

Roads on the sky

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Justification

- This material is designed for teachers of children before starting primary school. Some content is presented to give the teacher more resources, although they may be too ambitious for such young children, but the questions that they may sometimes ask require more extensive knowledge to be able to properly explain the issues that may arise.

Goals

- Know the constellations in the area of the sky where Orion is located.
- Observe some celestial bodies in different stages of evolution



Astronomy with the naked eye and/or with binoculars

Many people have been fascinated by looking at the sky, with the naked eye, especially if they were in an elevated place, far from a city and on a moonless night. There are many who believe that it cannot be observed without a telescope. But it is much easier to get binoculars. They are a good instrument to use with children since both eyes are used to observe.

Binoculars increase the field of vision and concentrate light in a much smaller area, allowing us to see objects that are faint and, at the same time, increase in their apparent size.



Astronomy with binoculars

The two basic characteristics of binoculars are their magnification and their diameter. For example, in 10x70 binoculars, the first number, 10, tells us that they have 10x magnification and the second number tells us that their diameter is 70 millimeters.

What are the most suitable binoculars for astronomy?
Although it is difficult to decide, a good option may be from 7 to 10x magnification and a minimum diameter of 50 mm.



Astronomy with binoculars

We must prevent people from holding the binoculars with their arms alone, as the vibrations make it very difficult to focus on observing the image. It is good to put the binoculars on a photography tripod or at least rest your elbows somewhere or just sit with the back of the chair between your legs and rest your arms on the backrest.



Astronomy with binoculars

We will be surprised by the objects that can be seen.

The most spectacular are the Moon, with its seas and craters, the satellites of Jupiter, the Orion nebula, the Andromeda galaxy...

Let's start with some constellations



Main constellations of the Orion area

In the Orion zone there are many objects that are related to different stages of stellar evolution, that is why we encourage all teachers to observe, recognize and share with their students the stars in this region of the sky using the asterism of the great “6” or the great “9” which are explained in the following slides.

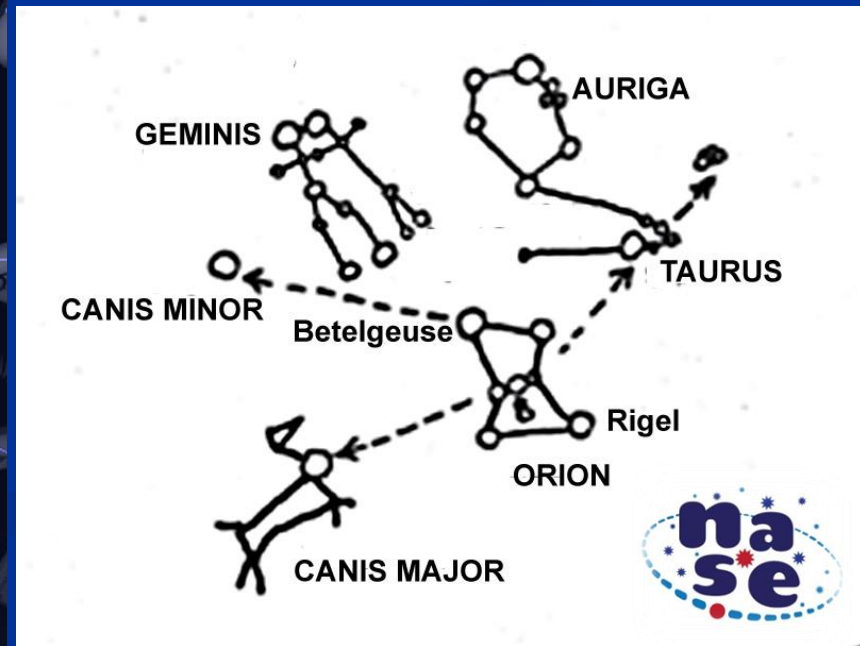


Main constellations of the Orion area

- Orion represents, according to Greek mythology, a giant in a hunting scene with Lepus and Taurus accompanied by two dogs Canis Major and Canis Minor and on the other side of Taurus are the Pleiades (7 sisters) with whom Orion fell in love.



Main constellations of the Orion area

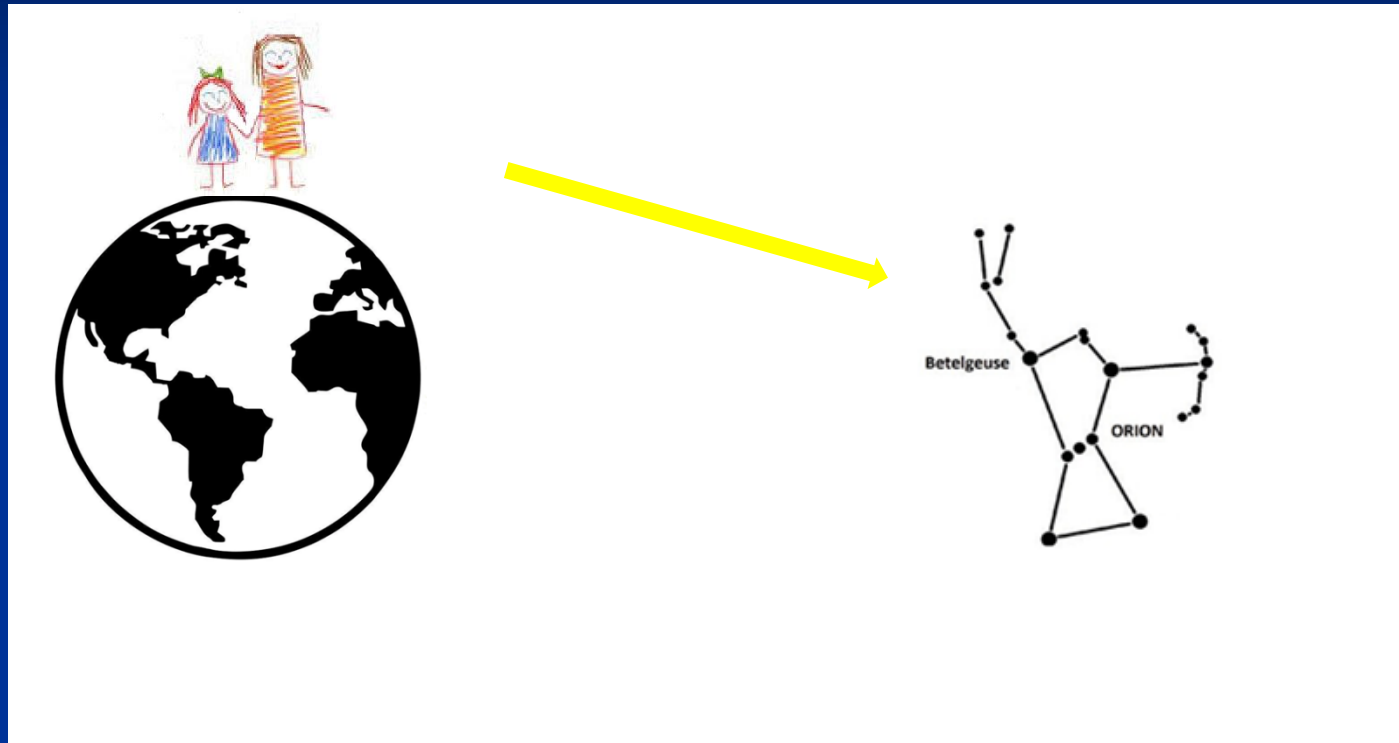


Activity 1: Orion as seen from different terrestrial hemispheres

Orion is seen with a different orientation (relative to the plane of the horizon) depending on the observation point on the Earth's surface and the time of the observation.



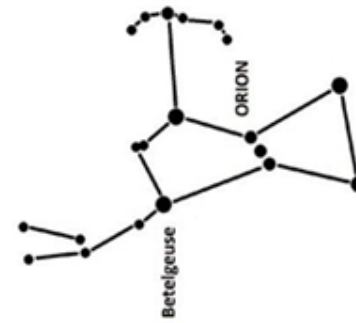
Activity 1: Orion as seen from different terrestrial hemispheres



