

# Night Skies

Over Beaufort County

## Educator Guide

### Episodes

*Each episode guide includes an overview with link to watch the episode, key terms, lesson plans for hands-on astronomy activities related to topics in the episode, and ideas for extension activities.*

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## 1. Our Galactic Address: Our Solar System

### Overview

This episode creates a scale model of the solar system using common landmarks in Beaufort County, beginning at the Hunting Island lighthouse and ending at the Yemassee Train Station.

### Key Terms

asteroid belt, dwarf planet (Pluto), ice giant (Uranus, Neptune), gas giant (Jupiter, Saturn), Kuiper belt, rocky planet (Mercury, Venus, Earth Mars), solar system, scale model

### Hands-On Astro Activities

#### Pocket Solar System

In this eye-opening activity, create a scale model of the *distances* between planets in the solar system on a strip of paper about one yard long (easy to do in the classroom). It incorporates fractions and can be linked with the model of the Milky Way Galaxy and the model of the Universe.

#### Worlds in Comparison

This activity is a real eye opener that can be done easily in the classroom and builds a scale model demonstrating the different *sizes* of the planets in the solar system. It incorporates fractions and measuring. Requires three lbs. of playdoh per group (includes easy recipe at the end of the instructions).

#### The Thousand Yard Model (Earth as a Peppercorn)

This model is to-scale for both sizes of planets AND distances between them. It must be done outdoors and requires a total distance of *about* 1,000 yards/meters (can be done either in yards or metric – both scales provided; students can measure their pace and calculate number of paces between planets to estimate distance). You'll have to find some objects of specific sizes to represent the planets.

### Extension

- Mapping: [This website](#) allows you to create a scale solar system model to any distance you wish and superimposes it on a Google Map centered on any lat/long entered. After creating their own map, you might instruct students to draw the map and chart the locations of the planets. Allows incorporation of latitude and longitude and cardinal directions.

## **2. Our Galactic Address: The Earth and Habitable Planets**

### **Overview**

In this episode, examine what characteristics make Earth the ideal location for the existence of life (climate, presence of liquid water, and organic compounds). The episode also covers how astronomers look for the existence of planets around other stars.

### **Key Terms**

exoplanet, habitable zone, Kepler mission, orbit, organic, revolution, rotation

### **Hands-On Astro Activities**

#### [How do we find planets around other stars?](#)

Demonstrate some of the ways scientists look for the presence of planets around other stars.

#### [Exploring Strange New Worlds](#)

This creative activity allows students to explore new (model) planets using methods that NASA has used to explore the planets of our own solar system. It could be modified to be as brief or in depth as you wish, including allowing a group of students to build their own planet and have another group explore it.

### **Extension**

- [Exoplanet Exploration](#): This interactive website by NASA visually demonstrates the different ways astronomers search for exoplanets. It includes graphics to show what the collected data look like.
- Creative Writing: Have students write a creative story about a new planet they discover including its physical characteristics, the star it orbits, and any lifeforms they find.

### 3. Our Galactic Address: The Sun

#### Overview

This episode covers characteristics of the Sun, including the energy it emits, its importance for life on Earth, and briefly touches on how solar eclipses occur.

#### Key Terms

energy, light, magnetism, nuclear fusion, solar eclipse, solar flare, star, Sun, Sun spot

#### Hands-On Astro Activities

##### UV Rays

Use beads that change color in the presence of ultra violet light to demonstrate how the Sun's energy reaches Earth. Students can design different trials and develop hypotheses about whether the beads will detect UV rays in different situations.

##### Magnetic Connection

This demonstration uses compasses and magnets to show how magnetic activity on the Sun can disrupt the Earth's magnetic field.

##### Where does the energy come from?

This activity shows that basically all energy flow on Earth ultimately comes from the Sun. Students create an energy web (like a food web) using cards with images of different plants, animals, and energy sources on them.

#### Extension

- Build a solar oven to show how energy from the Sun can be magnified to create heat
- Use [this banner](#) to show different characteristics of the Sun

#### **4. Our Galactic Address: The Milky Way Galaxy**

##### **Overview**

This video segment covers the basic characteristics and arrangement of the Milky Way galaxy, using scale models to demonstrate its size and the vast number of stars it contains.

