Orion´s sky
猎户座的天空

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Justification
前言

- 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.
- 本教材是为学龄前儿童教师设计的。有些内容的呈现是为了给教师提供更多的资源。虽然这部分内容对学龄前儿童来说有些难，但是教师需要更广泛的背景知识才能恰当地给儿童解释他们提出的一些问题。

Goals
教学目标

- Know the constellations in the area of the sky where Orion is located.
- 了解猎户座所在天区的星座。
- Observe some celestial bodies in different stages of evolution
- 观测处于不同演化阶段的天体。

Astronomy with the naked eye and/or with binoculars
肉眼 / 双筒望远镜天文学

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, increased in their apparent size.

许多人喜欢凭借肉眼欣赏星空，尤其是身处高处、远离城市且在无月夜时。很多人都认为没有望远镜就无法进行天文观测，但使用双筒望远镜**就容易得多。双筒望**远镜是与孩子们一起进行观测的好工具，因为它使**用双眼**进行观测。双筒望远镜扩大了视野范围，并将光线集中在一个小**得多的区域**，让我们能够看到暗淡的物体，同时增大物体的视大小。

Astronomy with binoculars
双筒望远镜天文学

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.

双筒望远镜的两个基本参数是放大倍率和物镜直径。例如，10x70 的双筒望远镜，第一个数字 “10” 表示其放大倍率为 10 倍，第二个数字 “70” 表示物镜直径为 70 毫米。

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.

什么样的双筒望远镜最适合天文观测呢？

虽然很难抉择，但一个不错的选择是放大倍率在 7 - 10 倍之间，且物镜直径最小为 50 毫米。

Astronomy with binoculars
双筒望远镜天文学

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.

我们要避免只用手臂握持双筒望远镜，因为手臂的晃动会使聚焦观测图像变得非常困难。将双筒望远镜安装在摄影三脚架上是个好办法，或者至少将肘部靠在某个地方，也可以反向跨坐在椅子上，将手臂放在椅背上。

Astronomy with binoculars
双筒望远镜天文学

We will be surprised by the objects that can be seen.
我们会被双筒望远镜里的天体所震撼。
The most spectacular are the Moon, with its seas and craters, the satellites of Jupiter, the Orion nebula, the Andromeda galaxy...
最壮观的景象包括：分布着月海和环形山的月球、木星的卫星、猎户星云和仙女星系等等
Let's start with some constellations
让我们从星座开始探索吧。

Main constellations of the Orion area
猎户座天区的主要星座

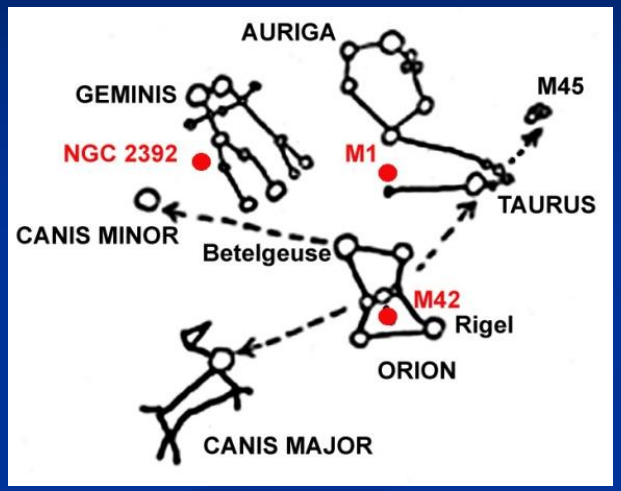
In the Orion zone there are many objects that are related to different stages of stellar evolution, that is why we encourage all teachers to observe, recognize and share with their students the stars in this region of the sky using the asterism of the great "6" or the great " 9" which are explained in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

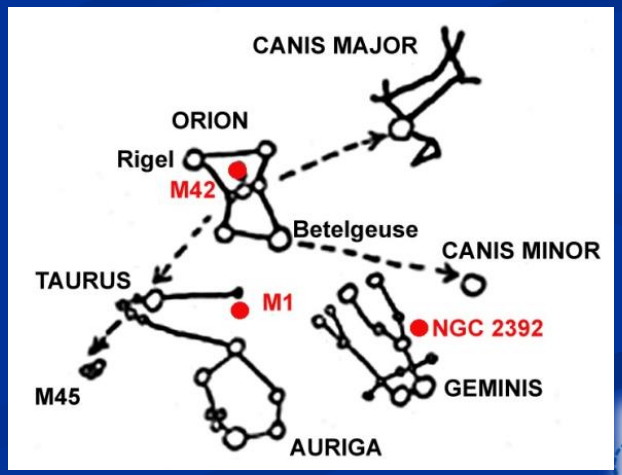
在猎户座天区，有许多处于恒星不同演化阶段的天体。因此，我们鼓励所有教师观察、识别该区域的恒星，并与学生分享。可以利用后面幻灯片中介绍的大 "6" 或大 "9" 星群来进行观测。

Main constellations of the Orion area
猎户座天区的主要星座

- 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.
- 在希腊神话中，猎户座代表一个在狩猎场景中的巨人，他与天兔座和金牛座在一起，身边还有大犬座和小犬座这两只“狗”。在金牛座的另一侧是昴星团（七姊妹星团），猎户座爱上了她们。

Main constellations of the Orion area
猎户座天区的主要星座



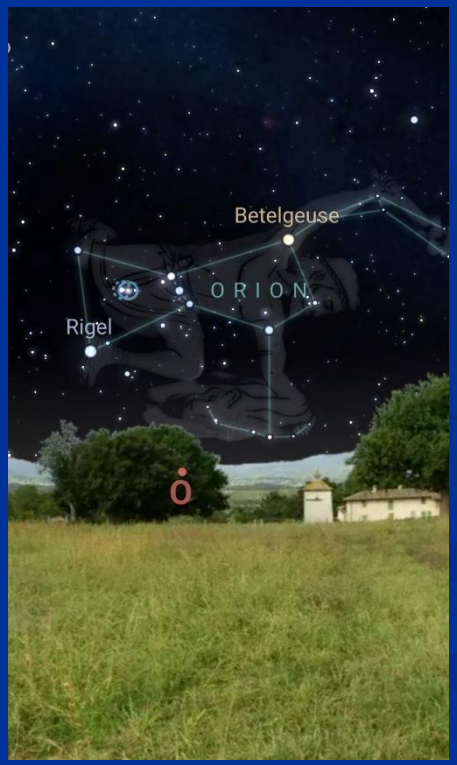


Activity 1: Orion as seen from different terrestrial hemispheres

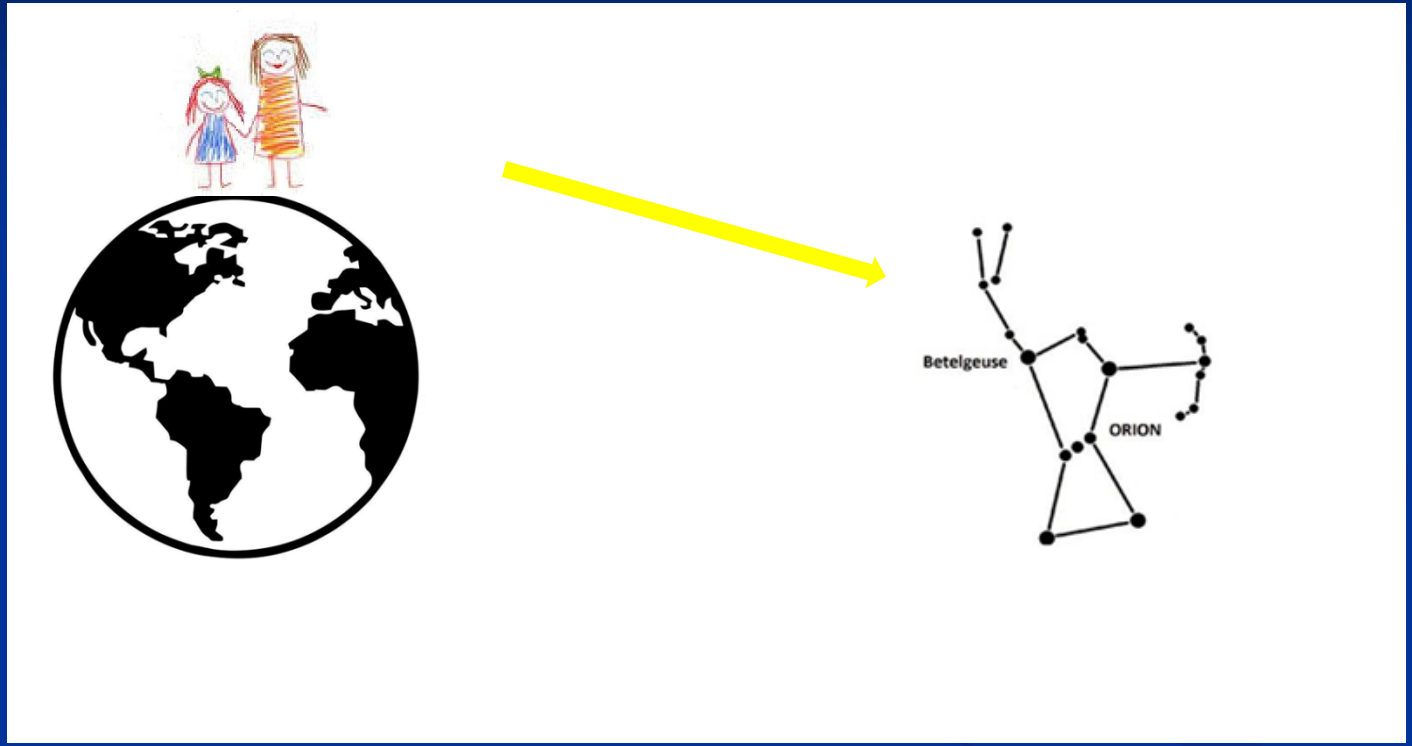
活动 1：从不同半球看猎户座

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.