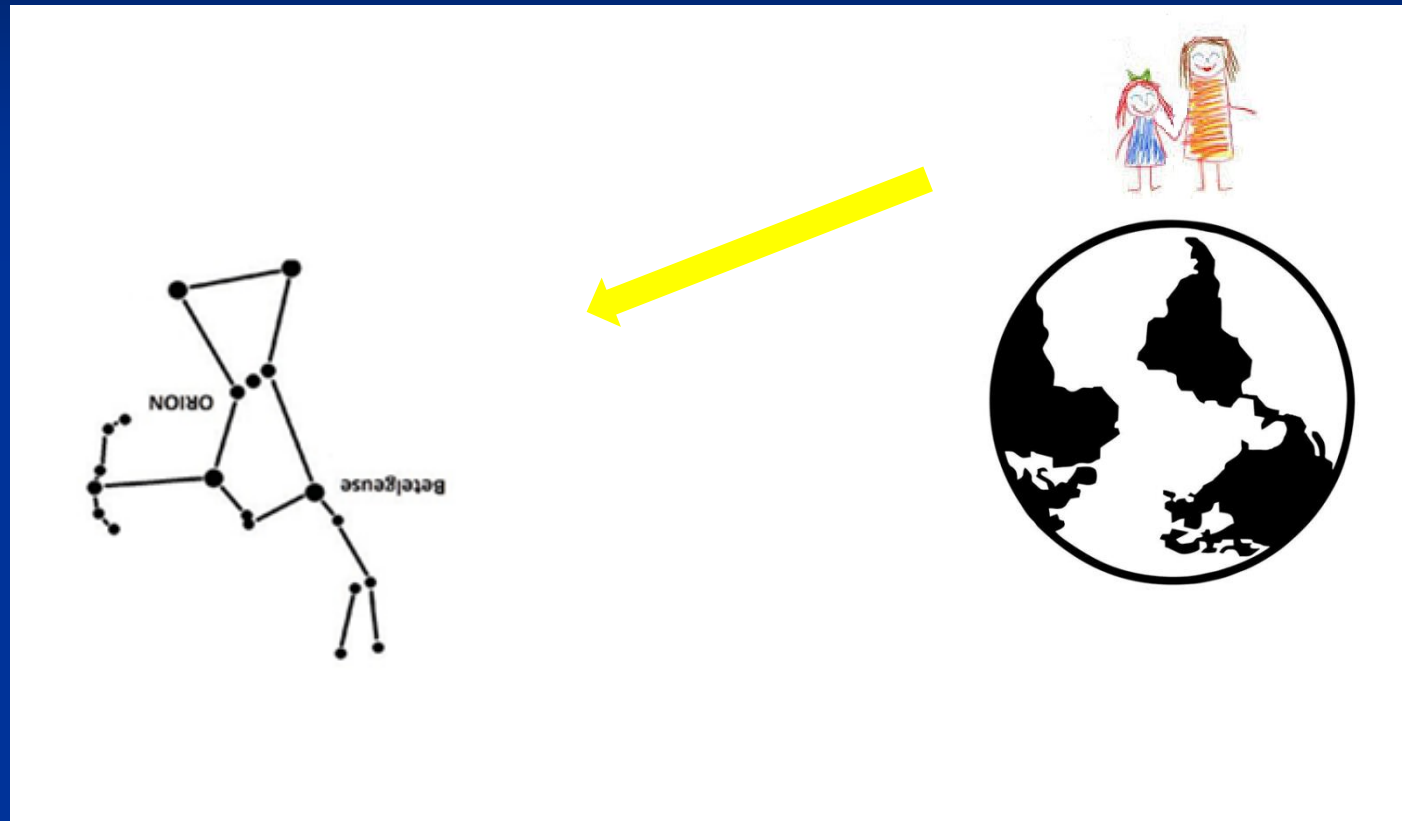
If the children are at the North Pole, they see Orion well positioned (head and shoulders above and feet below).

Activity 1: Orion as seen from different terrestrial hemispheres

If the children are in the equatorial zone they see Orion lying down, for example the head and shoulders on the left, the belt in the center and the feet on the right (or all on the other side as the case may be)



Activity 1: Orion as seen from different terrestrial hemispheres



If the children are at the South Pole, they see Orion “upside down”, with his head down, and his feet up.

Activity 1: Orion as seen from different terrestrial hemispheres



H. North



Equatorial Zone

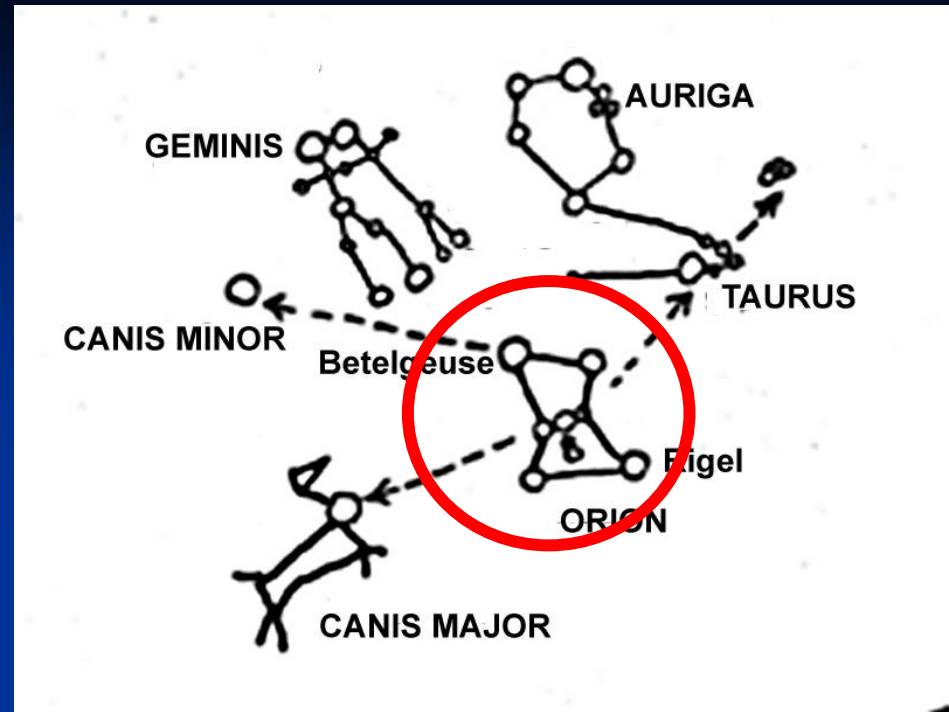


H. South

We present the constellations close to the Orion zone in both hemispheres, but the reader should only consider the slides for their hemisphere, depending on the associated white or yellow color.



Main constellations of the Orion area. North Hemisphere

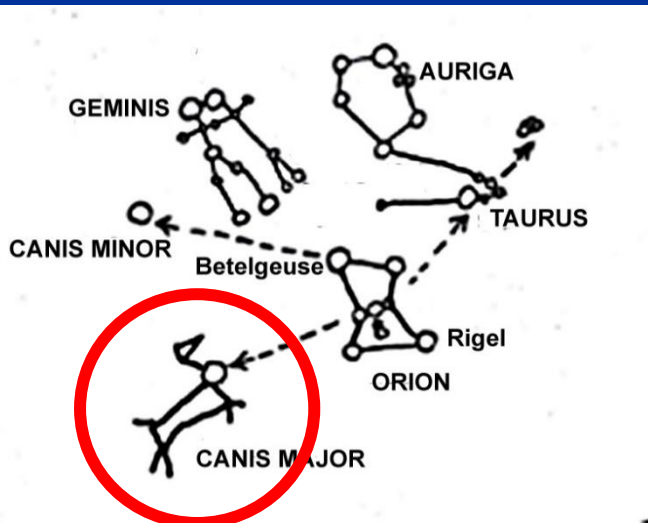


Constellation of Orion: The constellation of Orion is distinguished by a rectangle with three very close and aligned stars (The Orion's belt), which are in the center of the rectangle. Betelgeuse, the orange star, is at the top left of the rectangle.

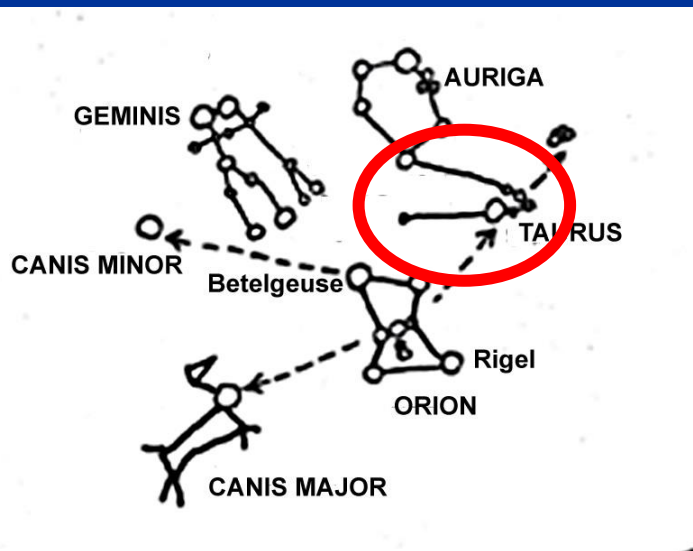
Main constellations of the Orion area. North Hemisphere

The Sirius star of Canis Major:

We follow the downward direction indicated by the three stars of Orion's belt, until we find a very bright star, Sirius. It is the brightest star that can be seen with the naked eye from mid-latitudes in the northern hemisphere.



Main constellations of the Orion area. North Hemisphere

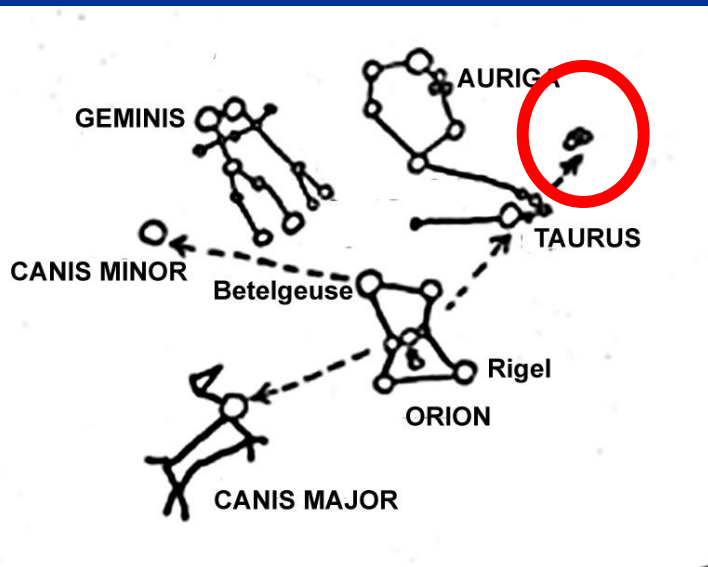


The constellation of Taurus:

We follow the direction indicated by Orion's belt, in the opposite direction to Sirius, until we find (a little higher than the indicated direction) a reddish star, Aldebaran, one of the eyes of Taurus.