##### **Key Terms**

barred spiral galaxy, black hole, the Local Group, Milky Way

##### **Hands-On Astro Activities**

###### **Our Place in Our Galaxy**

Using a quarter, a CD, and some birdseed, this activity helps students construct a mental model of the size and shape of the Milky Way as well as the vast number of stars it contains.

###### **A Universe of Galaxies**

Use this activity as an extension to Our Place in Our Galaxy to demonstrate the distances between galaxies in our universe. Depending on how far you want to extend the model into space, you might need an area as large as a football field but can make a shortened version of this activity work in a long hallway.

##### **Extension**

- Depending on the math level of the students, have them do the calculations for the volume of space that the stars in the Milky Way galaxy would take up in the birdseed model (Our Place in Our Galaxy).
- Have students research the different types of galaxies (either in simple books or on the internet depending on their level – see resources at the end of this Guide) and then have them create their own galaxies out of art materials like black construction paper, chalk, glitter, and paint.

## 5. Astronomical Events: The Great American Solar Eclipse

### Overview

This episode demonstrates how solar eclipses occur and how to view the sun safely. It includes footage of the total solar eclipse that occurred in August 2017. Understanding solar eclipses requires background knowledge of the phases of the moon.

### Key Terms

Bailey's Beads, diamond ring flash, eye safety, first contact, new moon, partial solar eclipse, pin hole viewer solar eclipse, total solar eclipse

### Hands-On Astro Activities

#### [Yard Stick Eclipse Model](#)

Using a yard stick, a Styrofoam ball and some clay, and either the real sun or a bright lightbulb in a darkened room, observe how a solar eclipse occurs. This model covers both solar and lunar eclipses.

### Extension

- [Tips](#) for viewing the sun and/or a solar eclipse safely
- [This video](#) demonstrates why solar eclipses don't happen every month.

## 6. Astronomical Events: Lunar Eclipses

### Overview

This episode covers what a lunar eclipse is, how and when one occurs, and how to observe one. It also examines the differences between penumbral, partial, and total lunar eclipses.

### Key Terms

blood moon, full moon, lunar eclipse, partial lunar eclipse, penumbra, penumbral lunar eclipse, total lunar eclipse, umbra

### Hands-On Astro Activities

#### Yard Stick Eclipse Model

Using a yard stick, some small balls, and either the real sun or a bright lightbulb in a darkened room, observe how a solar eclipse occurs. This model covers both solar and lunar eclipses.

### Extension

- Use [this website](#) to investigate when and where the next lunar eclipse will occur. Ask students to find out when the next lunar eclipse will take place in our area. Have them compare the sizes of the areas that will experience lunar vs. solar eclipses as well as the durations of lunar vs. solar eclipses and explain why the differences occur.

## 7. Astronomical Events: Meteor Showers

### Overview

Learn the differences between a meteor, meteoroid, and meteorite as well as the origin of most meteor showers. You'll also see a demonstration of how to "cook up a comet".

### Key Terms

asteroid, comet, meteor, meteorite, meteoroid, organic, radiant, sublimate

### Hands-On Astro Activities

#### [Cook Up a Comet](#)

Using dry ice and household ingredients, create a model comet to show the components that make up a comet and how debris is shed to form the trails that later cause meteor showers.

#### [Craters on the Earth and Moon](#)

This activity demonstrates why the moon is covered in craters while the Earth has very little evidence of craters – it touches on plate tectonics, erosion, and the Earth's atmosphere. You can use it to tie in to why meteor showers occur. Warning – messy!

#### [Meteorite or MeteorWrong?](#)

Students scientifically investigate the properties of meteorites and learn what they are and how they got to Earth. You will have to buy some fragments of meteors and other rocks online.

#### [Scaling the Asteroid Belt](#)

Explore the relative sizes and spacing of the asteroids that orbit around the Sun. This activity can be shortened to be a brief hands-on example when referring to asteroids rather than using the whole activity.

### Extension

- Investigate the times of year that meteor showers regularly occur and find out what the meteor showers are named in the [EarthSky meteor shower guide](#).



## 8. Astronomical Events: Supermoon & King Tides

### Overview

This episode explains what a Supermoon and King Tides are and examines how these huge tides are giving us clues to what sea level rise will look like in the future.