猎户座相对于地平面的方向（观测点）会随着地球表面上的观测点和观测时间的不同而有所变化。



Activity 1: Orion as seen from different terrestrial hemispheres
活动 1：从不同半球看猎户座



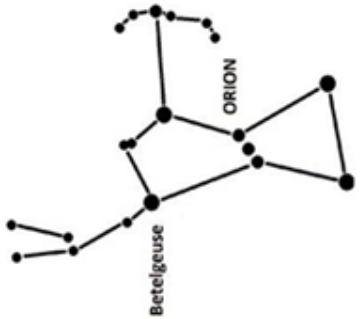
If the children are at the North Pole, they see Orion well positioned (head and shoulders above and feet below).
如果孩子们在北极，他们看到的猎户座位置是正常的（头和肩膀在上，脚在下）。

Activity 1: Orion as seen from different terrestrial hemispheres

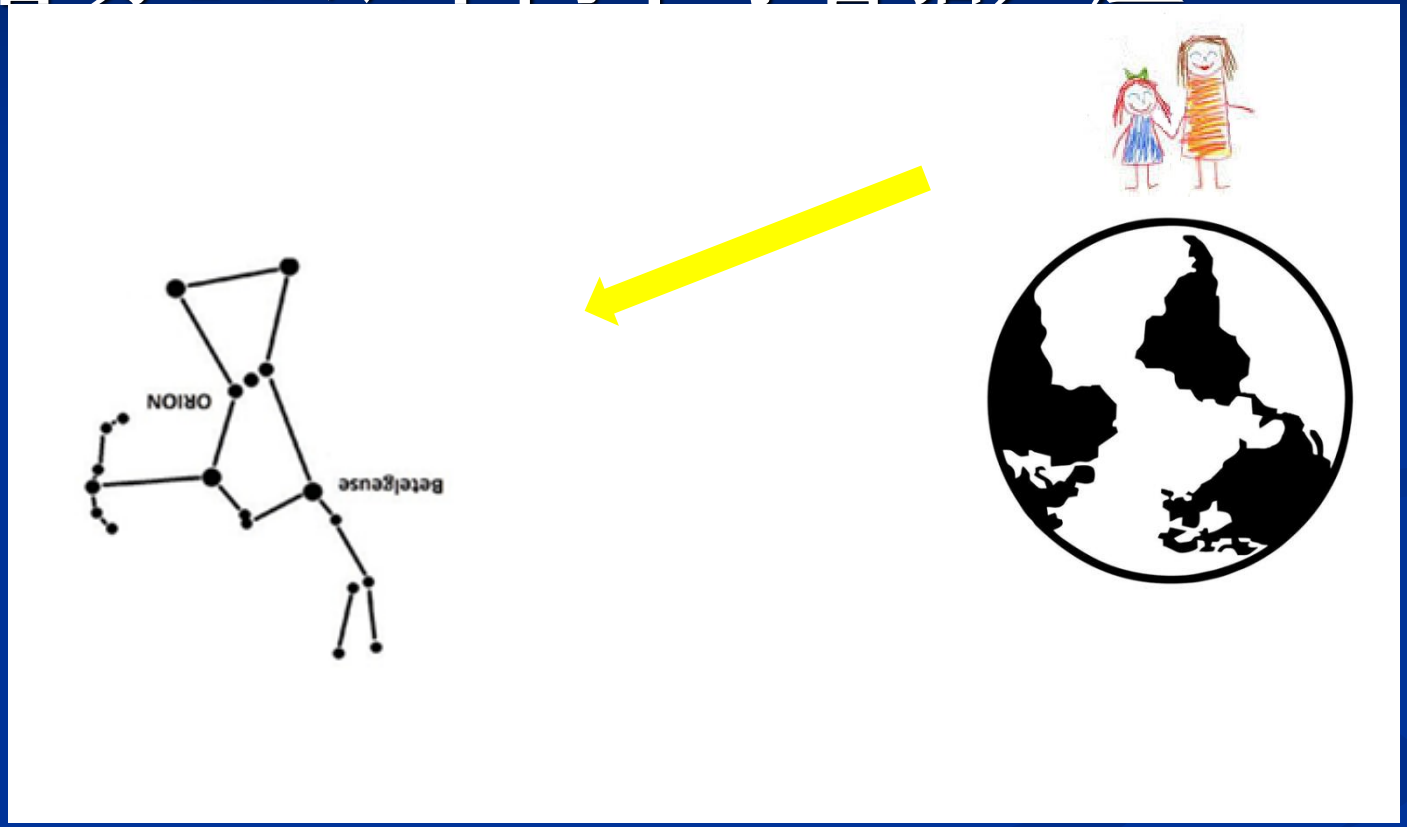
活动 1：从不同半球看猎户座

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)

如果孩子们在赤道地区，他们看到的猎户座是躺着的。例如，头和肩膀在左边，猎户腰带在中间，脚在右边（或者根据实际情况，所有部位方向相反）。



Activity 1: Orion as seen from different terrestrial hemispheres
活动 1：从不同半球看猎户座



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

如果孩子们在南极，他们看到的猎户座是"倒立"的，头朝下，脚朝上。

Activity 1: Orion as seen from different terrestrial hemispheres
活动 1：从不同半球看猎户座

H. North

北半球

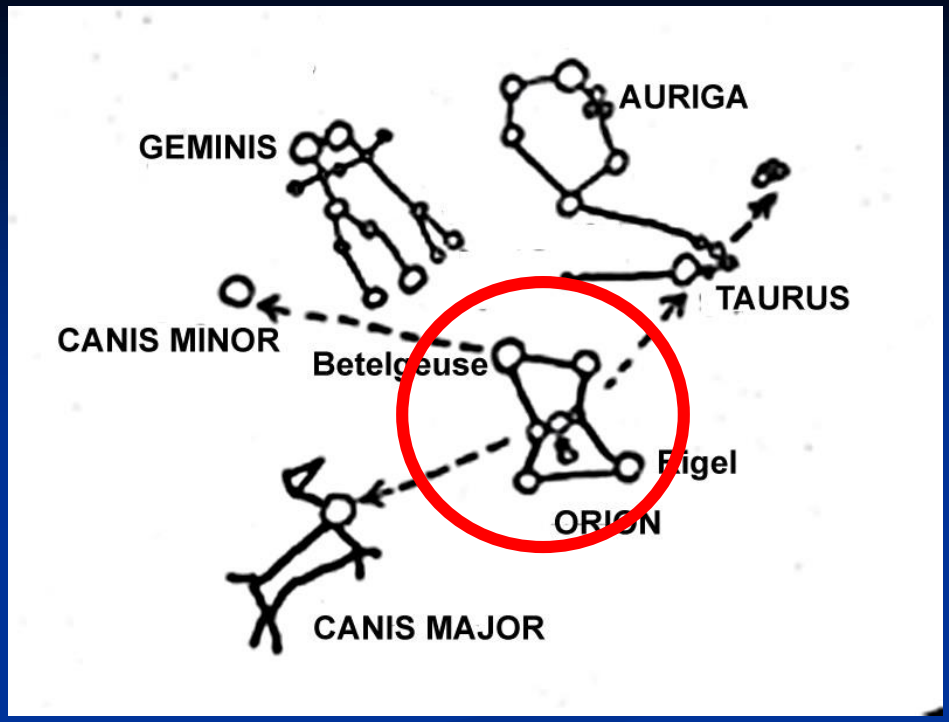
Equatorial Zone 赤道区域

H. South 南半球

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.

我们展示了南北半球猎户座区域附近的星座，但读者应根据所在半球，仅参考相应颜色（白色或黄色）标注的幻灯片内容。

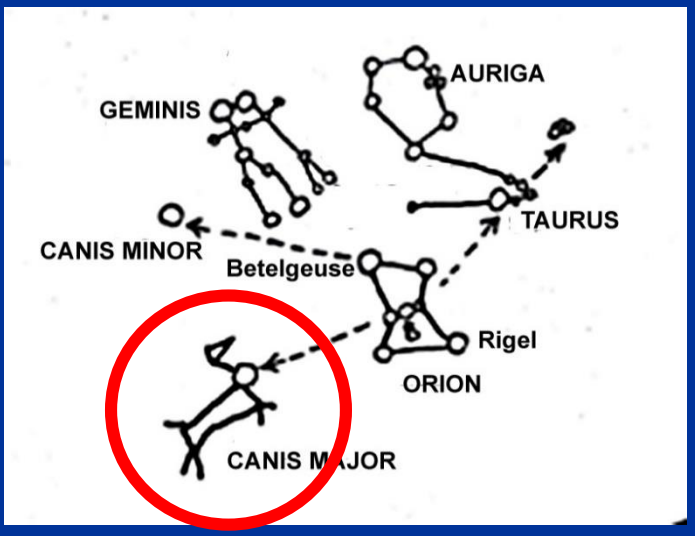
Main constellations of the Orion area. North Hemisphere
猎户座天区主要星座 - 北半球



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.

猎户座：猎户座的特点是一个矩形，在矩形中心有三颗非常靠近且排成一线的恒星（猎户腰带）。橙色的参宿四位于矩形的左上角。

Main constellations of the Orion area. North Hemisphere
猎户座天区主要星座 - 北半球

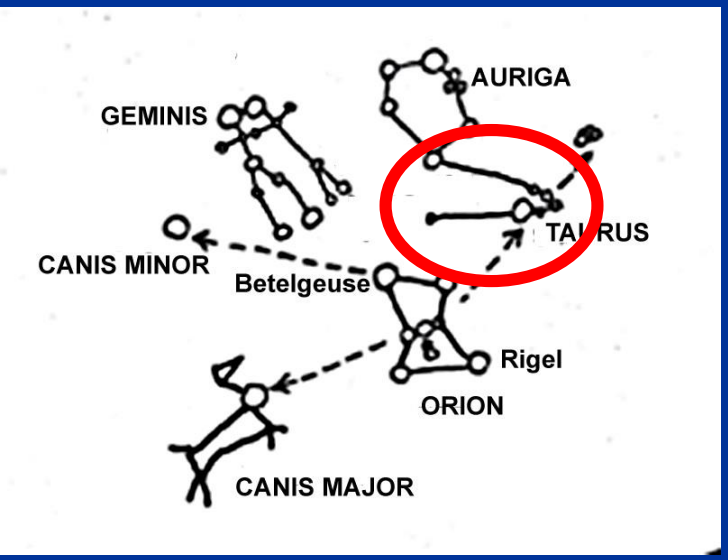


The Sirius star of Canis Major:

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.

