

SECRETS OF THE SUN

OBJECTIVES:

- To explore ways in which the Sun affects the Earth
- To see how the Sun generates energy
- To learn about some of the features on the Sun, including sunspots, solar flares, prominences, and coronal mass ejections
- To speculate on the Sun's expected life span; how it was formed and how it will ultimately end its life.

This show conforms to the following state science standards: 12.F.1A, 12.F.2b, 12.F.2c, 12.F.3c, 12.F.5a

BRIEF SHOW DESCRIPTION:

Take an intimate look at the role the Sun plays in the life of our solar system in this new full-dome show from Evans & Sutherland. From the nuclear forces churning at the heart of the Sun to the mass ejections of solar material into surrounding space, we experience the power of the Sun and its impact on the planets and ultimately life on Earth. We will trace the life cycle of the Sun itself, going back to its beginnings and moving forward in time to its eventual death.

PRE-VISIT ACTIVITIES/TOPICS FOR DISCUSSION:

- Use the space weather web site below to look at the face of the Sun today. Are there any sunspots? Make counts every day of the number of sunspots and graph the numbers. Look on the left side for the K_p index. If this number gets to be 6 or 7, there's a chance to see the northern lights in the evening sky. Measure the width of a large sunspot in millimeters. Using the sun's diameter as a scale (the Sun is 864,000 miles across), how wide are the sunspots? Compare them to the size of the Earth.
- Brainstorm ways the Sun affects the Earth – make a list.
- Shine a beam of light through a prism to make a color spectrum. The Sun's visible light is a mixture of the colors of the rainbow. If appropriate, extend this to the rest of the electromagnetic spectrum. What can each one of the wavelengths (radio, infrared, ultraviolet, and X-ray) tell us about the Sun?
- Ask at the planetarium for a sundial template and have the students construct paper sundials. Test them outside. Do you get the correct time? Why does the shadow change? (Hint: the Sun knows nothing about daylight saving time).

POST-VISIT ACTIVITIES/TOPICS FOR DISCUSSION:

- Project an image of the Sun onto an index card. *Never look directly at the Sun!* A projection is safe as you're looking at the card and not the Sun itself. If you have questions, contact a planetarium staff member.
- If you made a list in the second bullet above, what would you add to it after seeing the program?
- The Sun is the size that it is due to a balance between gravity and gas pressure. The fusion process produces a pressure outward. You can model this with two volunteer students pushing

on each other. If the fusion process increases, there is more gas pressure and the star expands. Gravity ultimately wins.

VOCABULARY LIST:

Aurora (northern lights)	Electrons	Plasma
Convection	Flare	Prominence
Core	Fusion	Protons
Corona	Magnetic field	Radiation
Coronal Mass Ejection	Neutrons	Sunspot
	Photosphere	
	Planetary Nebula	

INTERNET RESOURCES:

- The latest solar activity: <http://www.spaceweather.com>
- Solar Dynamics Observatory: <http://sdo.gsfc.nasa.gov/>
- SOHO satellite: <http://soho.nascom.nasa.gov/>
- STEREO mission: http://www.nasa.gov/mission_pages/stereo/main/index.html
- Lifespan of a star: http://aspire.cosmic-ray.org/labs/star_life/starlife_main.html or <http://www.enchantedlearning.com/subjects/astronomy/stars/lifecycle/>
- Hubble Telescope views of planetary nebula: <http://hubblesite.org/gallery/album/nebula/planetary/>
- Activities for students from Stanford: <http://solar-center.stanford.edu/activities/>
- How big is the Sun? Activities from Harvard: <http://hea-www.harvard.edu/scied/SUN/SunActivitiesIntro.html>
- More excellent activities (including sunspot counts): http://www.sunearthplan.net/media/9984_IHY_activities.pdf