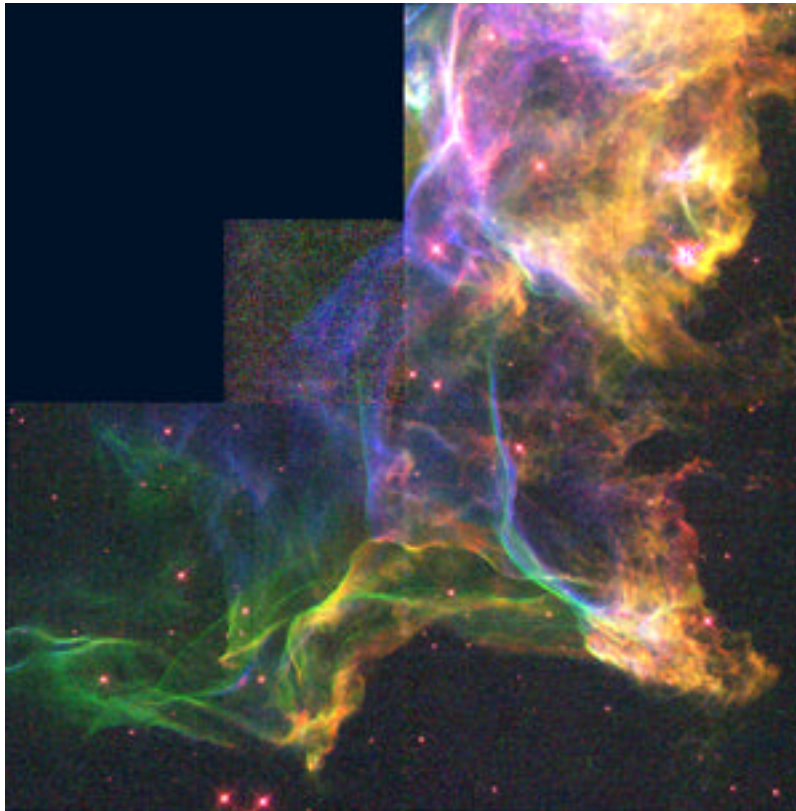


## Space Odyssey Online Teacher's Guide

# Stellar Evolution Game

Previsit Activity for Deep Space



courtesy Jeff Hester (Arizona State University) and NASA

**Grades 4- 8**  
**CDE Standards**  
Science: 4.4

## **Preparation and Materials**

**Estimated Preparation Time:** 15 minutes

**Estimated Activity Time:** 45 minutes

## **Materials**

Question cards copied on colored paper or card stock

Envelopes

Computers with Internet access

HR diagrams

## **Learning Goals/Objectives**

Students will

- Use an HR diagram to answer questions about star types
- Identify evolutionary pathways of stars based on star masses

## **Connection to *Space Odyssey***

During your visit to *Space Odyssey* have students explore the Life of a Star interactive. Students will be able to apply their knowledge from this activity to the concepts learned in the interactive.

## **Advanced Preparation**

1. Teach students to read an HR diagram. Students will need to use this information to answer the questions during the game.
2. Students will also need to be knowledgeable about basic stellar evolution pathways for stars based on their masses.
3. Copy a set of the game cards on matching colored paper for each group. Use a different color for each group. Place game cards in a sealed envelope to give to students at the beginning of the game.

## **Classroom Activity**

1. Divide students into teams. They will work together to answer a series of questions about star types and stellar evolution. Give each team an envelope filled with colored game cards.
2. Determine a time period for your game. Start the timer and have your students read the cards and try to answer the questions before they can consult any resources. Give them about five minutes on their own before you give them any of the resources.

3. Give students an HR diagram as well as other resources, which will provide them information on the life cycles of stars. The Enchanted Learning Web site has a series of articles on each of these topics.
4. Allow students to work and research for the remaining time period. Then stop and collect the cards. Discuss the answers to the questions.
5. The team with the most questions answered correctly wins the Stellar Evolution Game!

### **Variations/Extensions**

1. Have students work in teams to act out the life cycle of a star. Have students create props to make their role play more interesting. Ask students to create a script and have a narrator read the script to describe what is happening during their play.
2. Have students develop their own game about stellar concepts. Allow them to teach and play the game with classmates.