大犬座的天狼星：**沿着**猎户腰带三颗恒星**所指的方向向下**寻找，我们会找到一颗非常明亮的恒星——**天狼星。它是北半球中**纬度地区肉眼可见最亮的恒星

Main constellations of the Orion area. North Hemisphere
猎户座天区主要星座 - 北半球



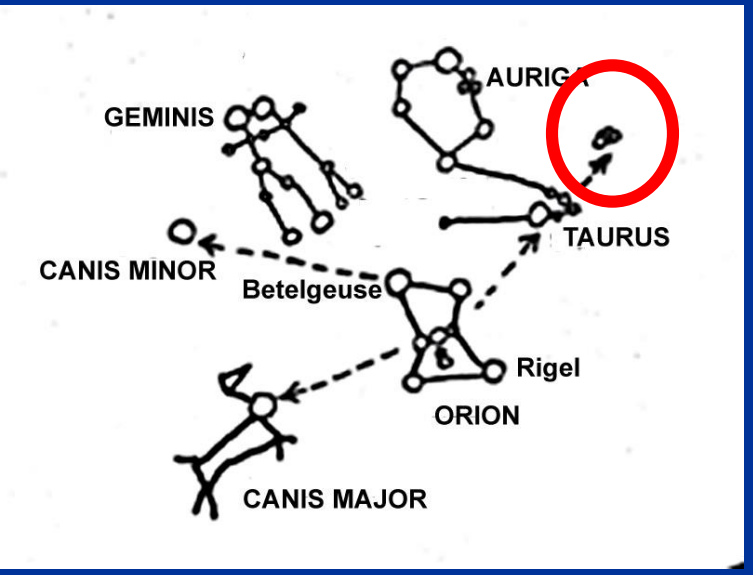
The constellation of Taurus:

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.

金牛座：沿着猎户腰带所指的方向，朝着与天狼星相反的方向寻找（在比所指方向稍高一点的位置），我们会找到一颗微红的恒星 —— 毕宿五，它是金牛座的“眼睛”之一。

Main constellations of the Orion area. North Hemisphere

猎户座天区主要星座 - 北半球

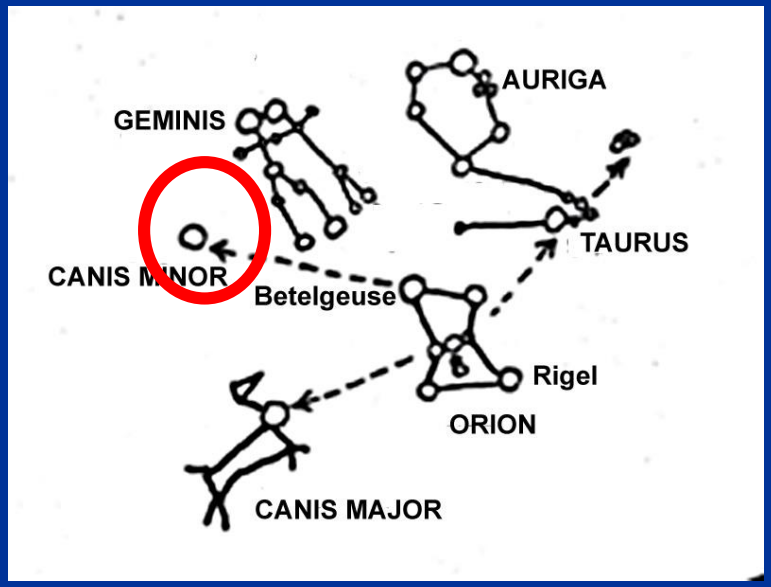


The Pleiades cluster:

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.

昴星团：继续沿着寻找金牛座**的方向和路径，再**远一点，我们会找到一群靠得很近的恒星——昴星团。

Main constellations of the Orion area. North Hemisphere
猎户座天区主要星座 - 北半球

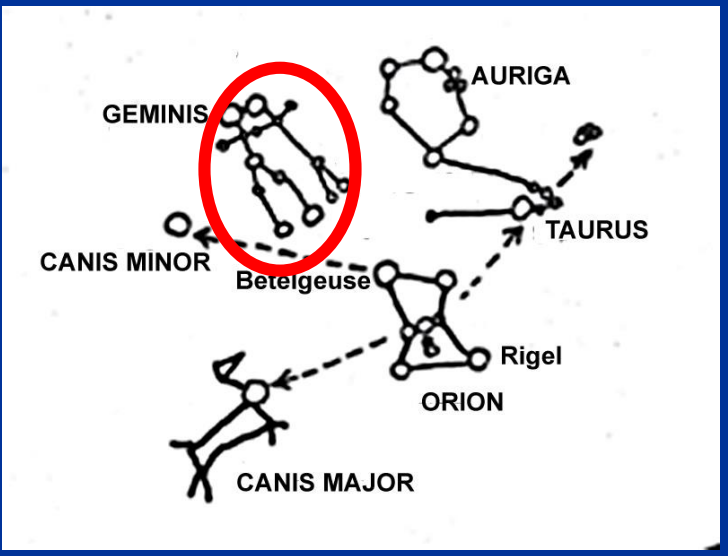


The Procyon star of the Canis Minor:

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

小犬座的南河三：沿着猎户座肩膀上的两颗恒星寻找，你可以找到小犬座里最亮的恒星 —— 南河三。

Main constellations of the Orion area. North Hemisphere
猎户座天区主要星座 - 北半球

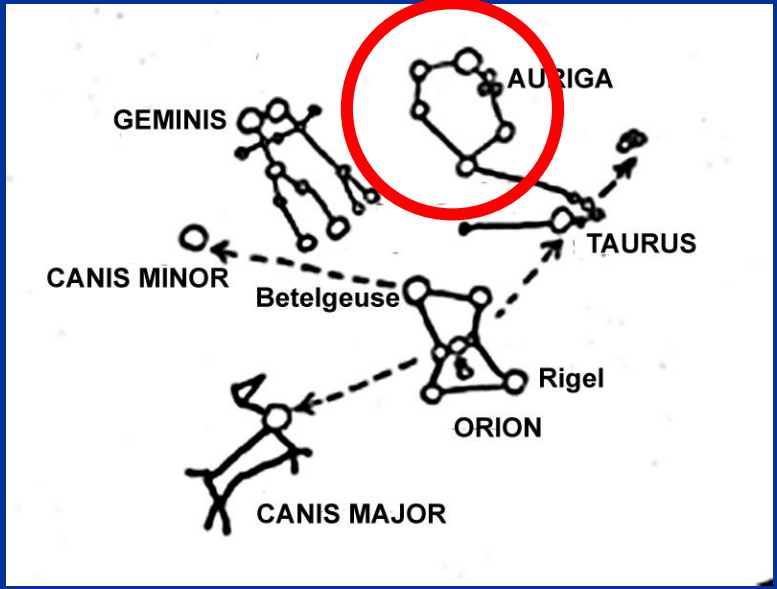


The constellation of Gemini:

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.

双子座：在猎户座上方，有两颗亮度相当且彼此靠近的特别醒目的恒星 —— 双子座的北河三和北河二。

Main constellations of the Orion area. North Hemisphere
猎户座天区主要星座 - 北半球

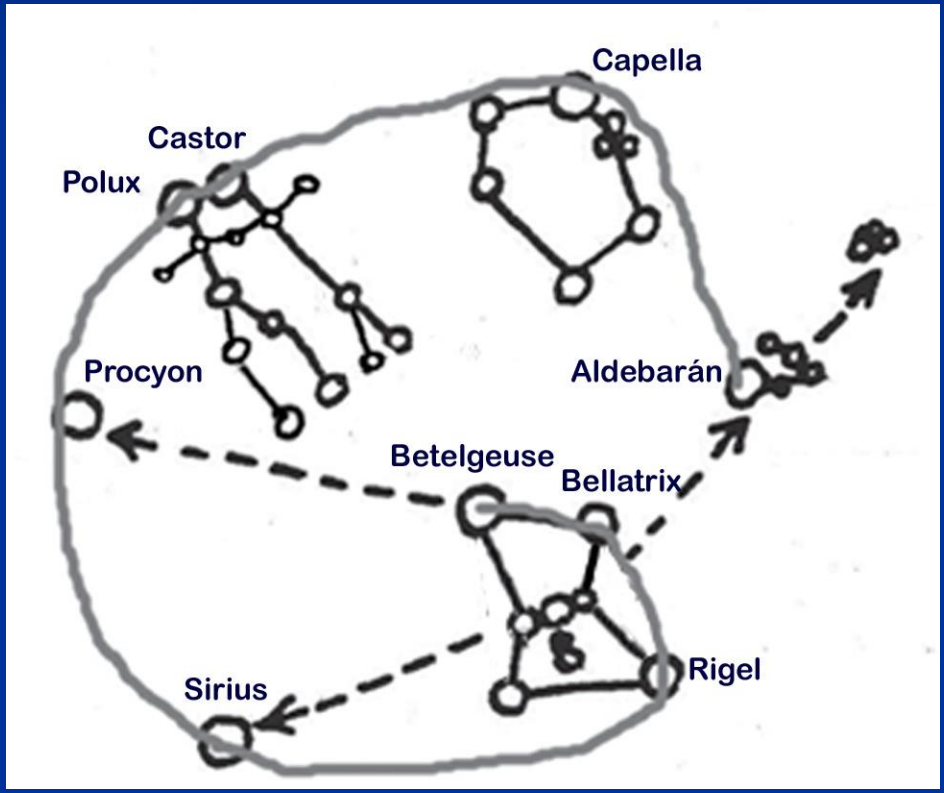


The Auriga constellation:

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

御夫座：在猎户座上方，双子座和**金牛座之**间有一个五边形，这就是**御夫座**，该星座最亮的恒星是**五**车二。

Main constellations of the Orion area. North Hemisphere
猎户座天区主要星座 - 北半球

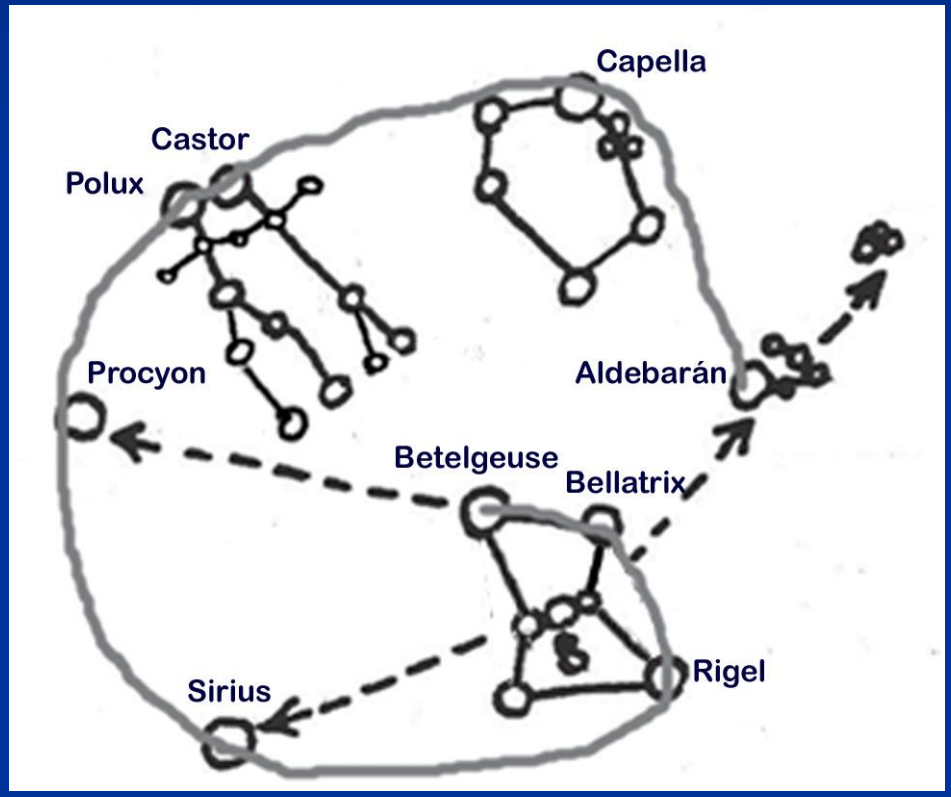


We will begin this great “6” in the two upper stars of the Orion rectangle, in what would be the two shoulders of the giant Orion. We start from the left shoulder (Betelgeuse), then we go to the other shoulder (Bellatrix), we continue along the right knee of the giant (Rigel).

