



Nature NB Program Kits:

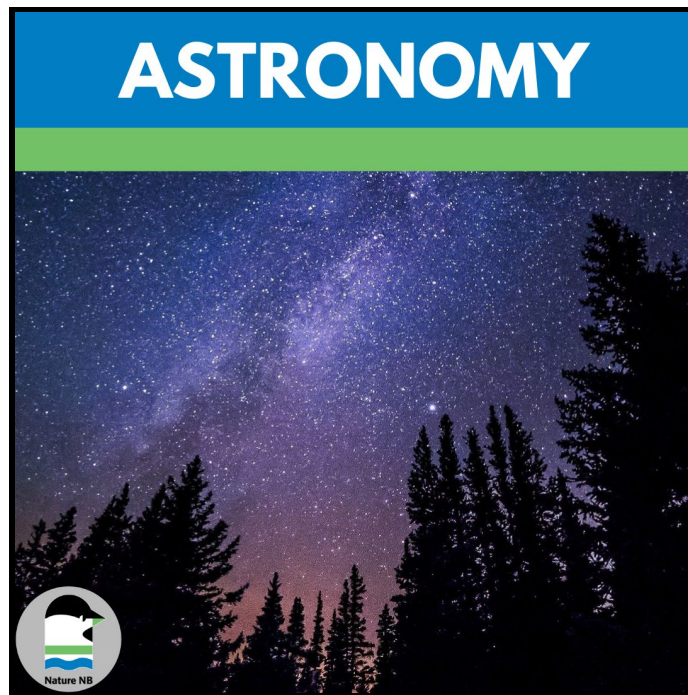


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Introduction

- The activities in this kit will help you introduce concepts like the solar system, moon phases, and constellations.
- The kit is written primarily for New Brunswick educators. The information and activities in this kit are tailored to the grade 6 curriculum, with specific curriculum links listed.
- Each activity in this kit works as a stand alone, so feel free to pick and choose the activities that fit best with your classroom.

Program Curriculum Links

Grade 6

Science

- **205-2** select and use tools in building models of the solar system that show approximate relative size of the planets and sun, and the approximate relative orbits of the planets around the sun
- **205-8** use electronic, print resources and/or visit a planetarium to gather information on the visual characteristics and mythology of constellations
- **301-20** observe and explain how the relative positions of Earth, the moon, and the sun are responsible for the moon phases, eclipses, and tides
- **302-13** identify constellations from diagrams, pictures and/or representations of the night sky

Background Information

Introduce your class to astronomy. Some key concepts that will be covered in this education kit are:

- Solar system
- Moon phases
- Tides
- Constellations
- Planispheres or star charts



Key terms to be defined:

Orbit: When an object in space moves around another, larger object because of gravity. Examples would be a planet orbiting a star (like the Earth orbiting the Sun) or a moon orbiting a planet (like the Moon orbiting Earth).

Tides: Tides are the rise and fall of sea levels due to the combined forces of and the Sun's and Moon's gravity and the Earth's rotation.

Constellation: A group of stars that form an outline; people have seen many different animals, objects, and characters in these stars.

Planisphere: A star chart with two rotating disks that can be adjusted to show the stars visible on a particular date.

Activity 1: Moon Phases

Materials: none

Location: outdoors or indoors with room to move

Time Required: 30 minutes

Activity description and instructions:

Students will act out the phases on the moon.

Before starting, ask students if they know the phases on the moon and draw them together: new, crescent, quarter, gibbous, full.

Call on 3 students to represent the Sun, Earth, and Moon, and have them line up in that order left to right, in front of the class. If you have adequate space, have the Sun standing further away to represent the greater distance between the Sun and Earth.

Explain that when the Sun, Earth, and Moon are lined up in this way, the light from the Sun can reach the side of the Moon that is facing us. The light reflects on this side and we see a full moon in the sky.