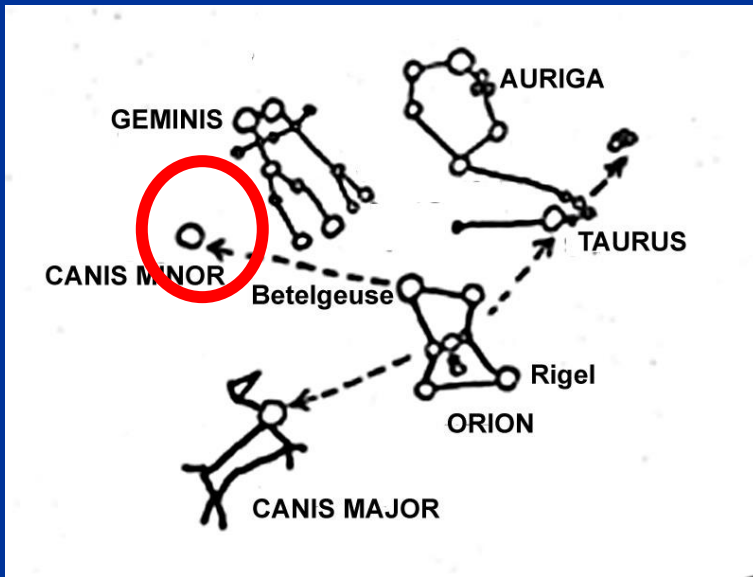
Main constellations of the Orion area. North Hemisphere



The Pleiades cluster:

We continue in the direction and sense that we have used to find Taurus, a little further, until we find a group of stars very close together: the Pleiades.

Main constellations of the Orion area. North Hemisphere



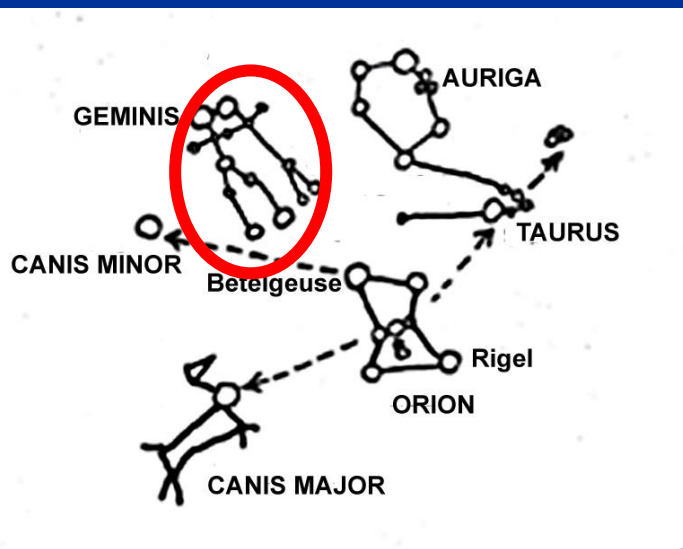
The Procyon star of the
Canis Minor:

Following the two stars that
are on Orion's shoulders
you can locate the brightest
star in its area, Procyon, of
the Canis Minor.



Main constellations of the Orion area. North Hemisphere

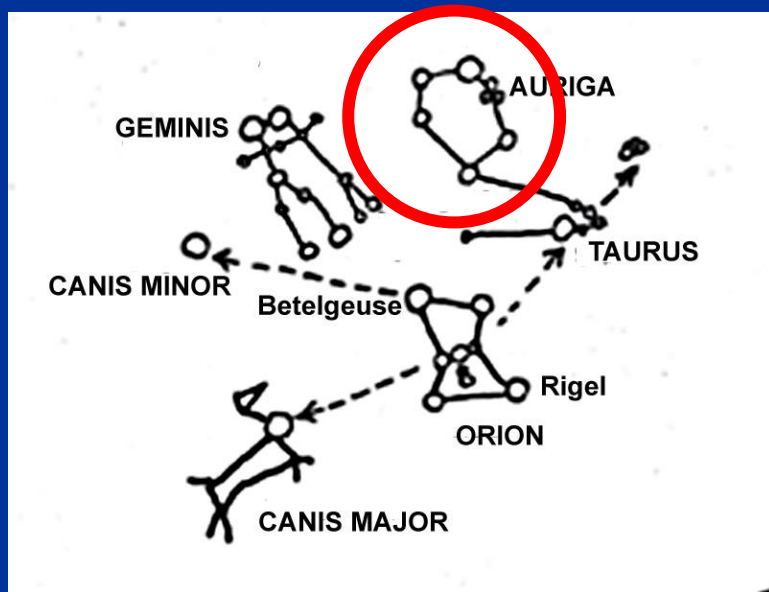
The constellation of Gemini:
Above Orion there are two stars
that stand out in their area for
their brilliance and for being very
close together: Pollux and Castor
from the constellation of Gemini.



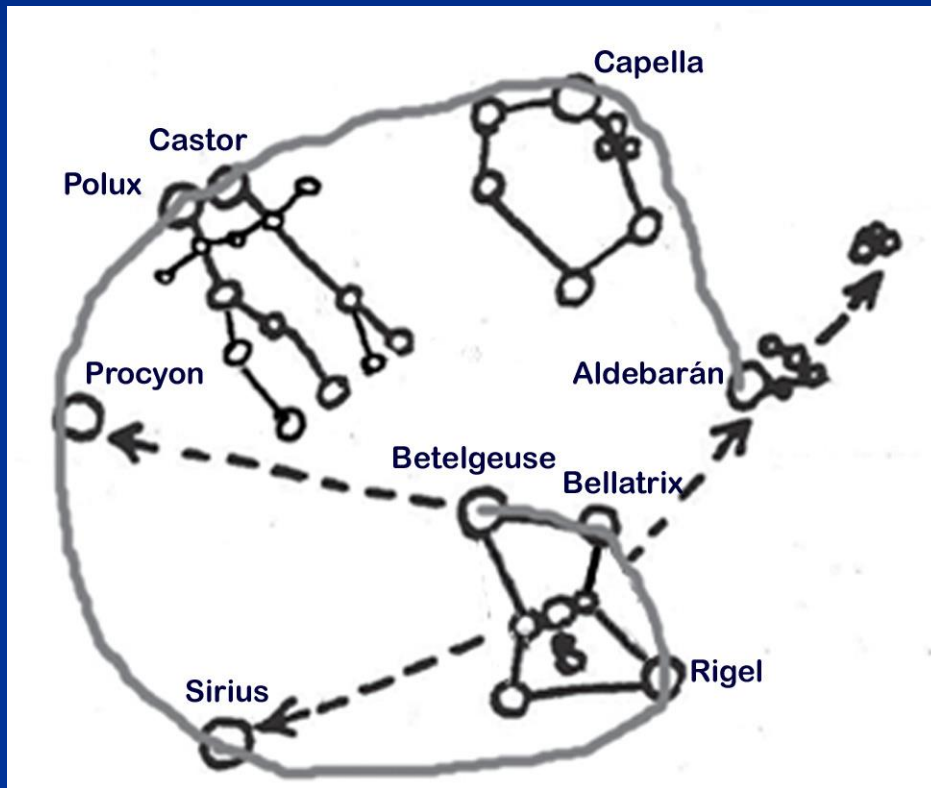
Main constellations of the Orion area. North Hemisphere

The Auriga constellation:

Above Orion, between Gemini and Taurus there is a pentagon, the constellation of the Auriga with the brightest star in the area, called Capella.

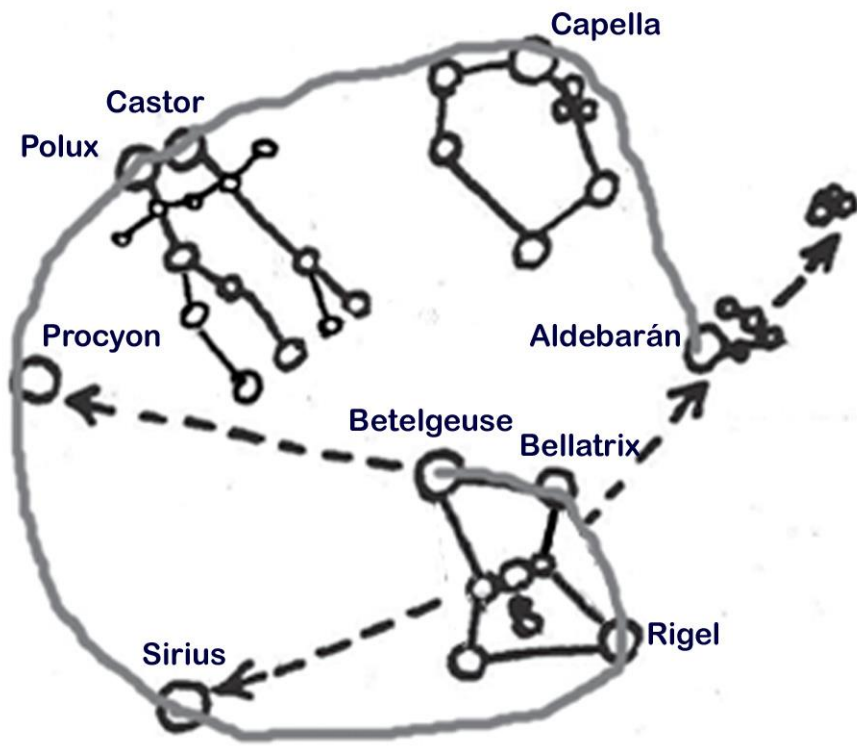


Main constellations of the Orion area. North Hemisphere



We will begin this great “6” in the two upper stars of the Orion rectangle, in what would be the two shoulders of the giant Orion. We start from the left shoulder (Betelgeuse), then we go to the other shoulder (Bellatrix), we continue along the right knee of the giant (Rigel).