我们从猎户座矩形上方的两颗恒星（猎户座的双肩）开始，构建这个大“6”。从左肩（参宿四）开始，然后到另一个肩膀（参宿五），接着沿着巨人的右膝（参宿七）继续。

Main constellations of the Orion area. North Hemisphere

猎户座天区主要星座 - 北半球



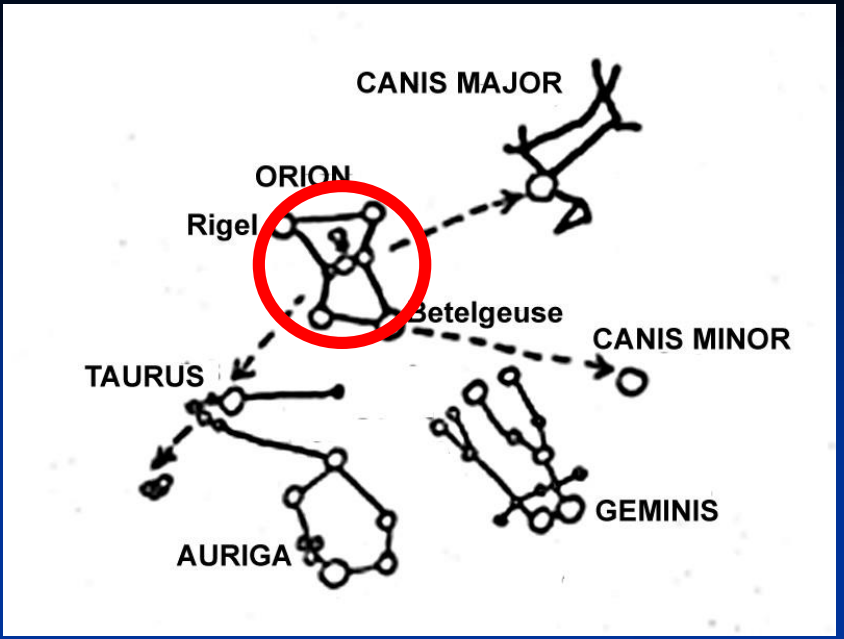
Sirius in Canis Major, Procyon in Canis Minor, Pollux and Castor in the constellation Gemini, Capella is in Auriga and finally we end up in Aldebaran, the bloodshot eye of the constellation Taurus.

大犬座的天狼星、小犬座的南河三、双子座的北河三和北河二、御夫座的五车二，最后到达金牛座的“充血眼睛”—— 毕宿五。

Main constellations of the Orion area.
North Hemisphere, the great “6”
猎户座天区主要星座 - 北半球，大 “6”

Main constellations of the Orion area.
North Hemisphere, the great “6”
猎户座天区主要星座 - 北半球，大 “6”

Main constellations of the Orion area. Southern Hemisphere
猎户座天区主要星座 - 南半球



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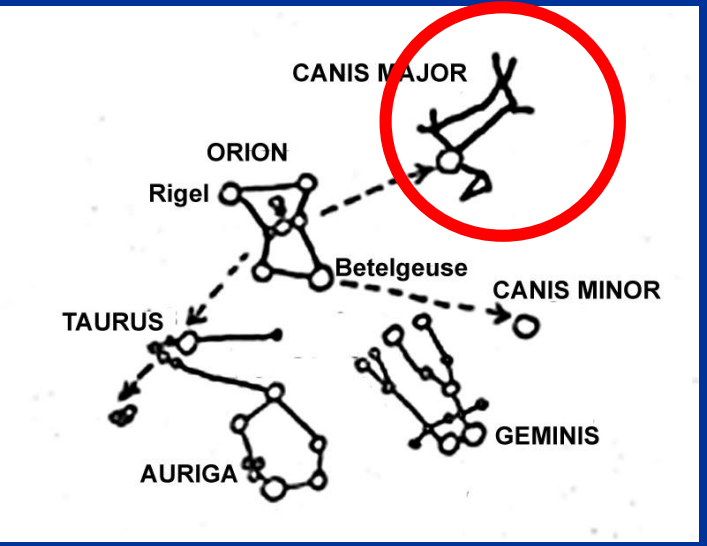
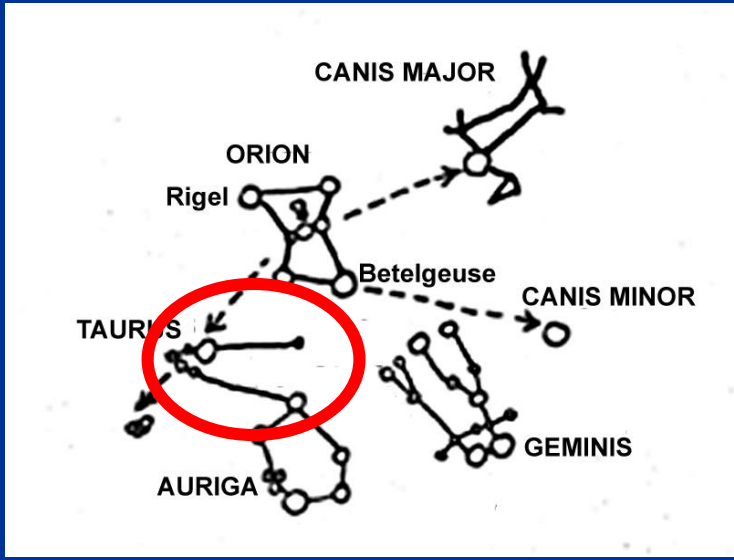
Main constellations of the Orion area. Southern Hemisphere
猎户座天区主要星座 - 南半球



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.

大犬座的天狼星：沿着猎户腰带三颗恒星所指的向上方向寻找，我们会找到一颗非常明亮的恒星—— 天狼星。它是南半球最亮的恒星。

Main constellations of the Orion area. Southern Hemisphere
猎户座天区主要星座 - 南半球



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.

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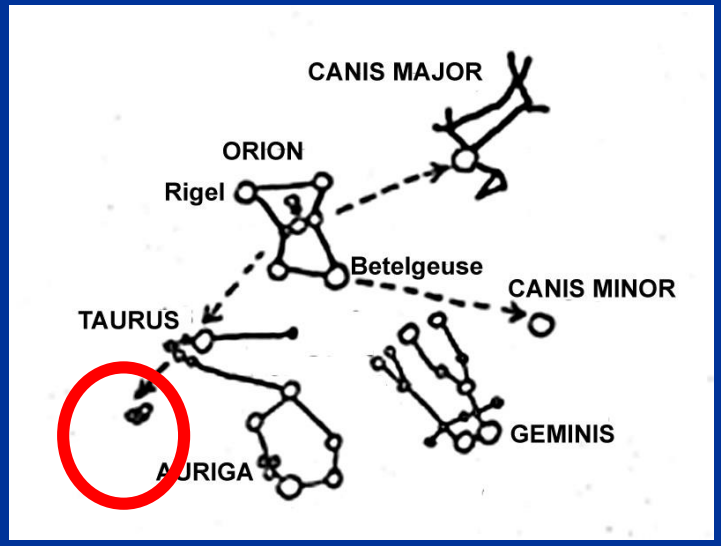
猎户座天区主要星座 - 南半球



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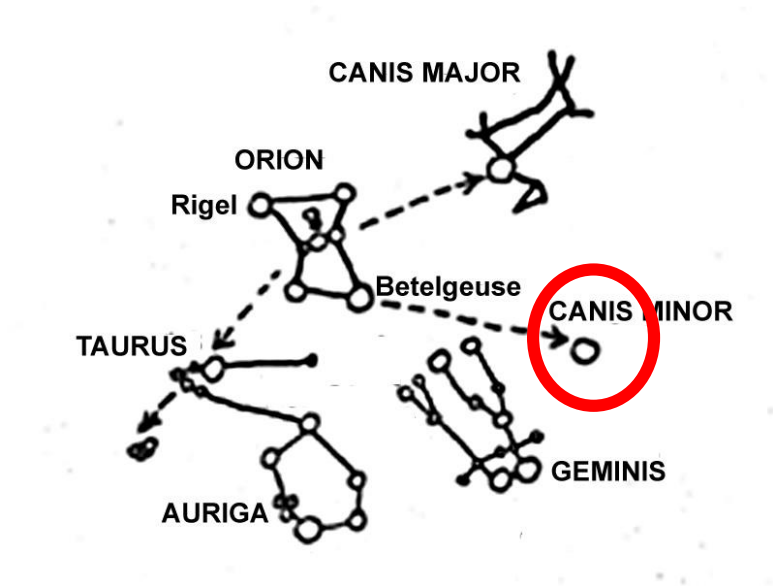
昴星团：继续沿着寻找金牛座的方向和路径，再远一点，我们会找到一群靠得很近的恒星 —— 昴星团。

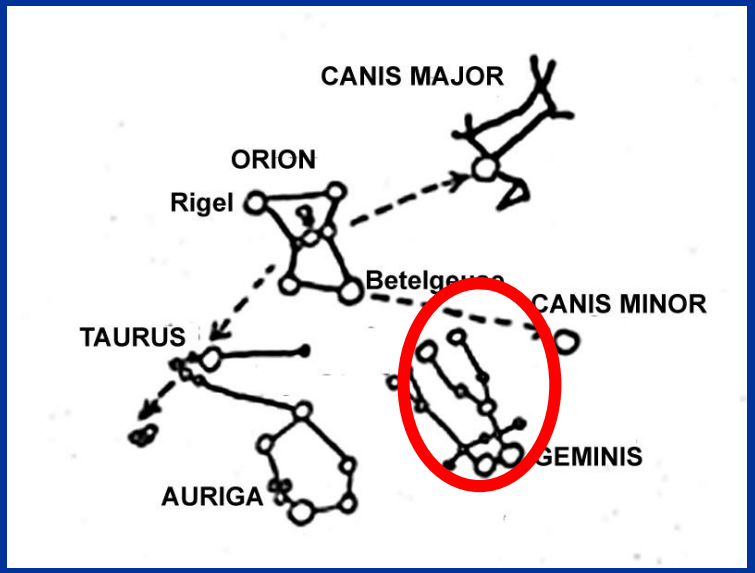
Main constellations of the Orion area. Southern Hemisphere
猎户座天区主要星座 - 南半球



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.