### Key Terms

apogee, full moon, king tide, moon illusion, new moon, perigee, sea level rise, spring tide  
super moon

### Hands-On Astro Activities

#### Gravity and Tides

This kinesthetic activity demonstrates how two high and low tides occur each day. As an extension to tie in King Tides, have the student who is the moon stand further or closer and those that are acting out the tides make the tides less or more dramatic.

### Extension

- Use this [interactive map](#) to explore which areas of the Lowcountry will be most affected by sea level rise and what the impact will be under different sea level rise scenarios.
- Participate in the [SC King Tides project](#).

## 9. The Seasons: Winter

### Overview

This episode explores the stars/constellations of the Winter Hexagon (Orion, Gemini, Canis Major, Canis Minor, and Taurus), including how to find them and associated mythology.

### Key Terms

asterism, constellation, mythology, star forming nebula, super giant, winter hexagon

### Hands-On Astro Activities

#### 3D Constellations

This activity demonstrates that while stars appear in certain two dimensional patterns and groupings we call constellations from our vantage point on Earth, in three dimensional space those stars are actually very far apart. Students create a 3D scale model of the Orion constellation.

### Extension

- **Star Lore:** Have students research and write a report on the mythology behind one of the constellations in the Winter Hexagon. Keep in mind that while most star stories come from Greek and Roman myths, other cultures also have their own astronomical mythology. Challenge students to find myths from at least two cultures.
- **Sky Heroes:** In this activity, students find their own star patterns in the sky and invent myths to accompany them.

## 10. The Seasons: Spring

### Overview

This episode explores the stars/constellations that mark springtime in the night sky (Ursa Major/the Big Dipper, Leo, Bootes, and Virgo), including how to find them and associated mythology.

### Key Terms

asterism, constellation, mythology

### Hands-On Astro Activities

#### 3D Constellations

This activity demonstrates that while stars appear in certain two dimensional patterns and groupings we call constellations from our vantage point on Earth, in three dimensional space those stars are actually very far apart. Students create a 3D scale model of the Big Dipper.

#### Star Clock

Students make a star clock out of paper and use the position of the Big Dipper to tell time. To bring this activity to life, you can use Stellarium to show what the sky looks like at different times of night and match it up with your clock.

### Extension

- **Star Lore:** Have students research and write a report on the mythology behind one of the springtime constellations. Keep in mind that while most star stories come from Greek and Roman myths, other cultures also have their own astronomical mythology. Challenge students to find myths from at least two cultures.
- **Sky Heroes:** In this activity, students find their own star patterns in the sky and invent myths to accompany them.

## **11. The Seasons: Summer**

### **Overview**

This episode explores the stars/constellations of the Summer Triangle (Aquila, Lyra, and Cygnus/Northern Cross), including how to find them and associated mythology.

### **Key Terms**

asterism, constellation, Milky Way, mythology, nebula, summer triangle

### **Hands-On Astro Activities**

#### **Trip Around the Triangle**

This activity is designed to be done under the night sky as a scavenger hunt of stars, constellations, and space objects that can be found in the Summer Triangle. However, it could be used in the classroom with students using the Stellarium program to take a virtual trip.

### **Extension**

- **Star Lore:** Have students research and write a report on the mythology behind one of the summer constellations. Keep in mind that while most star stories come from Greek and Roman myths, other cultures also have their own astronomical mythology. Challenge students to find myths from at least two cultures.
- **Sky Heroes:** In this activity, students find their own star patterns in the sky and invent myths to accompany them.

## 12. The Seasons: Autumn

### Overview

This episode explores the stars/constellations of the Andromeda story (Cepheus, Cassiopeia, Andromeda, Perseus, Pegasus, and Cetus), including how to find them and associated mythology.

### Key Terms

Andromeda myth, asterism, constellation, mythology, spiral galaxy

### Hands-On Astro Activities

#### [Myths with a Twist: Andromeda and the Whale](#)

Reenact the Andromeda myth with student participation. Click the link to jump to the Appendix of this Guide to find the story.

### Extension

- **Star Lore:** Have students research and write a report on the mythology behind one of the summer constellations. Keep in mind that while most star stories come from Greek and Roman myths, other cultures also have their own astronomical mythology. Challenge students to find myths from at least two cultures.
- **[Sky Heroes](#):** In this activity, students find their own star patterns in the sky and invent myths to accompany them.