Main constellations of the Orion area. North Hemisphere



Sirius in Canis Major,
Procyon in Canis Minor,
Pollux and Castor in the
constellation Gemini,
Capella is in Auriga and
finally we end up in
Aldebaran, the bloodshot
eye of the constellation
Taurus.

Main constellations of the Orion area.

North Hemisphere, the great “6”

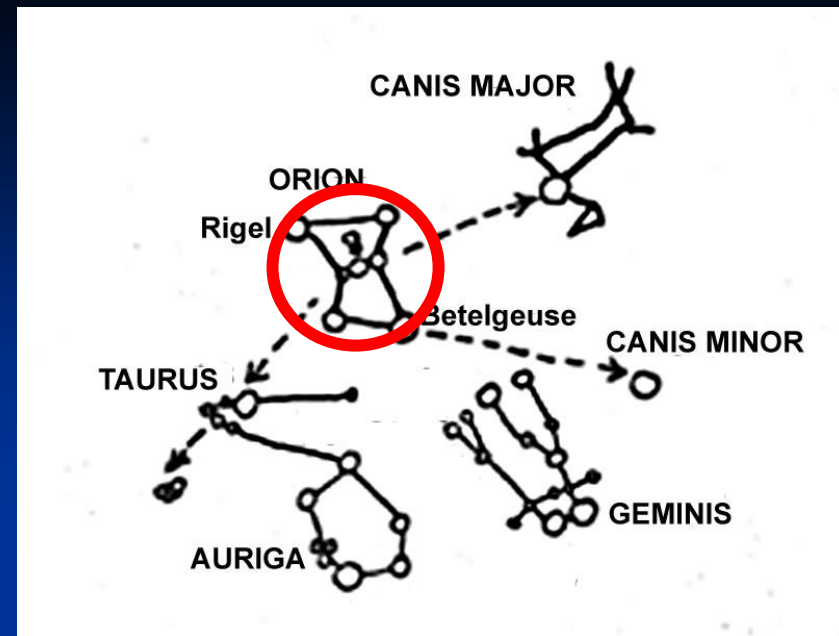


Main constellations of the Orion area.

North Hemisphere, the great “6”



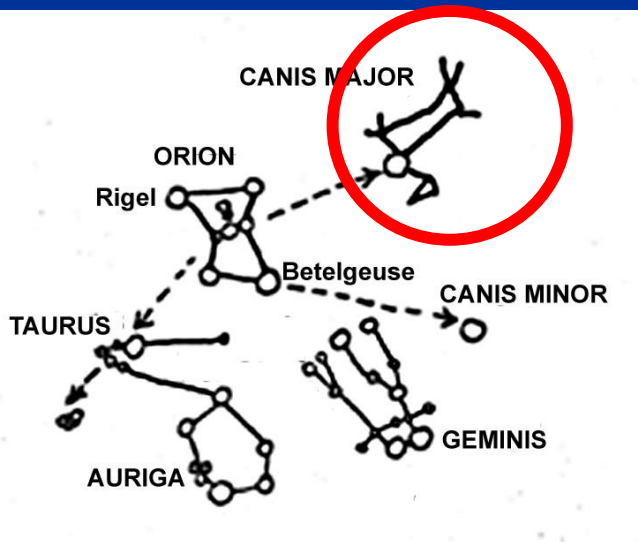
Main constellations of the Orion area. Southern Hemisphere



Constellation of Orion: The constellation of Orion is distinguished by a rectangle with three very close and aligned stars (the Orion's belt), which are in the center of the rectangle. Betelgeuse, the orange star, is at the bottom right of the rectangle.

Main constellations of the Orion area. Southern Hemisphere

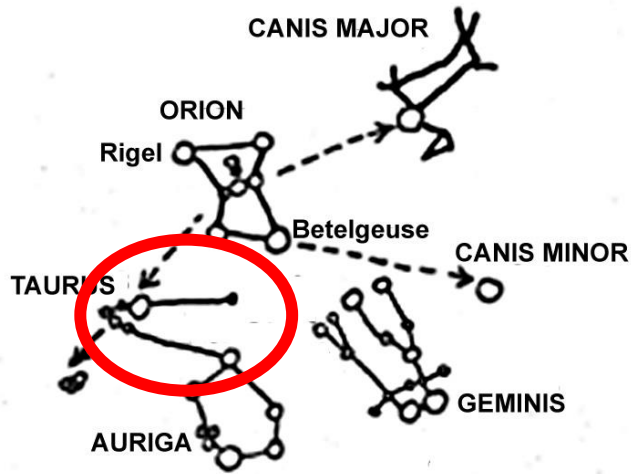
The star Sirius of Canis Major:
We follow the direction in the
ascending direction indicated by
the three stars of Orion's belt, until
we find a very bright star, Sirius. It
is the brightest star in the
southern hemisphere.



Main constellations of the Orion area. Southern Hemisphere

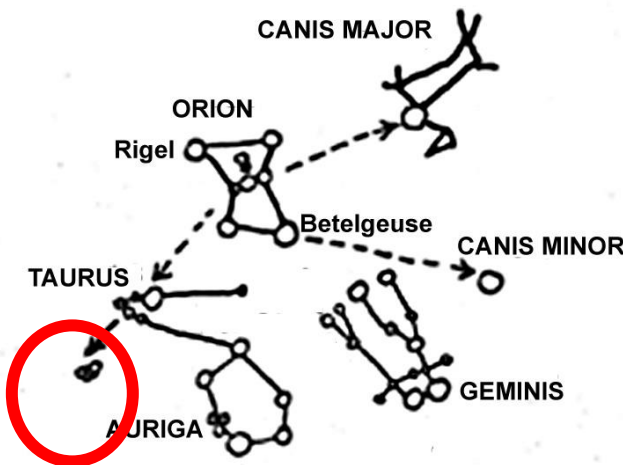
The Taurus constellation:

We follow the direction indicated by Orion's belt, in the opposite direction to Sirius, until we find (a little lower than the indicated direction) a reddish star, Aldebaran, one of the eyes of Taurus.

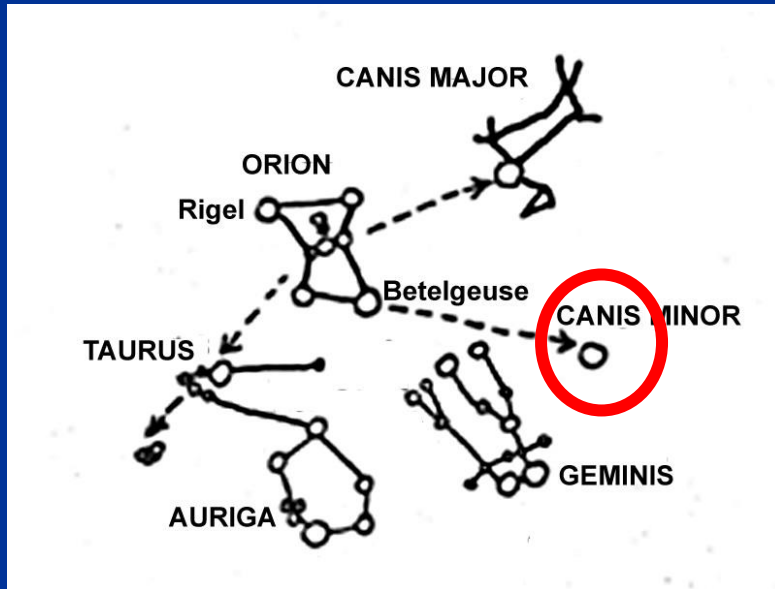


Main constellations of the Orion area. Southern Hemisphere

The Pleiades cluster: We continue in the direction and sense that we have used to find Taurus, a little further, until we find a group of stars very close together: the Pleiades.



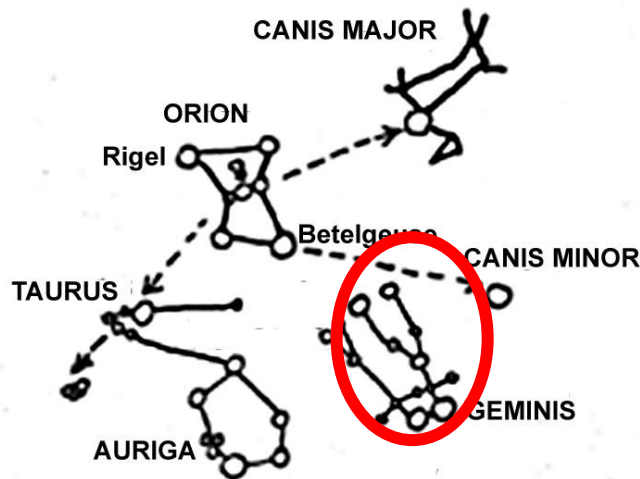
Main constellations of the Orion area. Southern Hemisphere



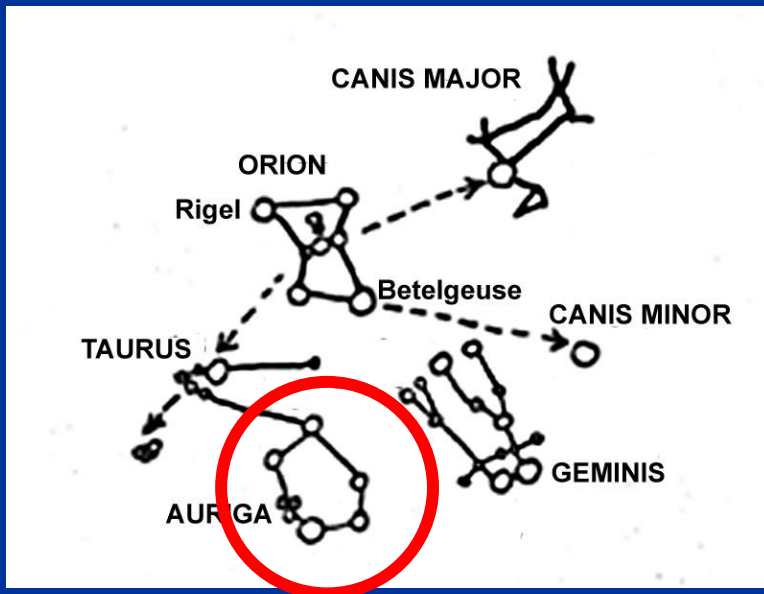
The star Procyon of the **Canis Minor**: Following the two stars that are on Orion's shoulders, you can locate the brightest star in its area, Procyon, of the Canis Minor.