小犬座的南河三：沿着猎户座肩膀上的两颗恒星寻找，你可以找到小犬座中最亮的恒星 —— 南河三。

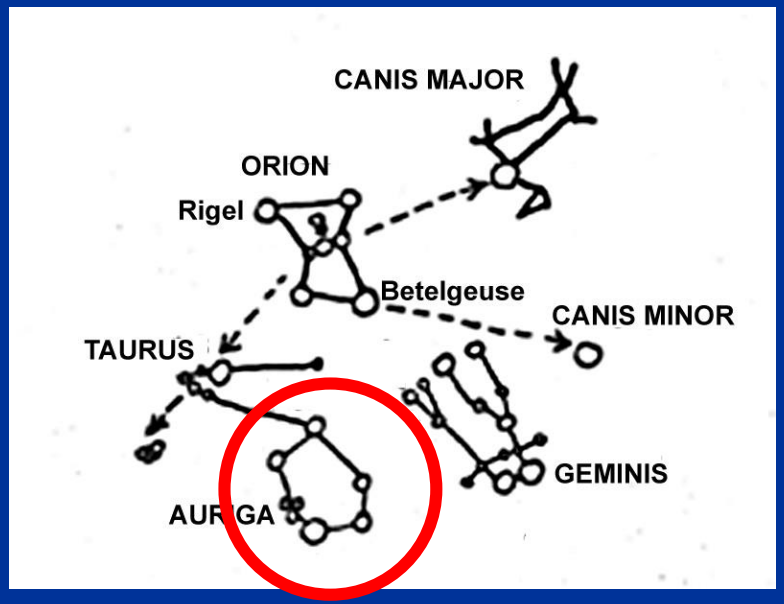
Main constellations of the Orion area. Southern Hemisphere
猎户座天区主要星座 - 南半球



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.

双子座：在毕宿五和南河三之间、在这**两**颗星和猎户座下方，有两颗**亮度相当且彼此靠近的特**别醒目的恒星——双子座的北河三和北河二。

Main constellations of the Orion area. Southern Hemisphere
猎户座天区主要星座 - 南半球

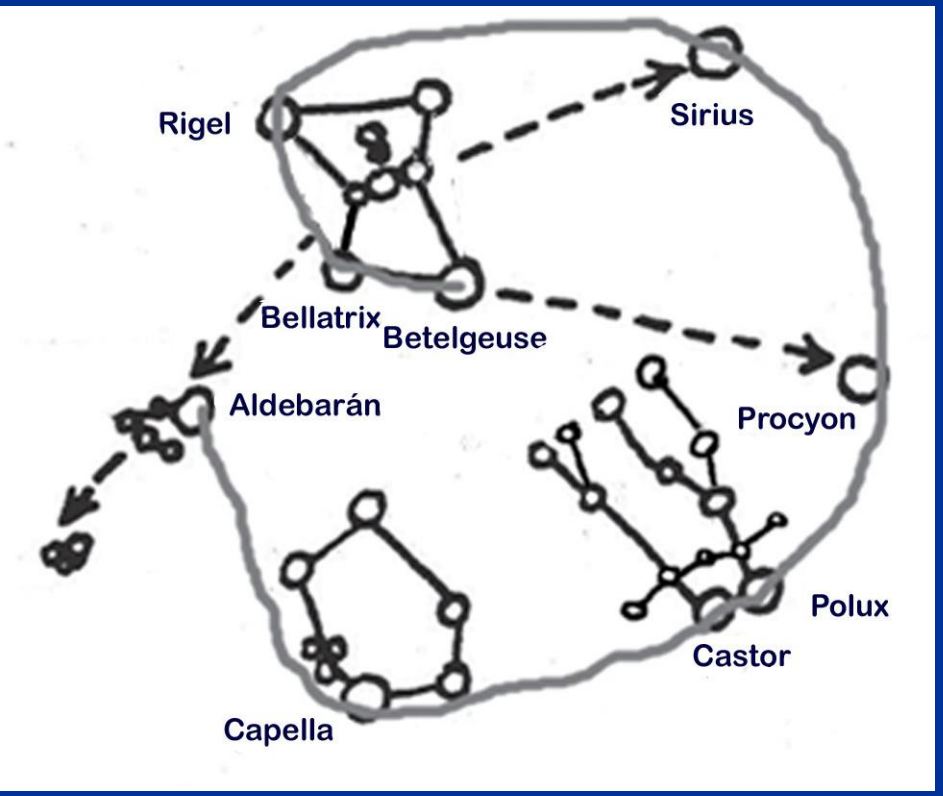


The Auriga constellation:

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

御夫座：在猎户座下方、双子座和金牛座之间有一个五边形，这就是御夫座，该星座最亮的恒星是五车二。

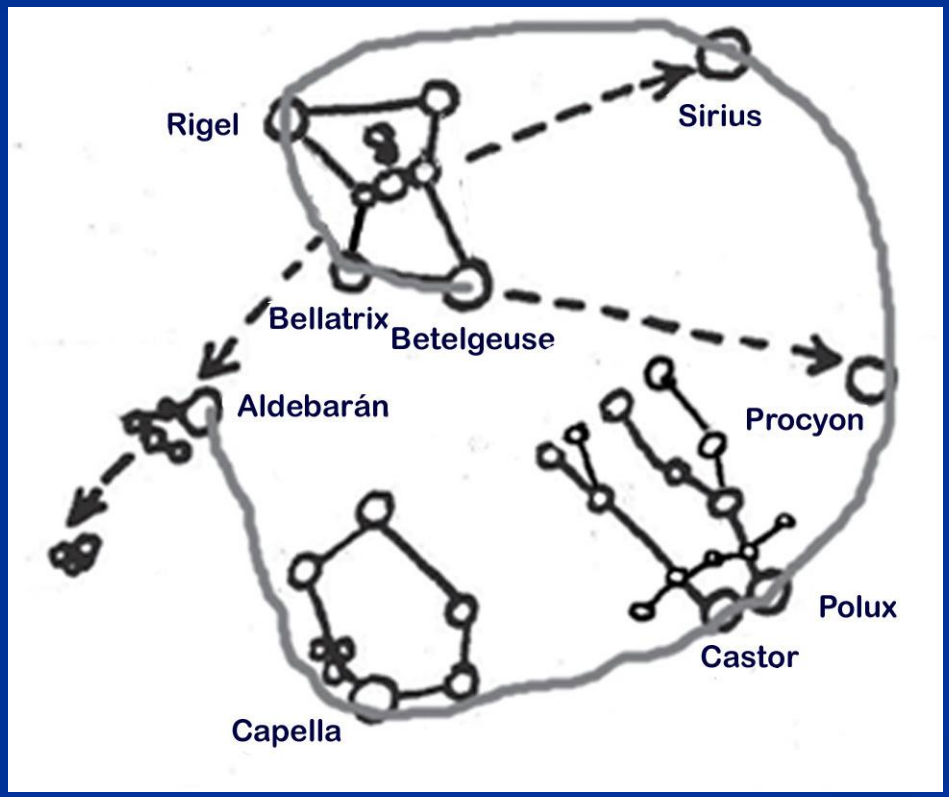
Main constellations of the Orion area. Southern Hemisphere
猎户座天区主要星座 - 南半球



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).

我们从猎户座矩形下方的两颗恒星（倒立的猎户座双肩）开始，构建这个大"9"。从左肩（参宿四）开始，然后到另一个肩膀（参宿五），接着沿着巨人的右脚（参宿七）继续。

Main constellations of the Orion area. Southern Hemisphere
猎户座天区主要星座 - 南半球

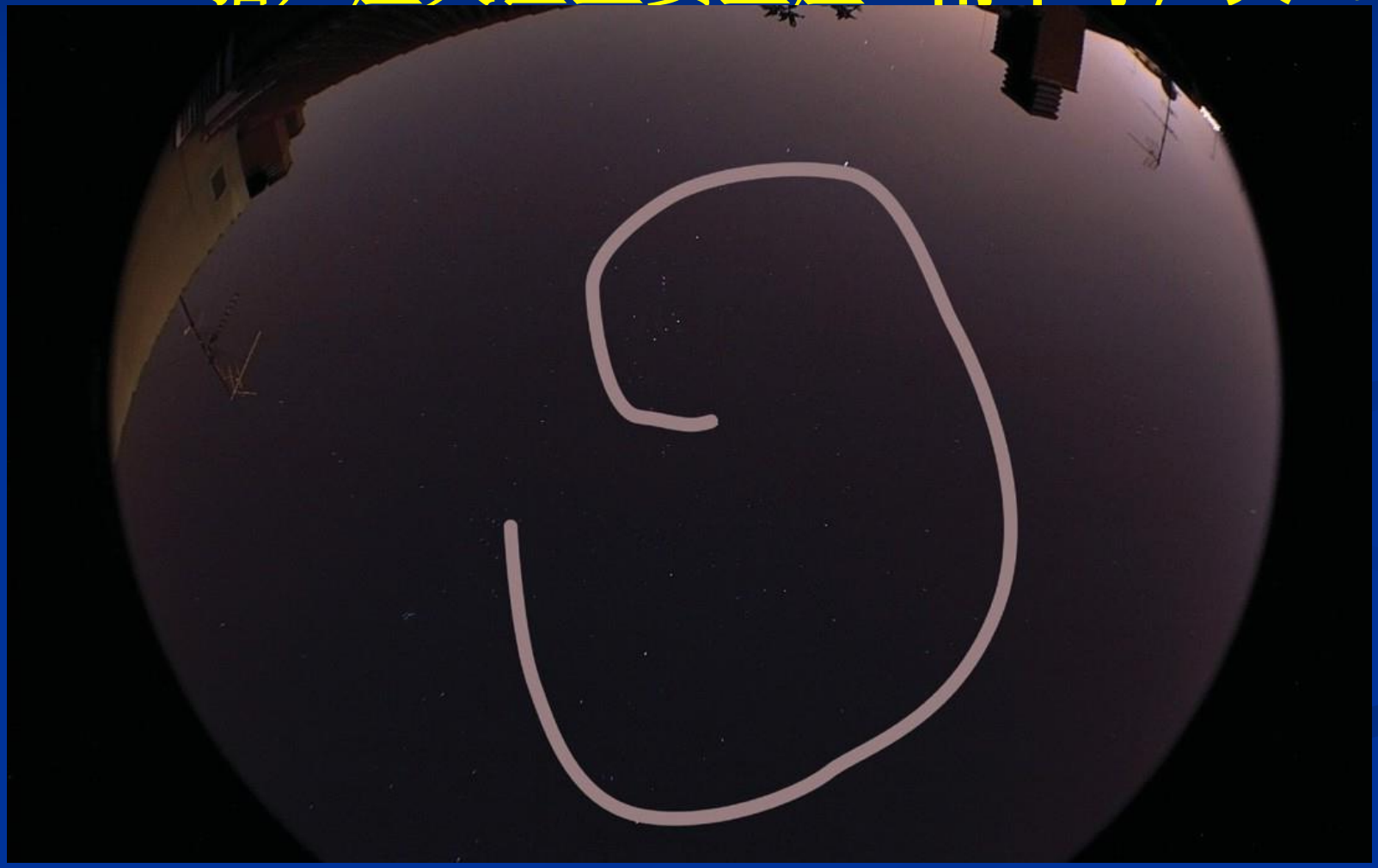


Sirius in Canis Major, Procyon in Canis Minor, Pollux and Castor in the constellation of Gemini (also upside down), Capella in Auriga and finally we end up in Aldebaran, the bloodshot eye of the constellation of Taurus.

