STARGAZING WITH HIPPARCUS

Discover the stars and constellations in the night sky,
Haus der Astronomie
BRIEF DESCRIPTION
Through storytelling children become familiar with the constellations in the Northern Hemisphere and their brightest stars. They will build a sky chart and learn how to find the constellations according to the observing time. They learn to classify the stars according to their brightness, just as Hipparchus did in 200 BCE.

GOALS
Children apply certain patterns to identify the constellations in the Northern Hemisphere sky and learn many stories linked to them. By using a sky chart, constellation cards and the Hipparchus brightness scale, they learn how to find and classify them. They are introduced to the Greek alphabet to identify the brightest stars.

LEARNING OBJECTIVES
After this activity, the children will be able to:

- identify constellations in the Northern Hemisphere.
- identify and classify the brightest stars of these constellations.
- repeat stories from ancient Greek mythology that are related to the stellar constellations.

EVALUATION

- The teacher may use the playing cards provided or a star chart/planisphere and ask the children to identify some of the constellations mentioned.
- The teacher may ask the children which Greek letter is used to label the brightest star of a constellation. He/She may have the children compare and discuss their results of Part III of this activity.
- The teacher can ask details about the stories, e.g.:
  - What is the hunter’s name?
Who is accompanying him?

What animal was after him by Gaia?

**MATERIALS**

- Stories of the book “Have you seen the great bear in the sky?” (Scorza), provided in this activity
- Greek constellations card set
- Sky chart form, to cut out
- Sheets with constellations showing the stars with different diameters
- The Hipparchus scale of star brightness

**BACKGROUND INFORMATION**

Hipparchus is often considered to be one of the greatest astronomical observer of old times. He compiled the first comprehensive star catalogue of the western world, and possibly invented the astrolabe, which he used to produce his star catalogue.

In 135 BCE Hipparchus reported the appearance of a “new star” in the sky. We now think that this star was actually a supernova - a dying star undergoing an enormous explosion. This was a huge surprise since it had been thought that the sky was eternal, perfect and unchangeable. After this discovery, Hipparchus kept observing the sky in case another new star would appear!

![Fig. 24 Earth procession (Credits: Earth and Planetary Magnetism Group Zurich)](https://www.space-awareness.org)

While observing and measuring the positions of the constellations during spring, and by comparing his measurements with those obtained by the Babylonians thousands of years earlier, Hipparchus concluded that the whole sphere of the sky with the constellations on it shifts. In reality it is the Earth’s axis that precesses like a spinning top. Because it takes 26,000 years for the Earth’s axis to complete a precession cycle, it is too slow to be noticed within a few years.

When Hipparchus started observing the stars, he noticed also that they had different brightnesses. In order to quantitatively measure and record the brightness of the stars in tables and to communicate his results to other astronomers, he introduced a magnitude scale that ranges from 1 to 6: The brightest stars had a magnitude of 1, the faintest ones 6.

**FULL ACTIVITY DESCRIPTION**

**Step I** Read the stories of the Book “Have you seen the great bear in the sky?” (Scorza) that we have provided below. Start by telling that up to 3,500 years ago, people sat outside in the evenings and listened to the stories that old men and women told about the starry sky. One amazing story told in Winter was that of Orion, the Greek hunter.

**Orion, the Greek hunter** Once in Greece there lived a handsome and fearless hunter named Orion. One day, while he was hunting in the forests on the isle of Chios, he met the beautiful Merope. Orion fell in love with her and wanted to marry her. Her father promised to agree to the marriage, but because he was so afraid of wild animals, Orion should first kill all the dangerous animals of the island.

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Orion immediately left, joined by his two hunting dogs, a big one and a small one. But instead of helping him with the hunt, the cheeky dogs ran jauntily after a rabbit. All by himself, Orion slew bears, wolves and many other wild animals. Only a huge bull escaped and hid deep in the forest.

After the successful hunt, he asked Merope’s father for the promised spouse. The father, however, declined because he could still hear the roaring of the wild bull at night. Upset, Orion left the island. In his boundless rage, he swore to kill all the animals on Earth.

This, in turn, infuriated earth goddess Gaia so much that she sent a huge scorpion after Orion. Fearlessly, the hunter attacked the dangerous animal, but his furious sword thrusts recoiled: the scorpion’s shell was harder than iron. Orion’s only choice was to flee. He ran as fast as he could, but the scorpion came closer and closer. Just before the scorpion could hurt the hunter with his sting Artemis, goddess of the hunt, transformed Orion into a constellation and thus saved him from the beast.

Today, Orion can be seen on the winter sky, along with the greater and the smaller dog, a rabbit and the wild bull. Even now, the terrible scorpion chases him, but at a safe distance as a summer constellation. Therefore, Orion and Scorpius are never visible at the same time.

Step II Give the children the cards “Orion’s story” from the card set. Ask them to match in pairs the constellations (Card A) and the group of stars (Card B), such that they become familiar with the constellations.

Step III Explain to the children that Hipparchus assigned names to the brightest stars using Greek letters, going in this order from the brightest to the faintest according to the Greek alphabet: α, β, γ, δ.

Let the children write down the Greek letters and practice:

Now take the card of the constellation of Orion and ask the children to identify the brightest stars and to write beside them the corresponding Greek letters. By using the Hipparchus scale (going from 1 to 6) let them assign a brightness (magnitude) to the brightest stars as shown in the table below.

**CURRICULUM**

**Space Awareness curricula topics (EU and South Africa)**

The journey of ideas, Stars, constellations

**CONCLUSION**
This activity helps children recognise stellar constellations in a playful way. It follows the ancient tradition of telling stories that are used as a method to easily remember constellations and their relative position in the sky. Cards are introduced as an easy to use resource to reinforce the patterns of stellar constellations. In addition, the children learn to work with a scientific mindset by estimating the brightness of stars, the same way that Hipparchus did.

ASTROEDU

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