Main constellations of the Orion area. Southern Hemisphere

The constellation of Gemini:
Between Aldebaran and
Procyon, below both and
Orion, there are two stars that
stand out in their area for their
brilliance and for being very
close together: Pollux and
Castor in the constellation of
Gemini.

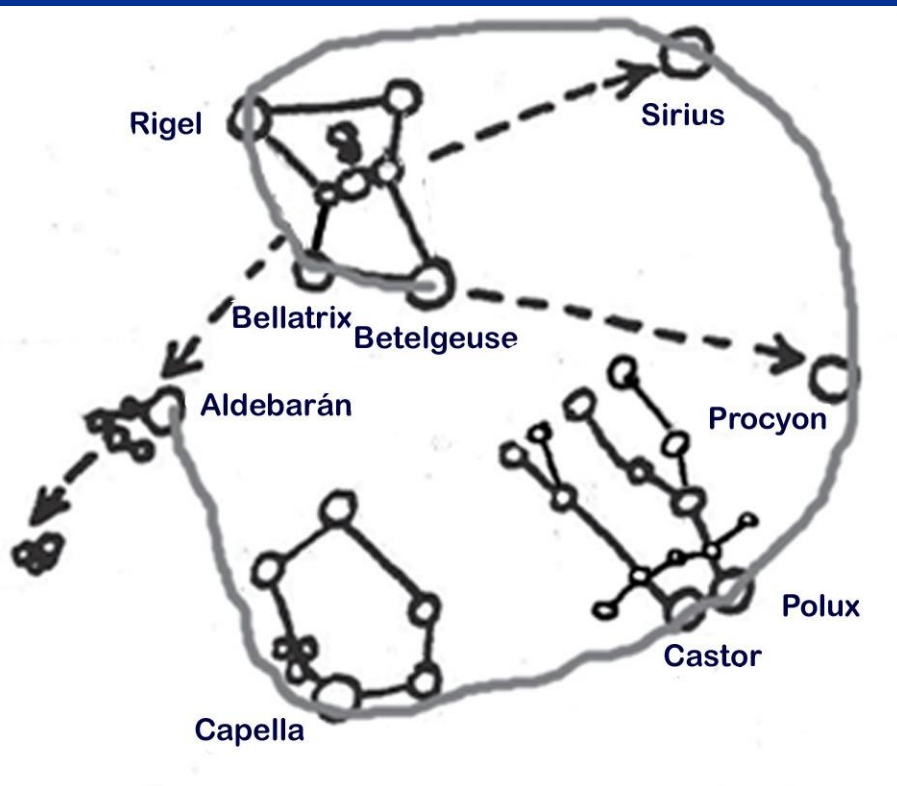


Main constellations of the Orion area. Southern Hemisphere



The Auriga constellation:
Below Orion, between Gemini and Taurus there is a pentagon, the constellation of Auriga with the brightest star in the area, called Capella.

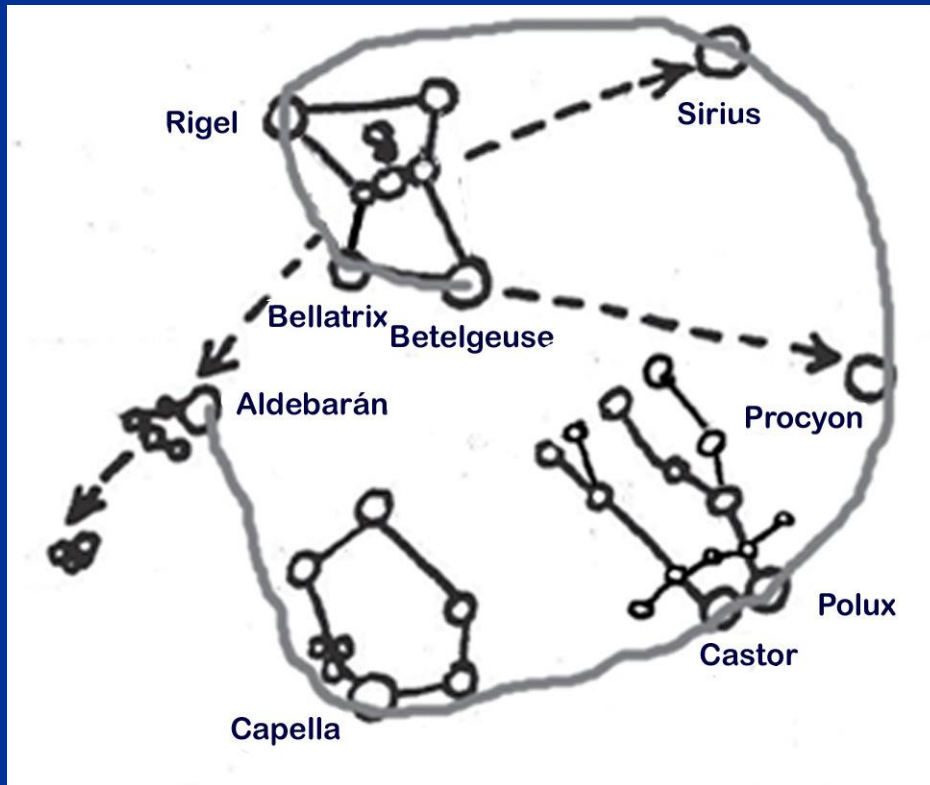
Main constellations of the Orion area. Southern Hemisphere



We will begin the big “9” in the two lower stars of the Orion rectangle, in what would be the two shoulders of the giant Orion (which is upside down). We start from the left shoulder (Betelgeuse), then we go to the other shoulder (Bellatrix), we continue along the right foot of the giant (Rigel).



Main constellations of the Orion area. Southern Hemisphere



Sirius in Canis Major,
Procyon in Canis Minor,
Pollux and Castor in the
constellation of Gemini
(also upside down),
Capella in Auriga and
finally we end up in
Aldebaran, the
bloodshot eye of the
constellation of Taurus.



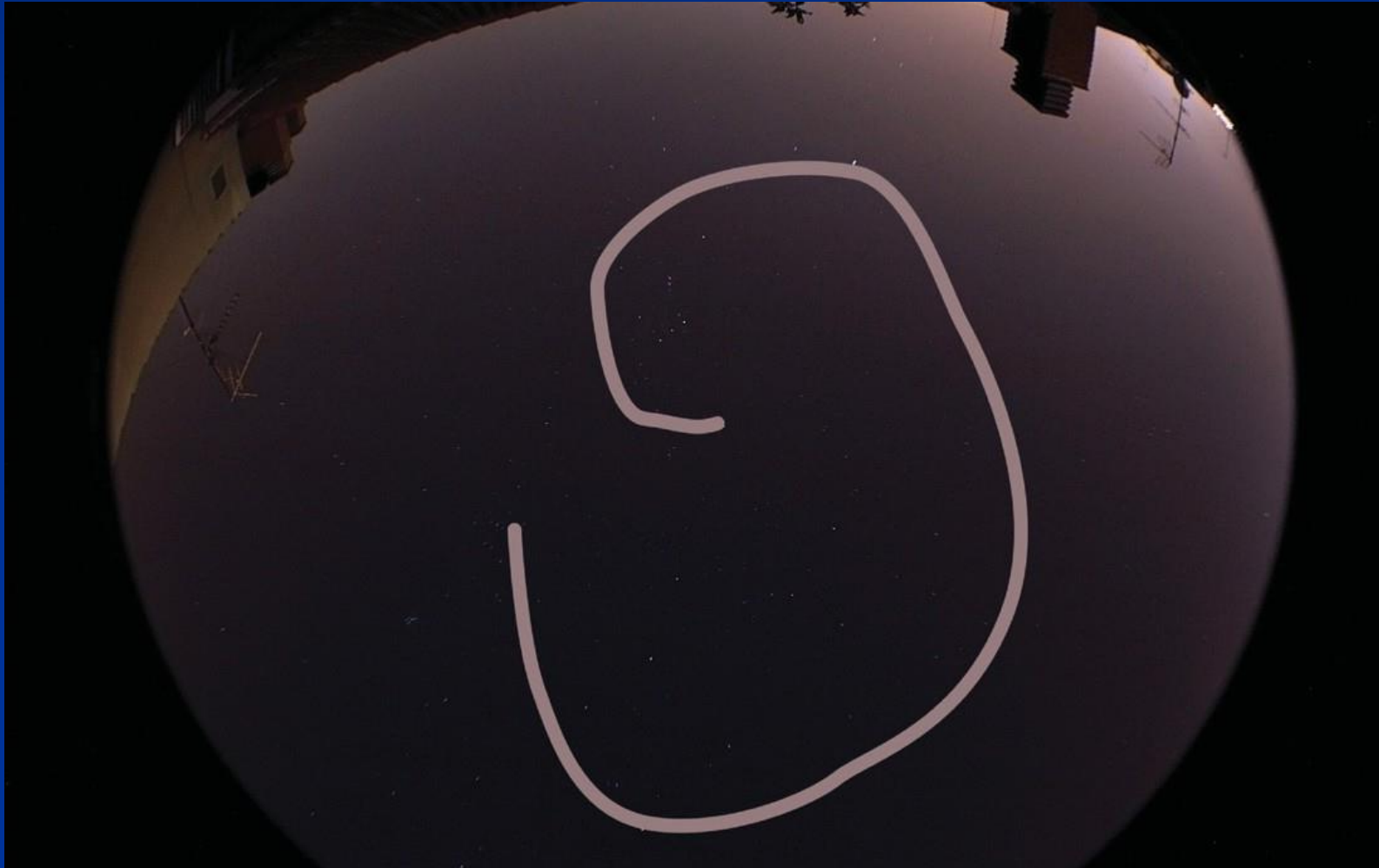
Main constellations of the Orion area.