大犬座的天狼星、小犬座的南河三、双子座（也是倒立的）的北河三和北河二、御夫座的五车二，最后到达金牛座的“充血眼睛”—— 毕宿五。

Main constellations of the Orion area.
Southern Hemisphere, the great “9”
猎户座天区主要星座 - 南半球，大 “9”

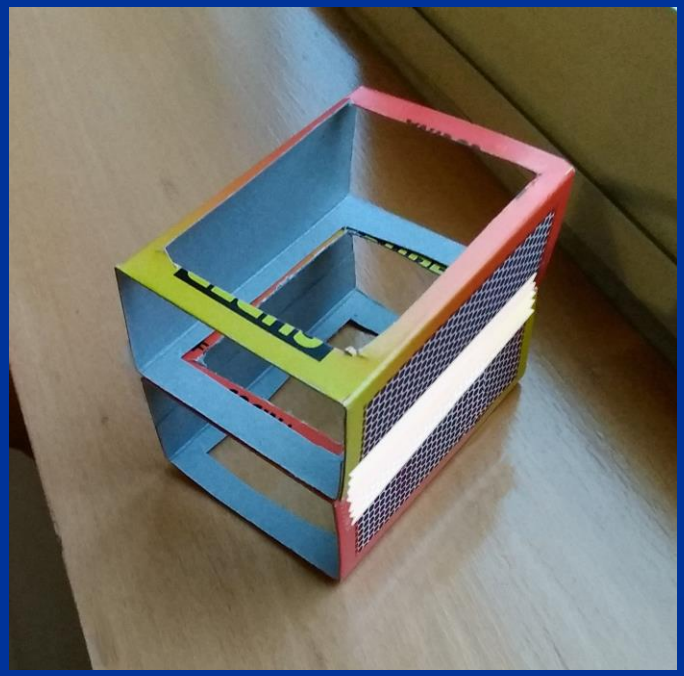
Main constellations of the Orion area.
Southern Hemisphere, the great “9”
猎户座天区主要星座 - 南半球，大 “9”



Activity 2: Constellation projector
活动 2：星座投影仪

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

为了在教室墙壁上展示星座，我们可以用几个火柴盒和手机的手电筒制作这个简单的投影仪。



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

我们把两个火柴盒的外表面剪下来，用胶带粘在一起，如图片所示。

Activity 2: Constellation projector
活动 2：星座投影仪

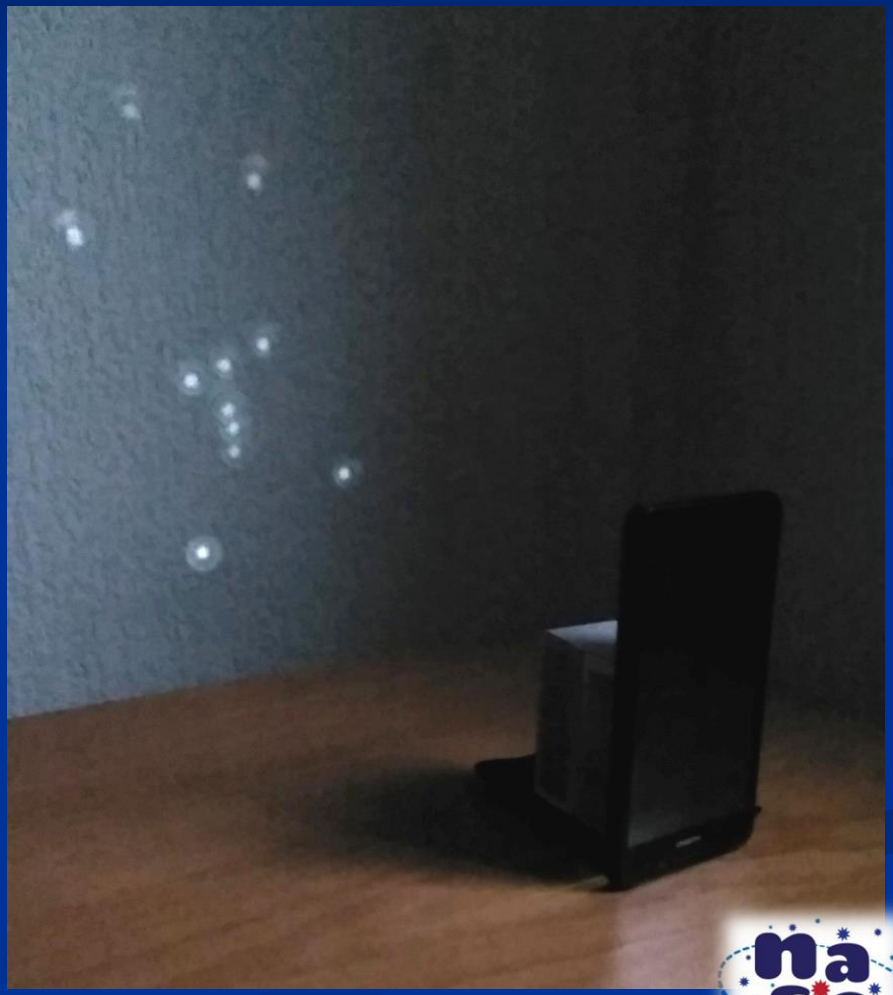
In one of the interior boxes we draw a constellation, for example Cassiopeia. With a pin we pierce the stars that form it.
在其中一个内盒上绘制一个星座，例如仙后座。用大头针在组成该星座的恒星位置扎孔。

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.
把第二个内盒底部大部分剪掉。将这两个盒子按图片所示的位置放好。