Have the Moon move so that it is behind the Earth. In this position, sunlight can only reflect on half of the side of the Moon facing the Earth. This is the quarter moon.



Next, have the Moon move so that it is between the Sun and Earth. In this position, sunlight cannot reach the side of the Moon that is facing Earth, and so we see a faint outline of the Moon, or a new moon.

Finally, have the Moon move so that it is in front of the Earth. This position will create another quarter moon.

Now that students have a solid understanding of how light reflects off the Moon, how we see that reflection, and how that changes based on the position of the Sun, Earth, and Moon, add in the crescent and gibbous phases. These are the phases in between quarter moons and full or new moons. The crescent moon has roughly $\frac{1}{4}$ of its side lit up, and the gibbous moon has roughly $\frac{3}{4}$ of its side lit up.

This role-play can also help explain the tides:

Explain how tides are primarily caused by the Moon's gravity on Earth; the Moon's gravity in addition to the rotation of the Earth causes the oceans to "bulge" on the side of the Earth that's facing the Moon and on the opposite side as well.

Repeat the moon phases role-play, this time to demonstrate how they influence the tides; i.e. our highest tides (spring tides) correspond to moon phases. When the Sun, Earth, and Moon are lined up (either in full moon or new moon phases), the added gravity of the Sun increases that ocean "bulge". Note that even though the Sun is a larger body and therefore has the strongest gravity, the Moon still has the greatest influence over tides because of its proximity to Earth.

Activity 2: Backyard Solar System

Materials: Place markers (sticks, pylons, flags, etc), measuring tape

Location: Sports field or other large outdoor area

Time Required: 30 minutes

Activity Description:

Students will create a to-scale distance model of the solar system in the schoolyard.

Instructions:

To help students visualize the vast distance in space, use the scale distances in the table to create a mini-solar system outside. The easiest scale to use is a 1:1, where one AU (see note below) equals one metre, but you can use a different scale to accommodate the area you have or to offer students practice with a more challenging unit conversion.



Start with a marker for the Sun at one end of a playing field. This marker can be a pylon or a simple stick stuck in the snow. If needed, place flagging tape or bright-colour visuals to better see the markers at a distance.

Measure the distance from the Sun to the first planet, Mercury, and so on for each planet in the solar system.

Note: AU stands for Astronomical Unit. Because the distances between objects in the universe are so large, it is easier to work with larger units like AU. One AU is the equivalent of 150 000 000 (one hundred and fifty million) km, the distance between the Sun and the Earth.

Celestial body	Distance from Sun in km	Distance from Sun in AU	Scale model distance in metres
Sun	0	0	0
Mercury	5.79×10^7	0.39	0.39
Venus	1.08×10^8	0.72	0.72
Earth	1.50×10^8	1.0	1.0
Mars	2.28×10^8	1.52	1.52
Jupiter	7.79×10^8	5.20	5.20
Saturn	1.43×10^9	9.54	9.54
Uranus	2.87×10^9	19.18	19.18
Neptune	4.50×10^9	30.06	30.06

Optional activity:

An alternative version to add a physical element to this activity is to have the students run or walk a couple of the planets' orbits and relate the time required for each planet to orbit the Sun. For example, one year is how we measure the orbit of the Earth around the Sun, but it takes only 88 days for Mercury to complete one orbit of the Sun and it takes Neptune 165 years!

Possible follow-up:

Try this activity for other topics. For example: scale distances of different provinces, countries or continents, a geological timescale to visualize when events happened relative to present-day.

Activity 3: Constellations

Materials: empty toilet paper rolls, duct tape, pen

Location: indoors

Time Required: 45 minutes

Activity Description:

Students will learn the Greek mythology behind constellations and make a constellation craft.