Southern Hemisphere, the great “9”



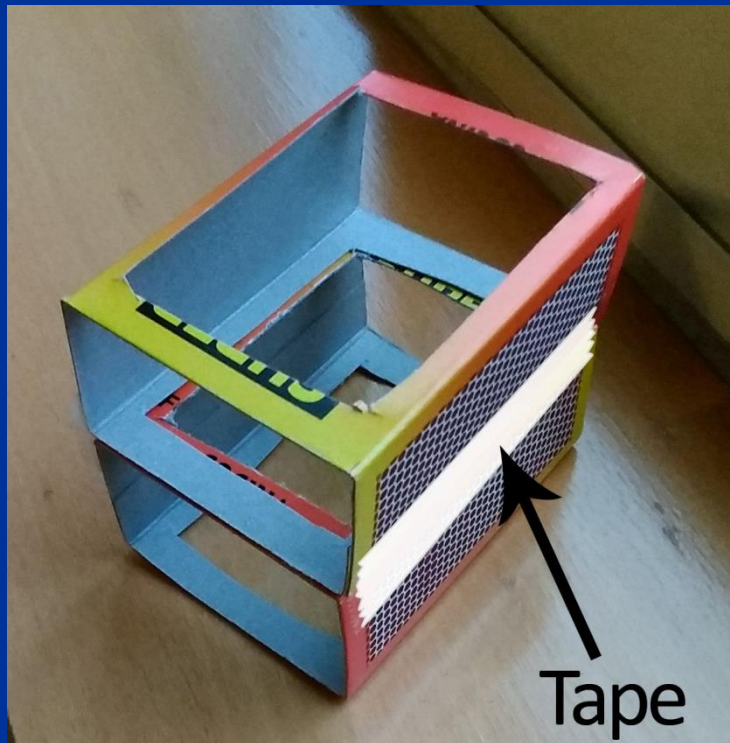
Main constellations of the Orion area.

Southern Hemisphere, the great “9”



Activity 2: Constellation projector

To display the constellations on the classroom wall, we can build this simple projector with several matchboxes and a cell phone flashlight.



We cut out the outer faces of two matchboxes, and joined them with adhesive tape, as seen in the image.



Activity 2: Constellation projector

In one of the interior boxes we draw a constellation, for example Cassiopeia. With a pin we pierce the stars that form it.



In the second inner box, we cut out almost the entire base. We introduce this one and the one with the constellation drawn in their places, as seen in the image.

Activity 2: Constellation projector

With the help of the phone flashlight, we can project the constellation on the classroom wall.

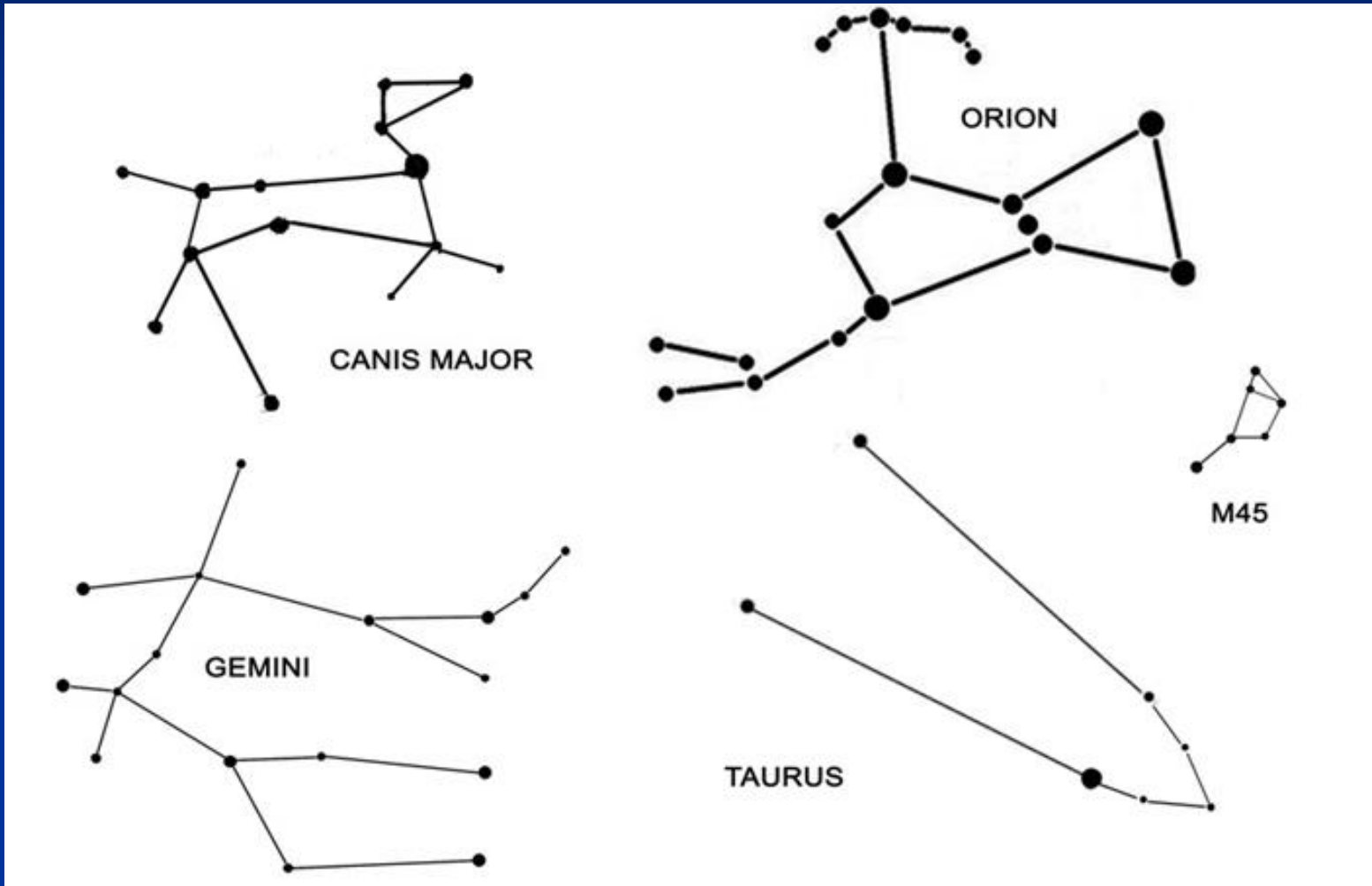


Activity 2: Constellation projector

We can make other constellations with more boxes, with the attached template.

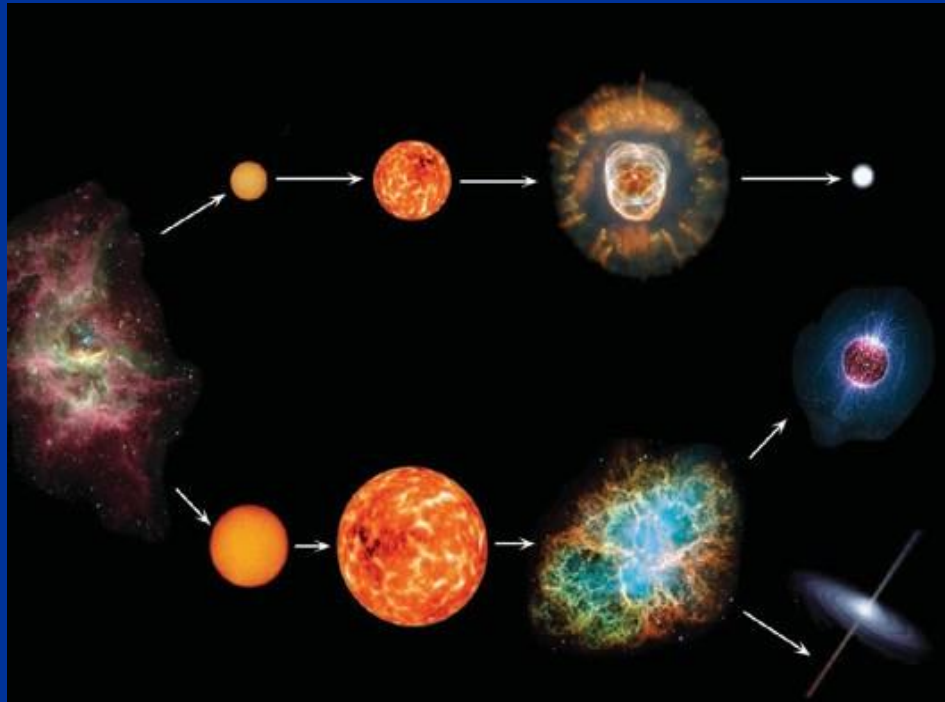


Activity 2: Constellation projector



Activity 3: Stellar evolution in 5 steps

Stars form in a cloud of dust. It generates an open cluster and evolves into adult stars within the main sequence, where they are in equilibrium for most of their lives.



In their final phase, and depending on their mass, they can give rise to a supernova explosion generating a black hole, or a neutron star, or the less massive ones, like our Sun, a planetary nebula with a central white dwarf.