Activity 2: Constellation projector
活动 2：星座投影仪

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

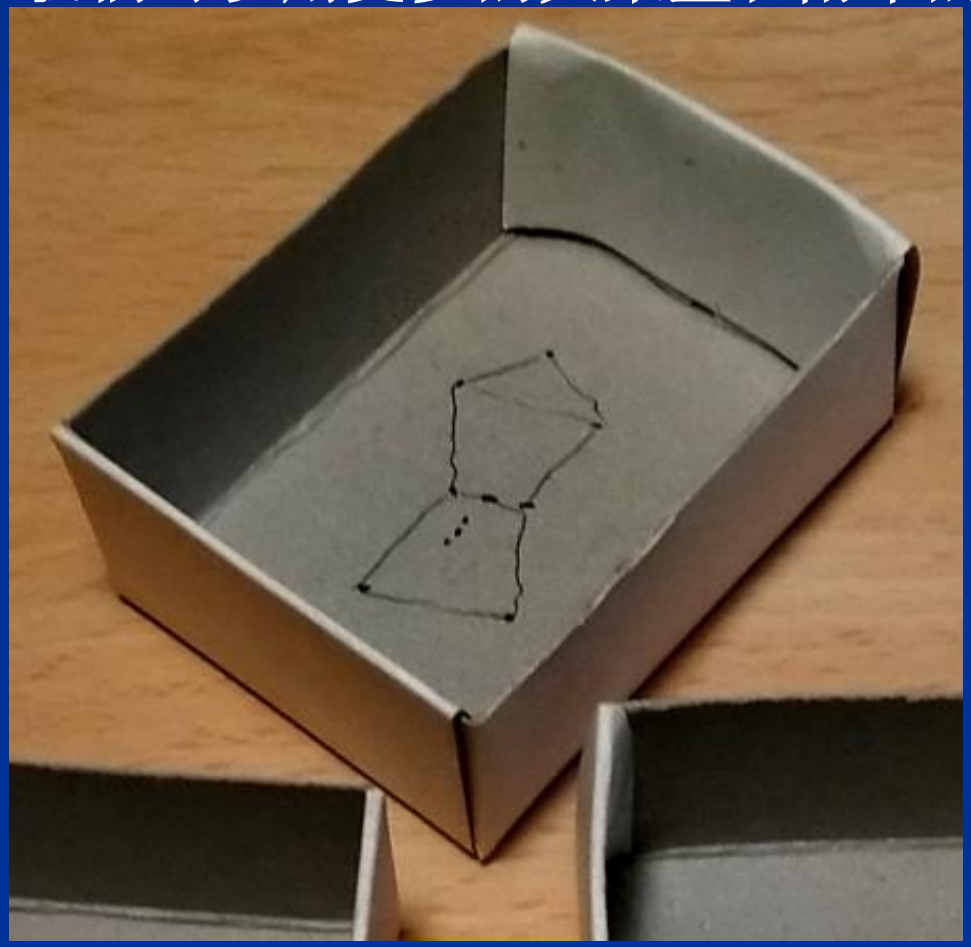
借助手机手电筒的光，我们可以把星座投影到教室墙壁上。



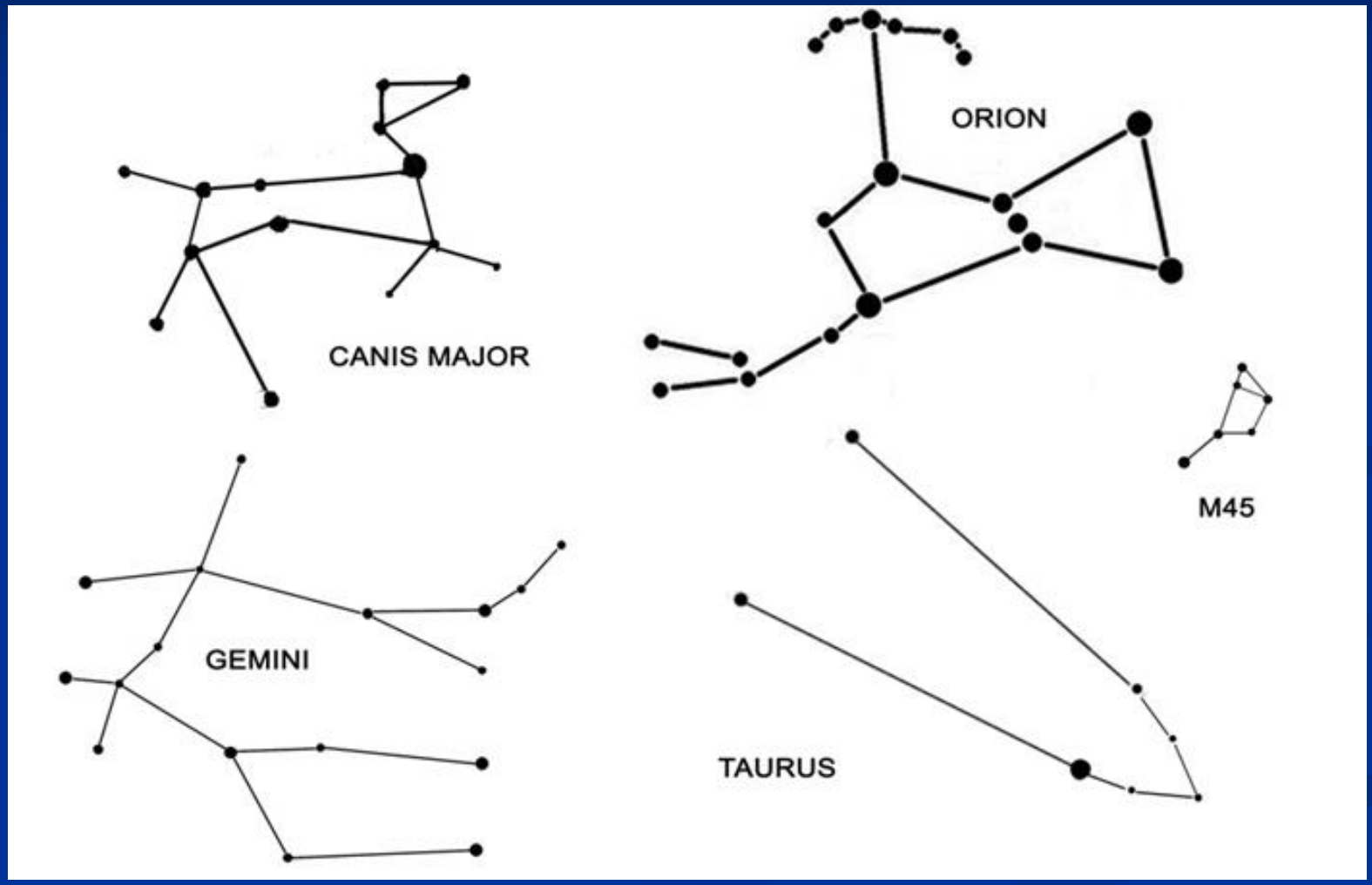
Activity 2: Constellation projector
活动 2：星座投影仪

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

我们可以用更多的火柴盒和附带的模板制作其他星座。

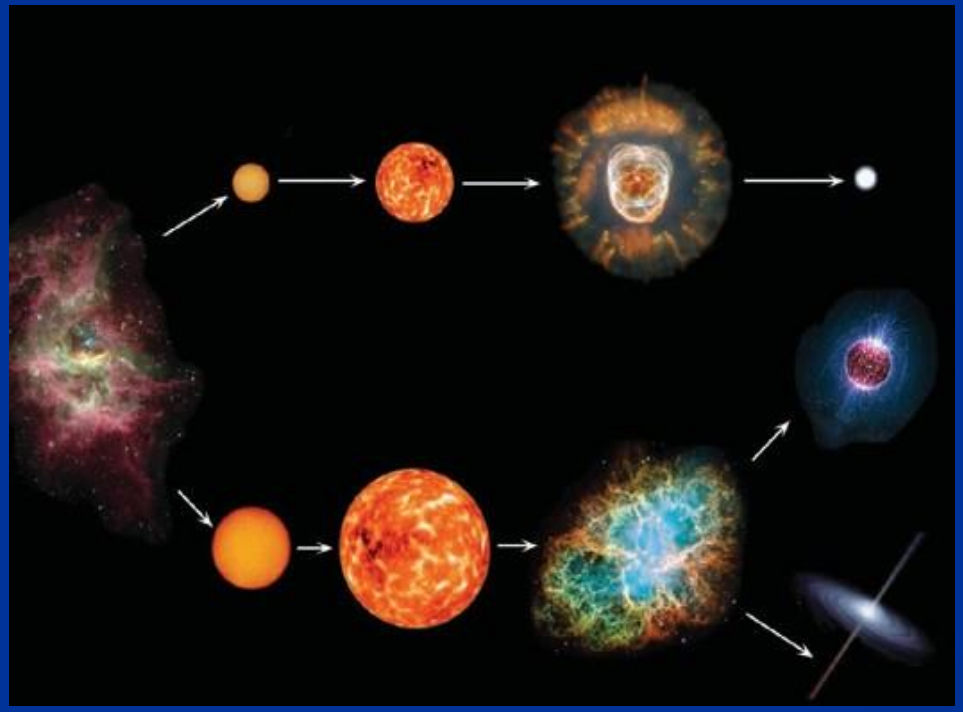


Activity 2: Constellation projector
活动 2：星座投影仪



Activity 3: Stellar evolution in 5 steps
活动 3：恒星演化的 5 个阶段

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.
恒星在尘埃云中形成，产生于疏散星团，然后演变成主序星阶段的成年恒星，在这个阶段它们大部分时间处于稳定状态。



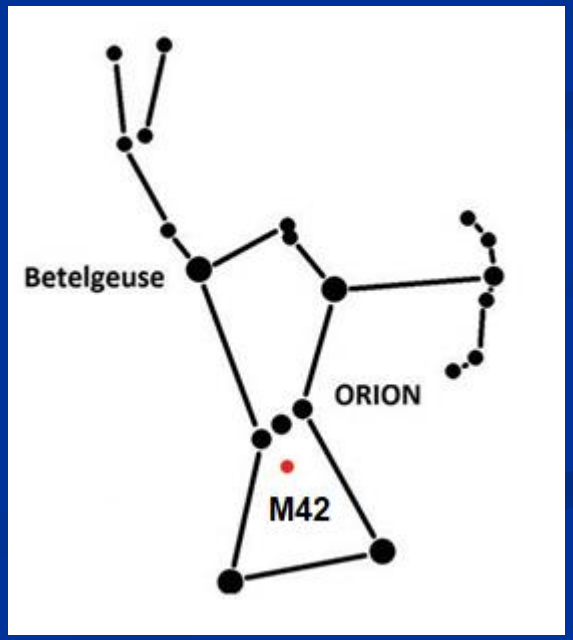
In their final phase, and depending on their mass, they can give rise to a supernova explosion generating a black hole, or a neutron star, or the less massive ones, like our Sun, a planetary nebula with a central white dwarf.
在恒星演化的最后阶段，根据质量不同，它们可能引发超新星爆炸，进而形成黑洞或中子星；质量较小的恒星，比如我们的太阳，则会形成带有中心白矮星的行星状星云。

Activity 3: Stellar evolution (step 1)
活动 3：恒星演化（步骤 1）

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

猎户星云 M42 是一个由气体云团组成的恒星“摇篮”。用双筒望远镜可以看到它呈微红色。

(Credit: NASA/ ESA Hubble)

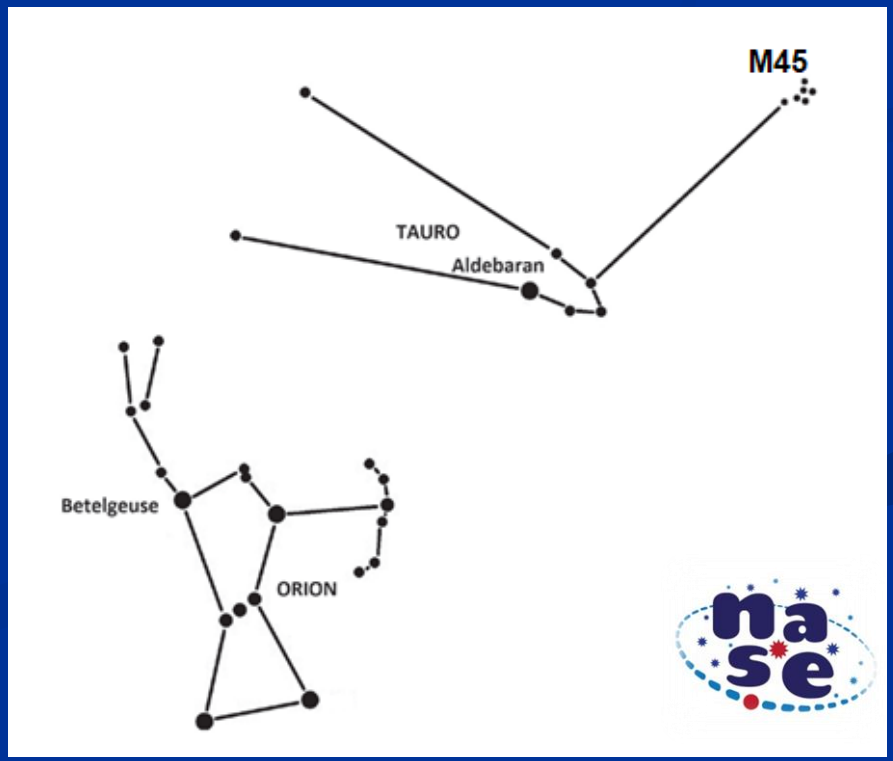


Activity 3: Stellar evolution (step 2)
活动 3：恒星演化（步骤 2）

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.