### **Resources**

#### **Web sites**

[http://observe.arc.nasa.gov/nasa/space/stellardeath/stellardeath\\_intro.html](http://observe.arc.nasa.gov/nasa/space/stellardeath/stellardeath_intro.html)

<http://www.star.le.ac.uk/edu/stars/index.html>

<http://www.aw-bc.com/info/bennett/images/hrdiagram.jpg>

<http://www.enchantedlearning.com/subjects/astronomy/stars/lifecycle/>

**Answer Key**

<p>Stars are formed in _____.</p> <p style="text-align: center;">(nebulae)</p>	<p>In nuclear fusion reactions of main sequence stars, hydrogen atoms are converted into _____ atoms.</p> <p style="text-align: center;">(helium)</p>	<p>True or False: Stars with the most hydrogen for nuclear fuel have the longest lives.</p> <p style="text-align: center;">(false)</p>	<p>Diagram the life cycle of a yellow dwarf star like our Sun.</p> <p style="text-align: center;">(nebula--&gt;protostar--&gt;yellow dwarf star--&gt;red giant--&gt;planetary nebula--&gt;white dwarf--&gt;black dwarf)</p>
<p>Our Sun is a _____ star.</p> <p style="text-align: center;">(yellow, main sequence, or intermediate mass star)</p>	<p>Create a mnemonic for remembering the classes of stars O, B, A, F, G, K, and M.</p> <p style="text-align: center;">(student answers will vary)</p>	<p>Star forming nebulae are made of _____ and _____.</p> <p style="text-align: center;">(molecular gas and dust)</p>	<p>The hottest stars are what color?</p> <p style="text-align: center;">(blue)</p>
<p>Red stars are classified as which star types?</p> <p style="text-align: center;">(M &amp; K)</p>	<p>True or False: White dwarf stars are hotter than red giant stars.</p> <p style="text-align: center;">(true)</p>	<p>Our Sun will become a _____ when it dies.</p> <p style="text-align: center;">(planetary nebula, black dwarf or white dwarf is acceptable)</p>	<p>Which types of stars create planetary nebulae in their lifetimes: Sun-like stars, super massive stars, or small stars?</p> <p style="text-align: center;">(Sun-like stars and small stars)</p>
<p>Draw a diagram to show the colors and temperatures of main sequence stars.</p> <p style="text-align: center;">(use HR diagram to check student answers)</p>	<p>At what temperature does nuclear fusion of hydrogen into helium begin?</p> <p style="text-align: center;">(27 million degrees Fahrenheit)</p>	<p>True or false: Stars never turn into black holes.</p> <p style="text-align: center;">(false)</p>	<p>Stars spend 90% of their lifetimes on this part of the HR diagram.</p> <p style="text-align: center;">(main sequence)</p>

**Student Cards**

<p>Stars are formed in _____.</p>	<p>In nuclear fusion reactions of main sequence stars, hydrogen atoms are converted into _____ atoms.</p>	<p>True or False: Stars with the most hydrogen for nuclear fuel have the longest lives.</p>	<p>Diagram the life cycle of a yellow dwarf star like our Sun.</p>
<p>Our Sun is a _____ star.</p>	<p>Create a mnemonic for remembering the classes of stars O, B, A, F, G, K, and M.</p>	<p>Star forming nebulae are made of _____ and _____.</p>	<p>The hottest stars are what color?</p>
<p>Red stars are given classified as which star types?</p>	<p>True or False: White dwarf stars are hotter than red giant stars.</p>	<p>Our Sun will become a _____ when it dies.</p>	<p>Which types of stars create planetary nebulae in their lifetimes: Sun-like stars, super massive stars, or small stars?</p>
<p>Draw a diagram to show the colors and temperatures of main sequence stars.</p>	<p>At what temperature does nuclear fusion of hydrogen into helium begin?</p>	<p>True or false: Stars never turn into black holes.</p>	<p>Stars spend 90% of their lifetimes on this part of the HR diagram.</p>