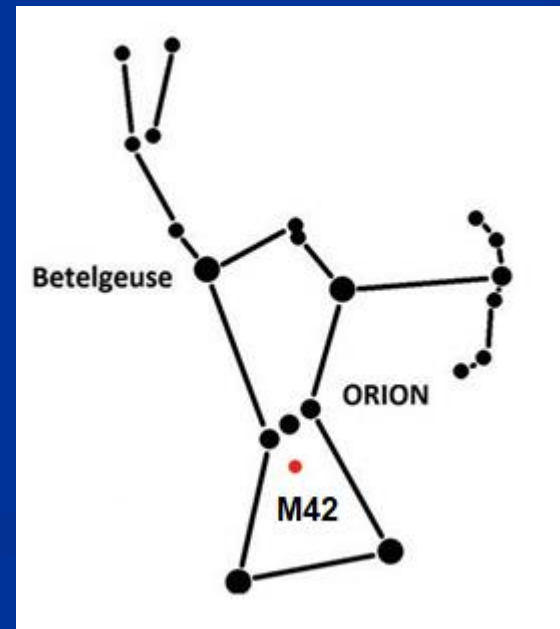


Activity 3: Stellar evolution (step 1)

The Orion Nebula M42 is a “nursery” of stars within a cloud of gas. With binoculars you can see the reddish nebula.



(Credit: NASA/ ESA Hubble)

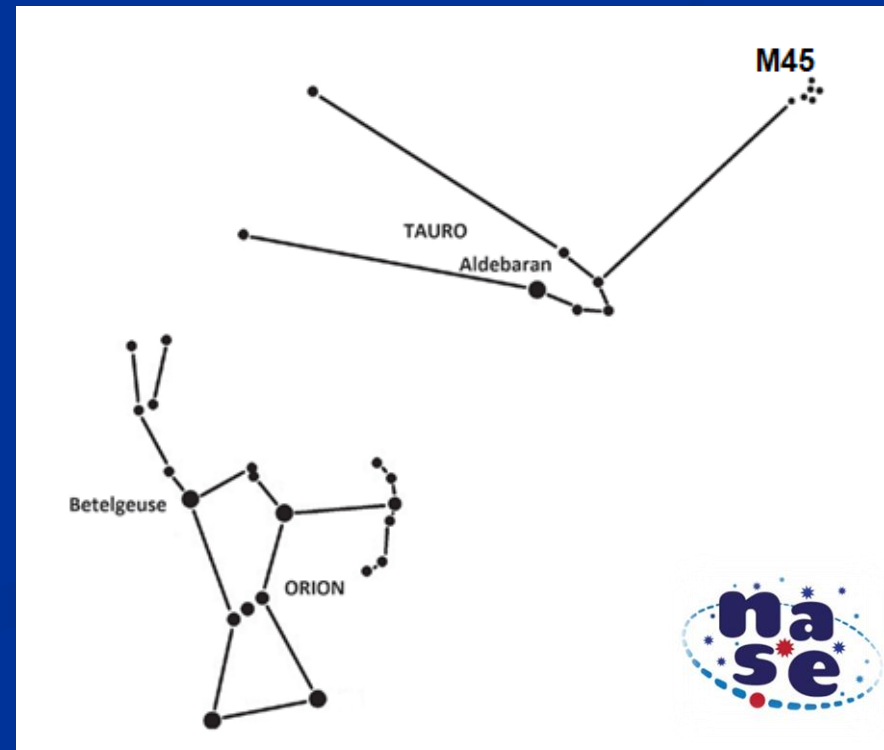


Activity 3: Stellar evolution (step 2)

The Pleiades open cluster M45 is a “nursery” for newborn stars. At first glance you can see 6 or 7 of them. With binoculars you can see up to 30, but there are hundreds of them born from the same cloud.

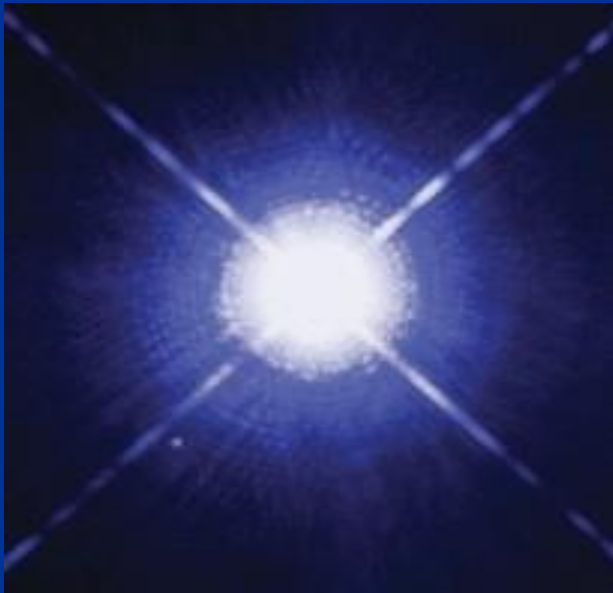


(Crédito: M.T. Russell)

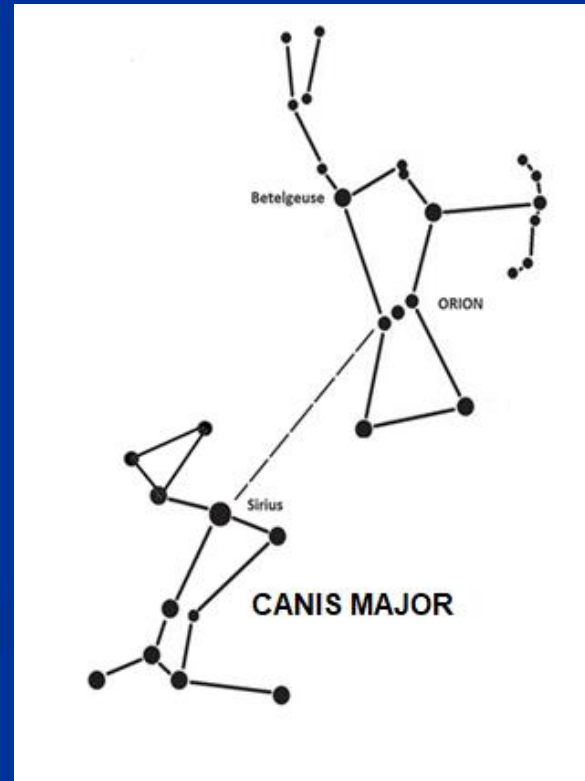


Activity 3: Stellar evolution (step 3)

Sirius is an example of a main sequence star. We can take others as an example, if we choose Sirius it is because it is the brightest of all those seen in our latitudes.

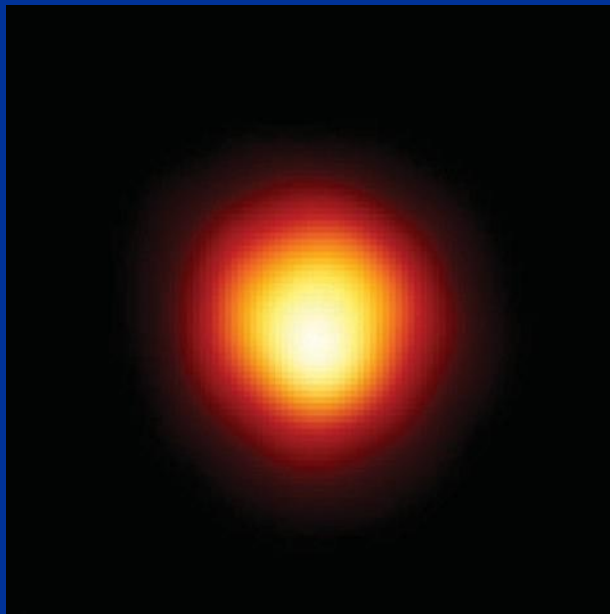


(Credit: NASA/ ESA Hubble)

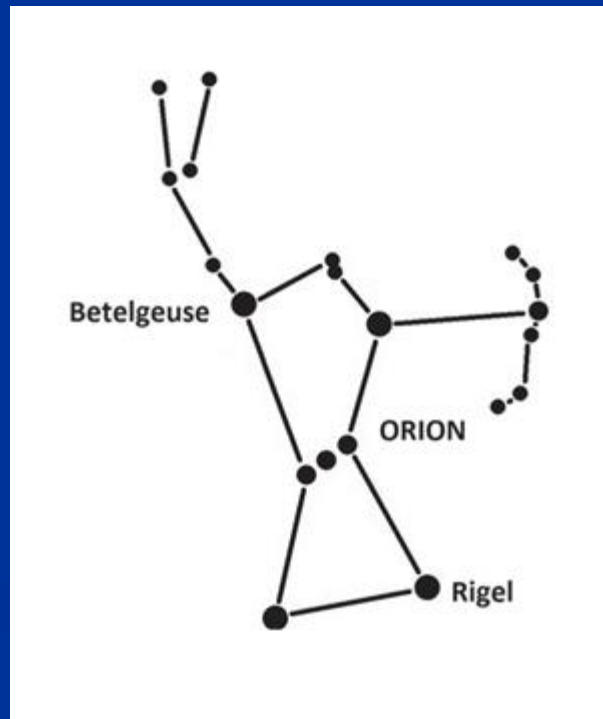


Activity 3: Stellar evolution (step 4)

Betelgeuse is in its final stage. When it runs out of all its hydrogen, it begins to burn its helium and expands. There are new nuclear reactions and it expands and contracts continuously (variable).