Instructions:

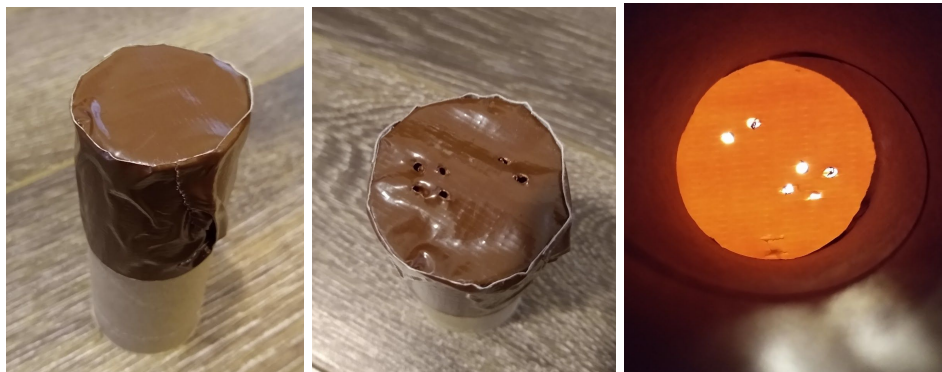
Mythology

Tell the stories of Greek mythology related to common constellations. See the appendix for child-friendly versions of some of these stories. Pictures of these constellations are included.

Constellation craft

Students can choose to make one of the constellations discussed. A possible alternative is having the students research other constellations and choose their favourite to create.

Cover one end of an empty toilet paper roll with duct tape. Use a pen to mark dots of the chosen constellation on the duct tape (a **mirror image** of the constellation needs to be drawn). Use the pen to punch small holes where the dots are. Now they can look through the other end of the roll to see the constellation!



Constellation craft of the Big Dipper

Tip: Taping 2 layers of duct tape will increase opacity and produce more contrast (and brighter “stars”).

Possible follow-up:

Have students create their own stories about a constellation. What do they think the constellation looks like? Write or tell a story to match the shape or picture they see.



Activity 4: Planispheres

Materials: printed planisphere, scissors, tape

Location: indoors

Time Required: 10 minutes

Background information:

A planisphere is a star chart with two rotating disks that can be adjusted to show the stars visible on a particular date.

Activity Description and Instructions:

Students will cut and tape the printed planisphere. Students can take their planisphere home to help them find and identify constellations.

Click the links for an [English planisphere](#) or a [French planisphere](#). Instructions for assembly are included on the documents.

Contact Us!

If you've used our program kits we would love to hear from you! Please email programs@naturenb.ca with feedback on your experience.

This program kit was developed with generous funding by:



Natural Sciences and Engineering
Research Council of Canada

Conseil de recherches en sciences
naturelles et en génie du Canada



APPENDIX

Greek mythology and constellations

Callisto and Arcas

The ancient Greeks believed in many, many gods. The ruler of the gods was named Zeus. He was a strong god who controlled thunder and lightning bolts!

Even though Zeus was married, he was always falling in love with other women, which made his wife Hera jealous and very angry. One time, Zeus fell in love with a nymph called Callisto and they had a son called Arcas who became a great hunter.

When Hera found out about Zeus and Callisto, she was so mad that she turned Callisto into a bear so that Zeus would think she was ugly. Callisto wandered around the woods as a bear, hiding from hunters.

After many years, Callisto saw her son Arcas in the woods. She was so happy to see him, that she forgot she was a bear and started running towards Arcas, the great hunter! Arcas took out a spear, ready to kill the bear, who he did not know was really his mother, Callisto!

Luckily, Zeus saw what was about to happen, and he sent a wind that blew Arcas and Callisto into the heavens where they would be safe... as constellations in the sky!

Callisto became the Big Dipper (also known as the Big Bear) and Arcas became the Little Dipper (also known as the Little Bear).





Hera's Golden Apple Tree

When Zeus married Hera, they were given many extraordinary gifts by the other gods. One of these gifts was a golden apple tree. Hera planted the tree in the garden of the sunset nymphs.