### **13. Special Topics: Light Pollution**

#### **Overview**

#### **Key Terms**

artificial light, light pollution, magnitude, nocturnal

#### **Hands-On Astro Activities**

##### Light Pollution Demo

In this simple and short activity, demonstrate how light pollution reduces the number of stars you can see. Show ways to minimize the impacts of light pollution. This activity could be made more creative and student-centered by allowing them to create their own background scene and star cube.

##### Bats, Moths, & Owls

This game teaches predator-prey relationships and shows how light pollution affects nocturnal animals.

It is a bit complicated but can be successfully modified for early elementary using the following instructions (read full activity description first): Each child is either a bat, moth, or owl and has to avoid lights to not get eaten and is trying to find enough food. With 15 kids, try 1 owl, 4 bats, 10 moths. Owl can see, bats have eyes closed and say “bat”. Moths have eyes open and MUST say “moth” when a bat calls out. Owl tries to tag bats, must be “perched” on a tree; can only leave the tree to tag a bat if a bat runs by. Bats must go to the owl nest when they are tagged. Bats try to tag moths. Moths must go to the bat cave when they are tagged. Play one round “regular”, then introduce light pollution. Moths don’t run around anymore, they are “stuck” to a light. Owl cannot see any more, blinded by the light. Must call out “owl” and bats must answer “bat”.

#### **Extension**

- Participate in the [Globe at Night](#) citizen science campaign and have students report the light pollution levels at their home. If that is not possible, you can simulate different levels of light pollution in Stellarium.
- Read “[There Once Was a Sky Full of Stars](#)” (elementary level).

## **14. Special Topics: The Lives of Stars**

### **Overview**

Stars have life cycles, much like a butterfly. This video demonstrates a kinesthetic activity to help students better understand the lives of stars from how they are born, to how they live, and how their life span comes to an end.

### **Key Terms**

black hole, fusion, giant star, gravity, main sequence, neutron star, star, star-forming nebula, super giant, white dwarf

### **Hands-On Astro Activities**

#### **Kinesthetic Life Cycle of Stars**

In this activity, re-enact the stages in the lives of both smaller stars and super massive stars.

#### **Supernova!**

This brief activity will demonstrate what happens when a star goes supernova...but be warned! You will give the students each a tennis ball and ping pong ball which will require a level of maturity and restraint for the activity to be effective. Alternatively, the students could simply observe the teacher demonstrate.

#### **Stellar Bar Code Classification Activity**

For an advanced class, take students' understanding of stars a step further by classifying the stars based on their spectra and relate this to temperature.

### **Extension**

- Investigate which stars we see in the night sky will [likely go supernova](#). Search for those stars together in Stellarium.
- Research what life would be like without supernovae. Students can conduct their own research or you could play [this game](#).

## **15. Special Topics: The Seasons**

### **Overview**

Why do we experience different seasons? This episode explains what astronomy has to do with the change of the seasons.

### **Key Terms**

axis of rotation, celestial pole, North Pole, South Pole, North Star, Polaris, revolution

### **Hands-On Astro Activities**

#### **Kinesthetic Astronomy**

This relatively involved activity uses students' bodies to demonstrate the meaning of a day, a year, and the change of the seasons.

#### **Globe Seasons Demo**

Use this demonstration where a light bulb and tilted globes show why the Earth experiences seasons.

### **Extension**

- This [interactive website](#) is a great tool to understand why we experience seasons.
- Have students research if other planets experience seasons too and why/why not.



## **16. Special Topics: Phases of the Moon**

### **Overview**

This video explores why the moon has phases and how the phase of the moon affects the tide.

### **Key Terms**

centrifugal force, first quarter moon, full moon, gravity, high tide, low tide, neap tides, new moon, phases of the moon, South Atlantic bight, spring tides, third quarter moon

### **Hands-On Astro Activities**

#### **Why does the moon have phases?**

This activity demonstrates why the moon has phases and helps students understand that although we see only part of the moon lit up at certain times, the moon is always experiencing night and day. It can also be used to help better understand what time of day the different phases are visible.

#### **Does the moon rotate?**

Use this activity to show why we always see the same face of the moon.