(Credit: A. Dupree CIA, NASA)



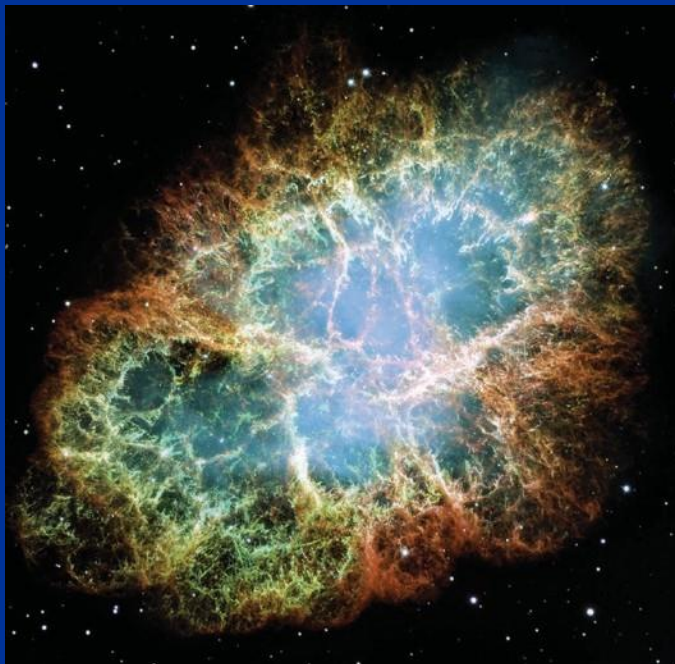
Activity 3: Stellar evolution (step 5)

The remains of dead stars are objects that can only be observed with a telescope, but it is good to show where these objects are located even if we cannot observe them with the naked eye or with binoculars due to their weak luminosity (more than one option: 5a and 5b)

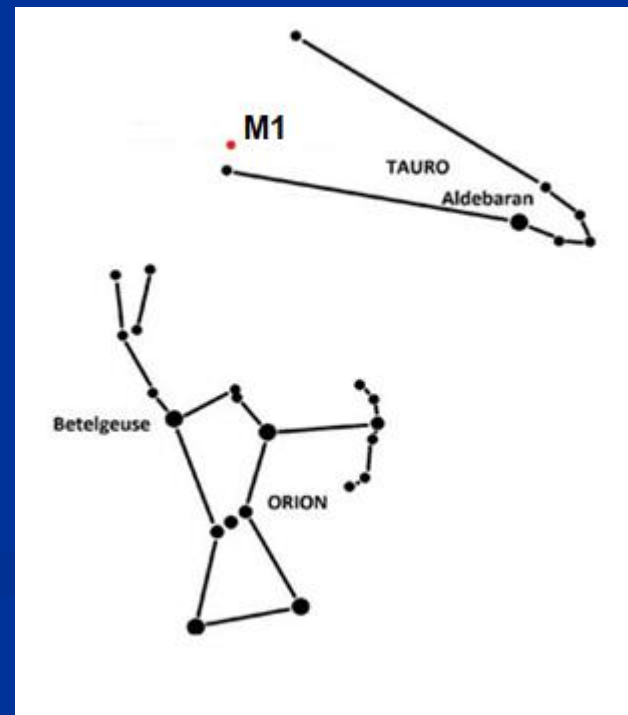


Activity 3: Stellar evolution (step 5a)

Crab Nebula M1. Remains of gas from a supernova observed by the Chinese in 1054. The central area of the star collapses into a highly dense object. The star rotates on itself, twisting the magnetic field and gives rise to a pulsar with a periodicity of 0.33 sec.

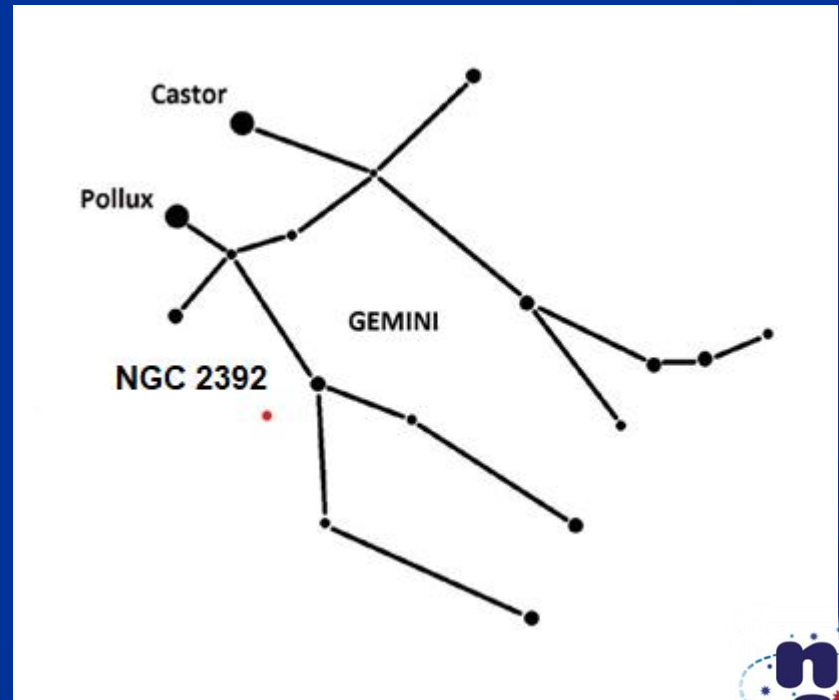


(Credit: NASA/ ESA Hubble)



Activity 3: Stellar evolution (step 5b)

Eskimo Nebula or Clown Face Nebula NGC 2392. It is an example of a planetary nebula, that is, the type of nebula that the Sun will give rise to when it ends its life in 5,000 million years.



(Credit: NASA/ ESA A. Fruchter and ERO)



Activity 4: The 5 steps in the great “6” or “9”

We will place on the big G drawings of a person as a fetus, new born, adult, old and a skull



(fetus)



(new born)



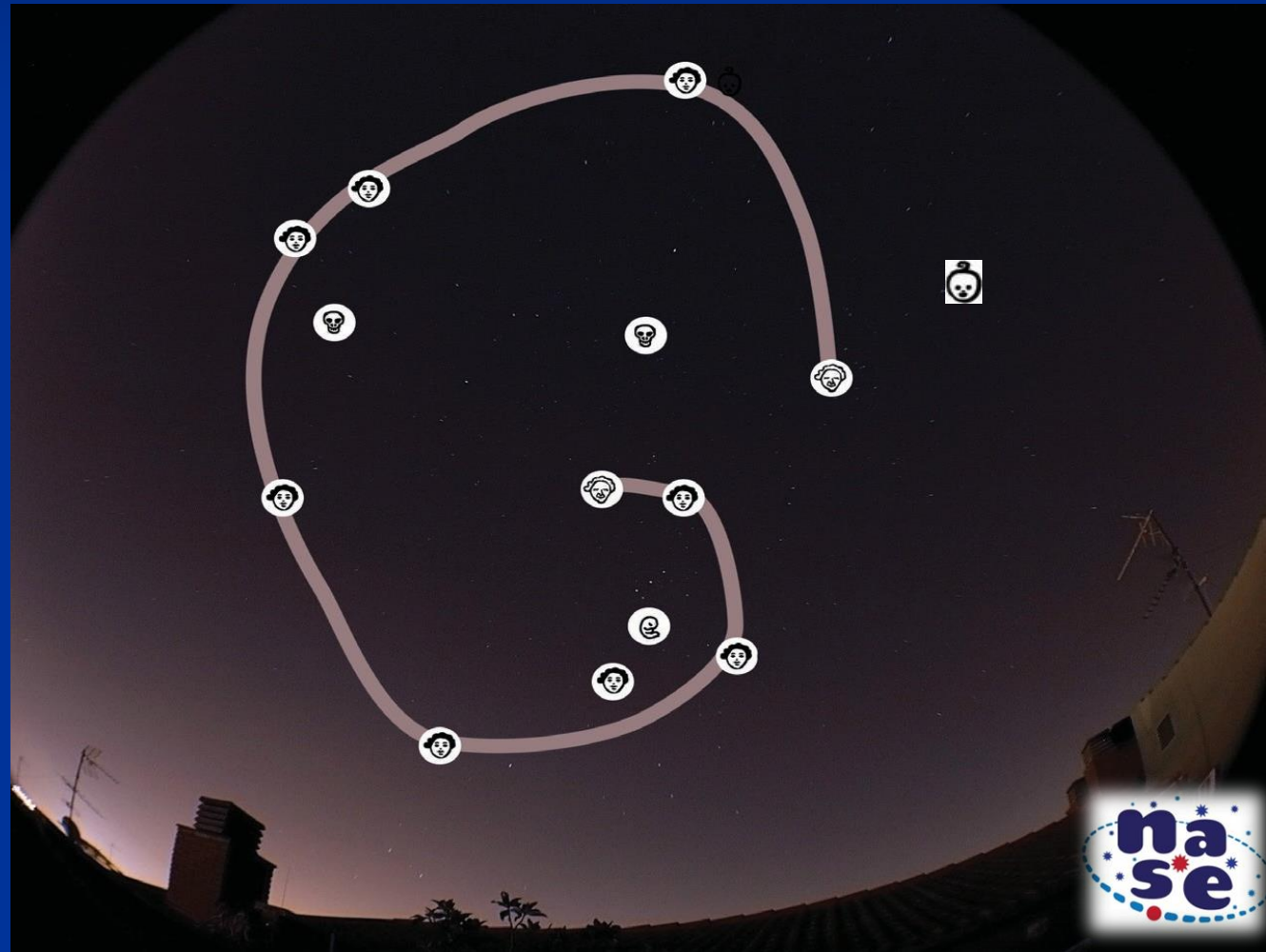
(adult)



(old)



(skull)



Conclusions

- Discover and enjoy the night sky
- Observe various types of objects.



Thank you very much
for your attention!