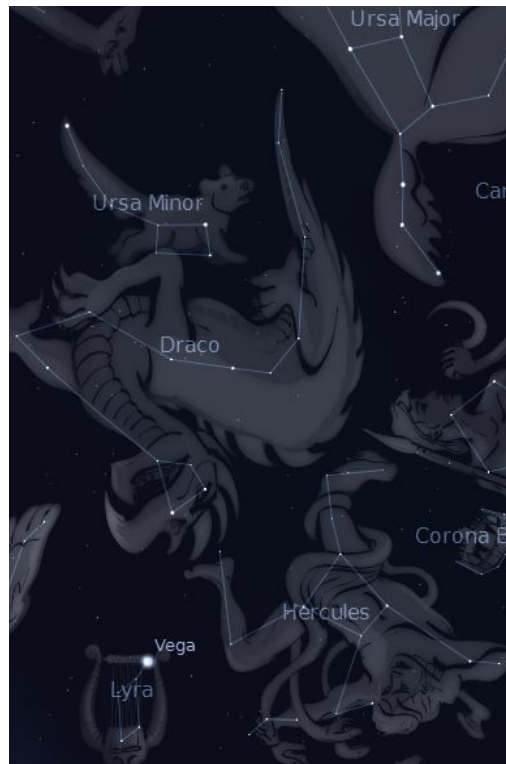
Hera loved the tree so much that she wanted to make sure the nymphs didn't pick any of her golden apples. So she placed the great dragon Ladon around the tree so that no one would pick apples from the tree.

The dragon Ladon was a terrifying dragon with a hundred heads! So Hera thought her golden apples would be very safe indeed!

Many years later, Zeus had a son called Hercules. Because Hercules was half god, he was very, very strong! But because he was half man, he was mortal. In order to become a god and gain immortality, Hercules had to complete Twelve Labours, which are twelve great challenges. One of Hercules's Twelve Labours was to steal some of Hera's golden apples from the tree. Hercules poisoned an arrow and killed the great dragon Ladon and then took the apples, making him one step closer to becoming a god.

Hera was so sad about the dragon's death that she put his image in the sky as a constellation. The constellation of Draco (the dragon) has Hercules's foot on its head.





Cepheus and Cassiopeia

The Greeks told a story of a King named Cepheus, who ruled the land from the Mediterranean to the Red Sea. Cepheus's wife was named Cassiopeia.

Queen Cassiopeia was extremely beautiful and had a beautiful daughter named Andromeda. However, Cassiopeia was also very vain and liked to boast about her and her daughter's beauty. It was her vanity that got her into trouble with Poseidon, the god of the sea.

Poseidon's wife Amphitrite was a nymph who lived in the seas that were part of the great kingdom of Cepheus and Cassiopeia. One day, Cassiopeia was boasting, saying that she and her daughter Andromeda were so lovely that they were even more beautiful than the sea nymphs. Amphitrite heard this and became enraged, telling Poseidon to punish Cassiopeia.

So Poseidon sent a sea monster to destroy Cepheus and Cassiopeia's land. Cepheus was worried for his land and for all of the people who lived in his kingdom, so he asked an oracle how he could protect his land from the sea monster. The oracle told him that the only way to save the kingdom would be to sacrifice his daughter Andromeda to the sea monster.

Not knowing how else to save the kingdom, Cepheus and Cassiopeia did what the oracle said. They tied Andromeda to a rock out at sea where the sea monster could find her.



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Thankfully for Andromeda, the hero Perseus saw what Cepheus and Cassiopeia had done. He killed the monster and rescued Andromeda from the rock. Perseus and Andromeda fell in love. The gods placed all of the people in this story (Cepheus, Cassiopeia, Andromeda, Perseus, and the sea monster) as constellations among the stars. To punish Cassiopeia for her vanity, she was placed among the stars in a way where she would be upside-down for part of the year.

