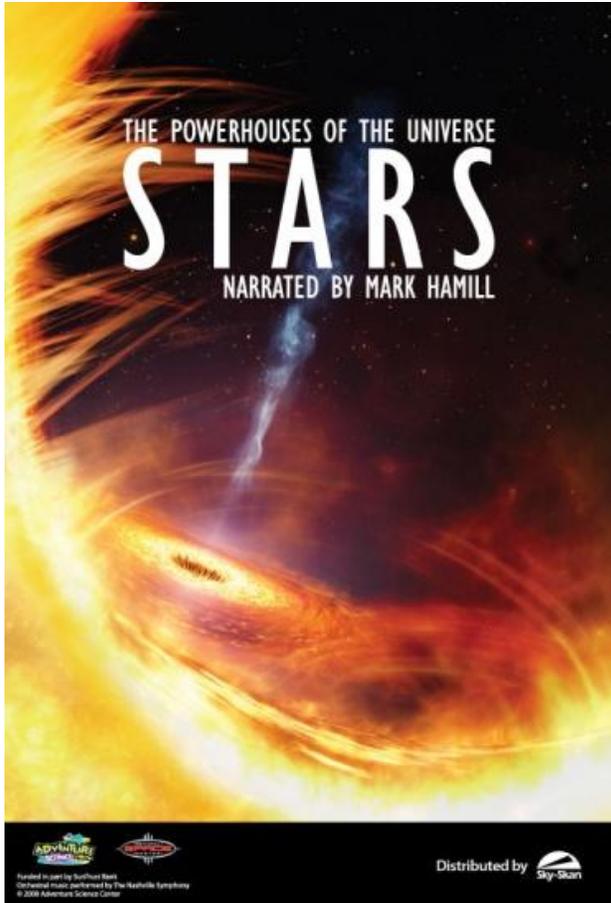


# STARS: The Powerhouses of the Universe

45 minutes

Recommended for grades 4 & up



## Program Summary

STARS focuses on the lives of the stars, how they are born, how they die, and how human understanding of the stars has changed over time. From Native Americans to Newton, from the electromagnetic spectrum to Einstein, audiences will explore nebulae, star clusters, pulsars, black holes, and more.

This dramatic program features the voice talent of Mark Hamill. The Nashville Symphony Orchestra, conducted by Albert-George Schram, resident conductor, performed part of the STARS soundtrack. STARS is a production of Adventure Science Center, Sudekum Planetarium, Nashville TN, distributed by Sky-Skan, Inc. The show was made possible, in part, by a gift from SunTrust Bank, Inc.

## Science Standards

1. Earth and its Place in the Universe
2. Forces and Motion
3. Energy

## Objectives

1. Define and describe two types of stellar objects: such as an average star like the Sun, nebula, star cluster, pulsar, supernova, or black hole.
2. Define and describe the components that make up the electromagnetic spectrum.
3. Identify at least one cultural advancement in human understanding of the sky.

## Pre-Visit Activities

1. Download a monthly star chart from the adventuresci.com website. Encourage students to locate constellations and any planets visible in the evening sky.
2. Have the students read myths or stories involving the constellations. Encourage them to find early explanations for what the stars were, the Milky Way, aurora, comets, the cause of day and night or the seasons, and other astronomical phenomena.
3. Ask students to describe the typical lifecycle of different types of stars: the Sun, star cluster, black hole, etc. How do they think the Sun will die?
4. Observe the Sun using safe, non-direct methods such as pinhole projection, telescope projection, or a sunspotter.

## Post-Visit Activities

1. Based on the information from the show, ask students to briefly describe the typical steps in a star's lifecycle.
2. Have the students investigate solar topics such as sunspots, the solar cycle, flares and prominences, and how the Sun affects climate on Earth. This activity could also be expanded to include seasons, weather patterns, magnetic fields, CMEs, etc.
3. Present and explore the Hertzsprung-Russell (H-R) diagram and how it graphically illustrates the different types and lives of stars.
4. Have students investigate the different classes of stars: O, B, A, F, G, K, M, R, N. How are these stars different from one another?
5. What are the prospects of different classes of stars having planets? If they had planets, how would life have to develop and adapt to survive under different environmental conditions?
6. An armada of spacecraft has been launched to study the Sun. Have students research various missions such as SOHO, TRACE, STEREO, Ulysses, Hinode, and others.

## Vocabulary

black hole	nuclear fusion reactions
constellation	pulsar
core	radio telescope
electromagnetic spectrum	radio waves
galaxy	red giant star
gamma rays	spectrum
globular star cluster	supernova
gravity	telescope
Great Orion Nebula	ultraviolet
Milky Way	x-rays
nebula	yellow dwarf star

## Resources

### Books

*The Brightest Stars: Discovering the Universe through the Sky's Most Brilliant Stars* by Fred Schaaf  
*The Sun* by Steele Hill and Michael Carlowicz  
*Extreme Stars* by James B. Kaler  
*The Cambridge Encyclopedia of Stars* by James B. Kaler  
*The Little Book of Stars (Little Book Series)* by James B. Kaler  
*The Sun* by Seymour Simon  
*The Sun Observer's Guide* by Pam Spence  
*An Introduction to the Sun and Stars* by Simon Green  
*Sentinels of the Sun: Forecasting Space Weather* by Barbara B. Poppe and Kristen P. Jorden  
*Totality: Eclipses of the Sun* by Mark Littmann, Fred Espenak, and Ken Willcox  
*Stars and their Spectra: An Introduction to the Spectral Sequence* by James B. Kaler  
*The Ever-Changing Sky: A Guide to the Celestial Sphere* by James B. Kaler  
*Touch the Sun* by Noreen Grice a NASA Braille book

### Websites

Stars by James Kaler  
<http://www.astro.uiuc.edu/~kaler/sow/sowlist.html>  
STEREO spacecraft  
<http://stereo.gsfc.nasa.gov/spacecraft.shtml>  
Hinode spacecraft  
[http://solar-b.nao.ac.jp/index\\_e.shtml](http://solar-b.nao.ac.jp/index_e.shtml)  
Ulysses  
<http://ulysses.jpl.nasa.gov>  
Mythology:  
<http://www.bulfinch.org/>  
<http://www.pantheon.org/>  
<http://homepage.mac.com/cparada/GML/>  
Solar System Exploration (including an exhaustive list of planetary missions, past, present and future)  
<http://solarsystem.nasa.gov>  
StarDate - daily astronomy radio program:  
<http://stardate.org/teachers/classroom.html>  
Sky and Telescope's "This Week's Sky at a Glance":  
<http://www.skyandtelescope.com/observing/ata glance>

Adapted from the STARS Education Guide originally produced by:



[www.adventuresci.com](http://www.adventuresci.com)