### **Extension**

- Have students observe the moon twice a week for a month. They should note the time of day when they saw the moon and draw a picture of it.
- Using a tray with a black piece of paper in the bottom and sand or salt in the tray, students can draw the phases of the moon with their fingers.

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### **Night Sky Preservation**

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## Resources

### [Night Sky Network Outreach Resources](#)

This collaborative NASA site compiles all sorts of awesome **hands-on astronomy lesson plans**. You can search by topic and it tells you the appropriate age group, venue, all materials needed, how-to, and background info. Most of the hands-on activities in this Guide are found at the NSN.

### [My Sky Tonight](#)

A collection of **astronomy activities for early learners** (geared toward preK but can be scaled up and used successfully for early elementary as well). Activities focus on shadows, the moon, day & night, the sun, stars/constellations, and creative “space exploration” fun. The site also includes developmentally appropriate practices and science practices for young children in astronomy.

### [Windows to the Universe](#)

This **website** by the National Earth Science Teachers Association contains huge amounts of information about the Sun, Earth, solar system, and the mythology behind it all. It is available in both English and Spanish and can be adjusted to beginner, intermediate, and advanced levels so might be a good resource for students to use when doing research.

### [Sky and Telescope](#)

**Website/magazine** that covers astronomy news and has a great segment about what’s interesting in the current night sky.

### [EarthSky](#)

The EarthSky **website** publishes great articles every day covering what you’ll see in the night sky with lots of background/mythological info and current events and astronomical discoveries. You can subscribe to their daily email to keep up to date with astronomical events and findings.

### [National Audubon Society Field Guide to the Night Sky](#)

This **book** contains information about the night sky from stars to galaxies to comets and includes sky charts and lots of great star/constellation lore from different cultures.

### [365 Starry Nights](#)

This **book** takes a day-by-day look at interesting astronomical features in the night sky. Easy to follow and a great learning tool.

### [Stellarium](#)

**Free software download** that allows you to use your computer/projector as a virtual planetarium.

## Appendix

### **Myths with a Twist: Andromeda and the Whale**

(Adapted from the Astronomical Society of the Pacific)

This retelling of the Andromeda myth involves audience/student participation – they provide the sound effects. To really bring the myth to life, participants could even make costumes and act it out. Be sure to practice the sound effects list once and pause at the \*\*\* to give plenty of time for audience/student response. You may want to give background about Perseus getting the Gorgon's head.

\*\*\*Sound effects that go with each character:

**Cepheus the King:** (deep, low voice) I'm the King!

**Cassiopeia the Queen:** (regal female voice) I'm the Queen!

**Andromeda the Princess:** (conceited voice, with hands on hips) I'm pretty.

**Perseus the Hero:** (Shout, with fist raised in the air) To the rescue!

**Pegasus the Flying Horse:** (make galloping sounds by slapping open hands on laps while singing to the tune of the first line of the William Tell Overture) Da-Da-Dum, Da-Da-Dum, Da-Da-Dum-Dum-Dum!

**Cetus the Whale:** (make eating and smacking noises, maybe a belch)

According to this ancient Greek myth, **Cepheus the King\*\*\*** and his wife, **Cassiopeia the Queen\*\*\*** had an extraordinarily beautiful daughter by the name of **Andromeda the Princess\*\*\***. She was so lovely in fact, that the Queen bragged about her beauty all the time. This drove the sea nymphs crazy as they were quite lovely themselves. So they complained to Neptune, the god of the seas, that he must do something about her incessant bragging. He did. He sent **Cetus the Whale\*\*\*** to devour everything along the coastline. Well, poor **Cepheus the King\*\*\*** did not know what to do. So he went to an oracle for advice. They did that in those days. But the oracle gave him awful advice. In order to save his country, he would have to sacrifice his daughter by chaining her to a rock by the sea and let the monster eat her up. He had no choice, so he did, and along came **Cetus the Whale\*\*\***. Just then, out of the sky came **Perseus the Hero\*\*\*** on the back of **Pegasus the Flying Horse\*\*\***. He swooped down and held the head of Medusa he was carrying in front of the Whale who took one glance and turned to stone. He saved **Andromeda the Princess\*\*\*** and everyone lived happily ever after. THE END.