



“Experience the Aurora”

OBJECTIVES:

This show conforms to the following NGSS: HS.ESS1.1

BRIEF SHOW DESCRIPTION:

The Northern Lights! One of nature's truly awesome sights! But what are they and what causes them? Over seven months in the Arctic Circle, Evans & Sutherland crews captured timelapse images of the Aurora Borealis with high resolution digital SLR cameras outfitted with fisheye lenses. The results are spectacular. For the first time the aurora has been captured as it was meant to be experienced, as a display that covers the entire sky. This immersive show shares the science behind the aurora and tells the story of our quest to find and photograph the aurora for fulldome theaters. Winner of 2 Telly Awards.

PRE-VISIT ACTIVITIES/TOPICS FOR DISCUSSION:

- If you have a small telescope or pair of binoculars, try projecting an image of the Sun for the class to see. *NEVER* look directly at the Sun! You can hold point the telescope and/or binoculars at the Sun by using the instrument's shadow. If you're using a telescope with a tube, the shadow would be a circle. Hold an index card 6-8 inches behind where you would normally look and you should see an image of the Sun on the paper. Do you see any sunspots? Compare your view to that on www.spaceweather.com.
- Ask students what they know about the aurora. Has anyone in the class ever seen the phenomena? What did they look like? Construct a KWL chart in class.
- Use a funnel and a globe of the Earth to show how the Earth's magnetism can “funnel” particles from the Sun to the polar regions. Be sure to show how the magnetic pole is different from the geographic pole.
- Experiment with static electricity by hanging an inflated balloon from a string. What if you rub the balloon with wool? Can you charge the balloon? What does it attract? Repel? Try rubbing some PVC pipe with fur or wool. The pipe can actually attract a thin stream of water from the sink! Try this with some very small squares of paper.
- Print the foldable book for each student & discuss: <http://static.ehe.osu.edu/sites/beyond/penguins/downloads/feature-stories/aurora-45-book.pdf>

POST-VISIT ACTIVITIES/TOPICS FOR DISCUSSION:

- Discuss with the class what they would think if they saw strange, moving lights in the sky like they saw in the show. What would you think was happening? Then look up some of the legends in the internet resources below and share a few stories.
- Look up the current “K-index” on www.spaceweather.com. It will be on the left side of the web page under the Sun image. If the K-index reaches level 6 or above, there's a chance we might see the northern lights.

- Discuss the 11-year sunspot cycle (see the resources below). Where are we at in the cycle? When might the next maximum occur (add roughly 11-years to the last maximum). Are our chances to see the northern lights increasing or decreasing?
- Have the students draw/paint their impressions of the northern lights. A teacher's guide to connecting the phenomena to art & writing can be found at <http://lasp.colorado.edu/home/wp-content/uploads/2011/08/Dancing-Lights-Lessons.pdf>. For the younger ones: <https://www.littlepassports.com/blog/craft-diy/northern-lights-activity-for-kids/>.
- Using the "auroral oval" (<https://services.swpc.noaa.gov/images/aurora-forecast-northern-hemisphere.jpg>) discuss with the class where on the Earth one would see the Northern Lights right now. Be sure to account for day and night, too!

VOCABULARY LIST:

Aurora Borealis
 Coronal mass ejection
 Magnetic field
 Photosphere
 Solar corona
 Solar wind

INTERNET RESOURCES:

- Spaceweather: www.spaceweather.com
- Northern lights explained: <https://www.northernlightscentre.ca/northernlights.html> or <https://www.loc.gov/rr/scitech/mysteries/northernlights.html> or <https://www.swpc.noaa.gov/news/what-are-northern-lights> (with lots of links)
- Aurora forecasts: <https://www.swpc.noaa.gov/products/aurora-30-minute-forecast>
- Mythology & legends: <https://www.hurtigruten.com/must-read-articles/northern-lights/northern-lights-legends-from-around-the-world/> or <https://www.theaurorazone.com/about-the-aurora/aurora-legends> or <https://www.indigenouspeople.net/aurora.htm>
- The sunspot cycle: <https://scied.ucar.edu/sunspot-cycle>
- Solar Dynamics Observatory satellite: <https://sdo.gsfc.nasa.gov/> (look under "data" for movies to project in the classroom).
- Parker Solar Probe: <https://www.nasa.gov/content/goddard/parker-solar-probe>
- NASA materials: <https://image.gsfc.nasa.gov/poetry/activities.html>