疏散星团昴星团 M45 是新生恒星的“摇篮”。乍一看，你可以看到 6 - 7 颗恒星。用双筒望远镜可以看到多达 30 颗恒星，但实际上有数百颗恒星形成于这一团星云。

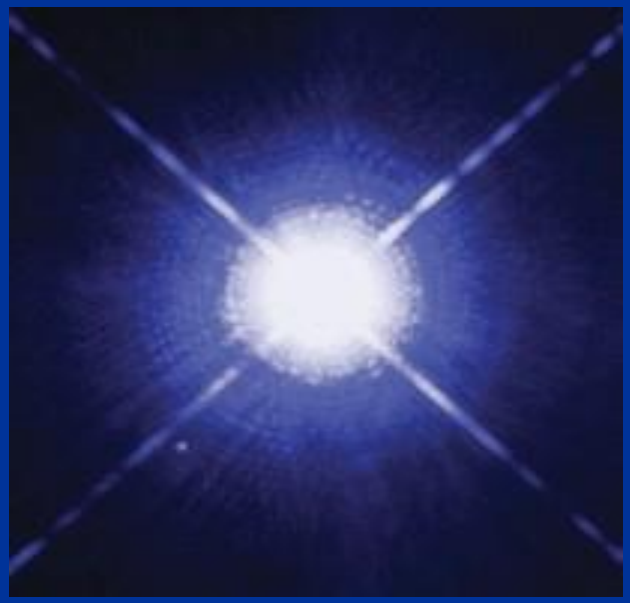
(Crédito: M.T. Russell)



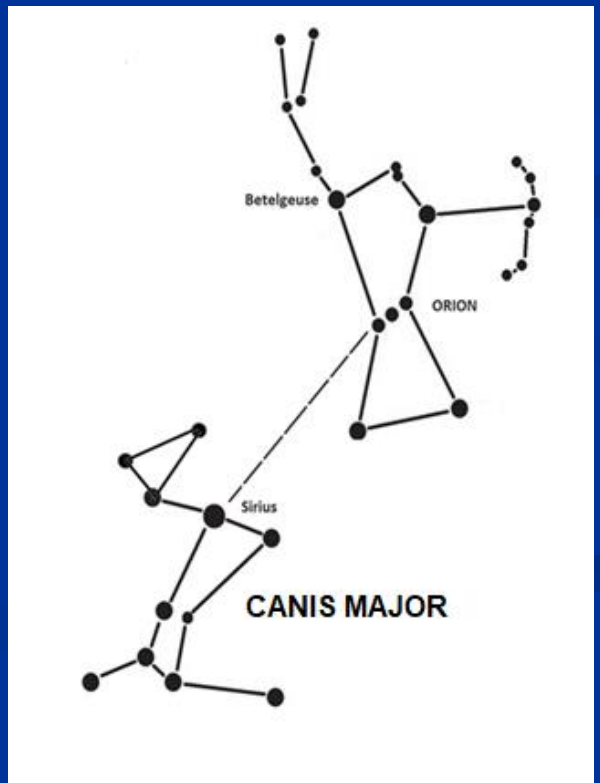
Activity 3: Stellar evolution (step 3)
活动 3：恒星演化（步骤 3）

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.

天狼星是一颗主序星。我们也可以选择其他主序星来举例，但选择天狼星是因为它是在我们所处纬度能看到的所有恒星中最亮的。



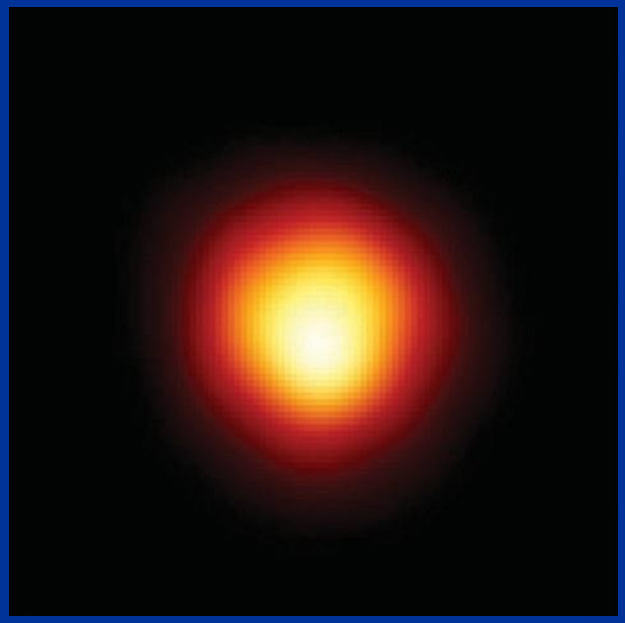
(Credit: NASA/ ESA Hubble)



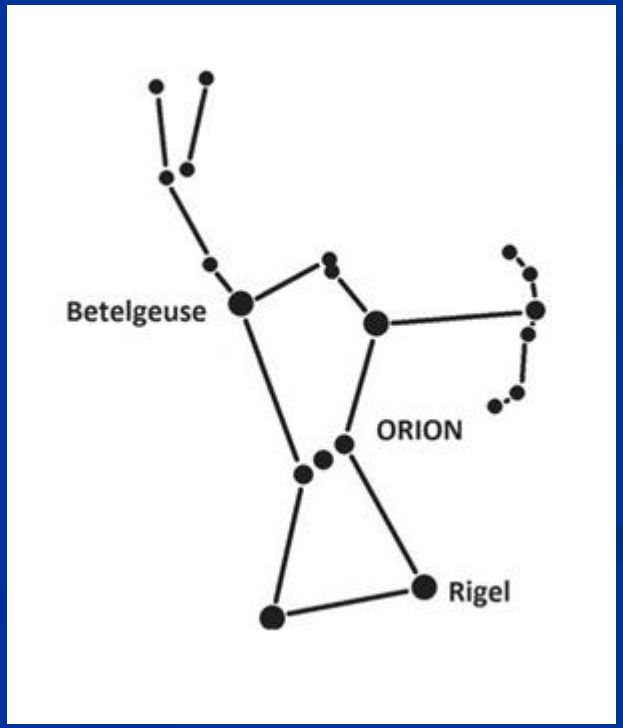
Activity 3: Stellar evolution (step 4)
活动 3：恒星演化（步骤 4）

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).

参宿四正处于其生命的最后阶段。当它的氢全部耗尽后，开始燃烧氦并膨胀。于是就会发生新的核反应，它会不断膨胀和收缩（**属于**变星）。



(Credit: A. Dupree CIA, NASA)



Activity 3: Stellar evolution (step 5)
活动 3：恒星演化（步骤 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)

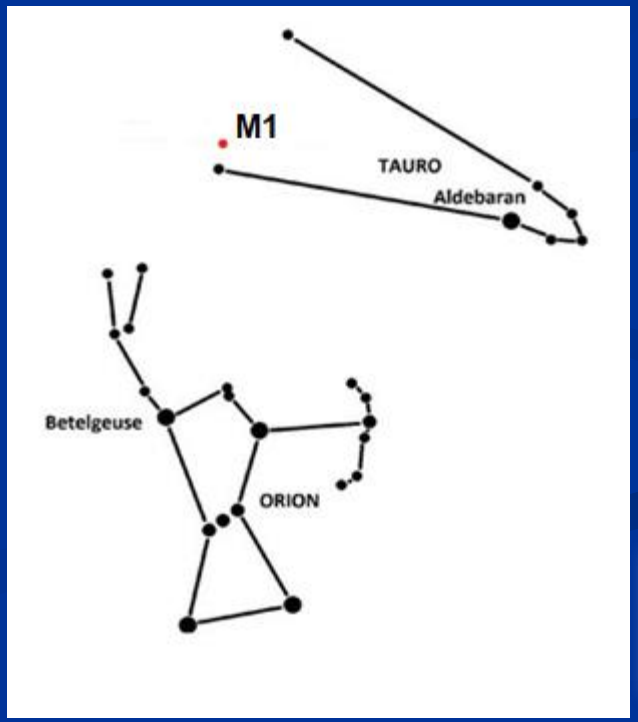
死亡恒星的残骸只能用望远镜才能观测到，但即便因它们的光度太低，无法用肉眼或双筒望远镜看到，我们也应该让孩子们知道这些天体所在的位置（有多种示例：5a 和 5b）

Activity 3: Stellar evolution (step 5a)
活动 3：恒星演化（步骤 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.

蟹状星云 M1 是 1054 年中国观测到的超新星爆发后的气体残骸。恒星的中心区域坍缩成一个高密度天体。这颗恒星高速自转，扭曲磁场，成了一颗周期为 0.33 秒的脉冲星。

(Credit: NASA/ ESA Hubble)

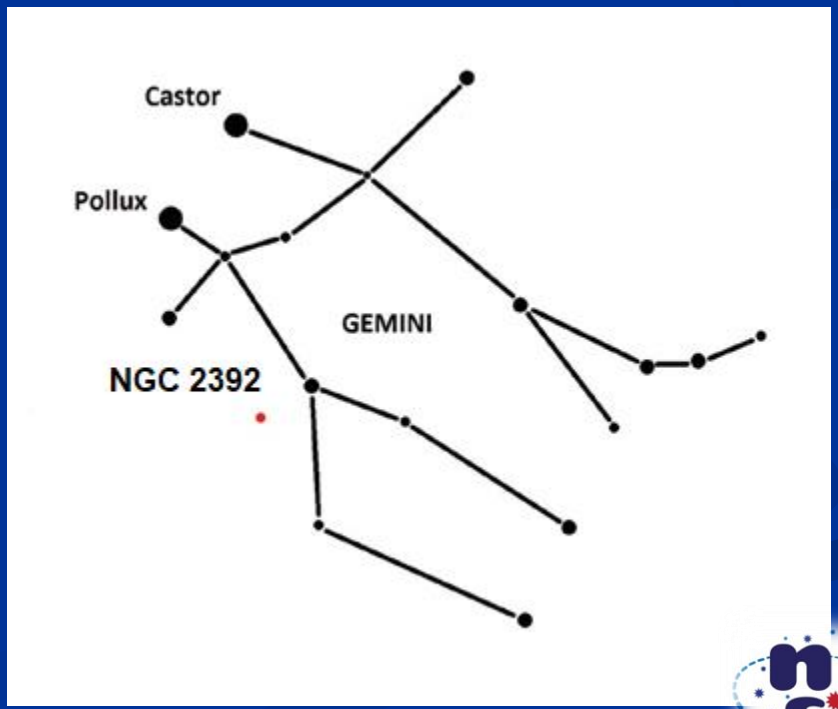


Activity 3: Stellar evolution (step 5b)
活动 3：恒星演化（步骤 5b）

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.

NGC 2392 （爱斯基摩星云或小丑脸星云）就是一个行星状星云。类似太阳这样的恒星在 50 亿年后、生命终结时就会形成这种星云。

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



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

活动 4：大 “6” 或大 “ 9” 中的 5 个阶段

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

我们在大 “6” 或 大“ 9” 的图案上分别放置代表胚胎、新生儿、成年人、老人和骷髅的图案。

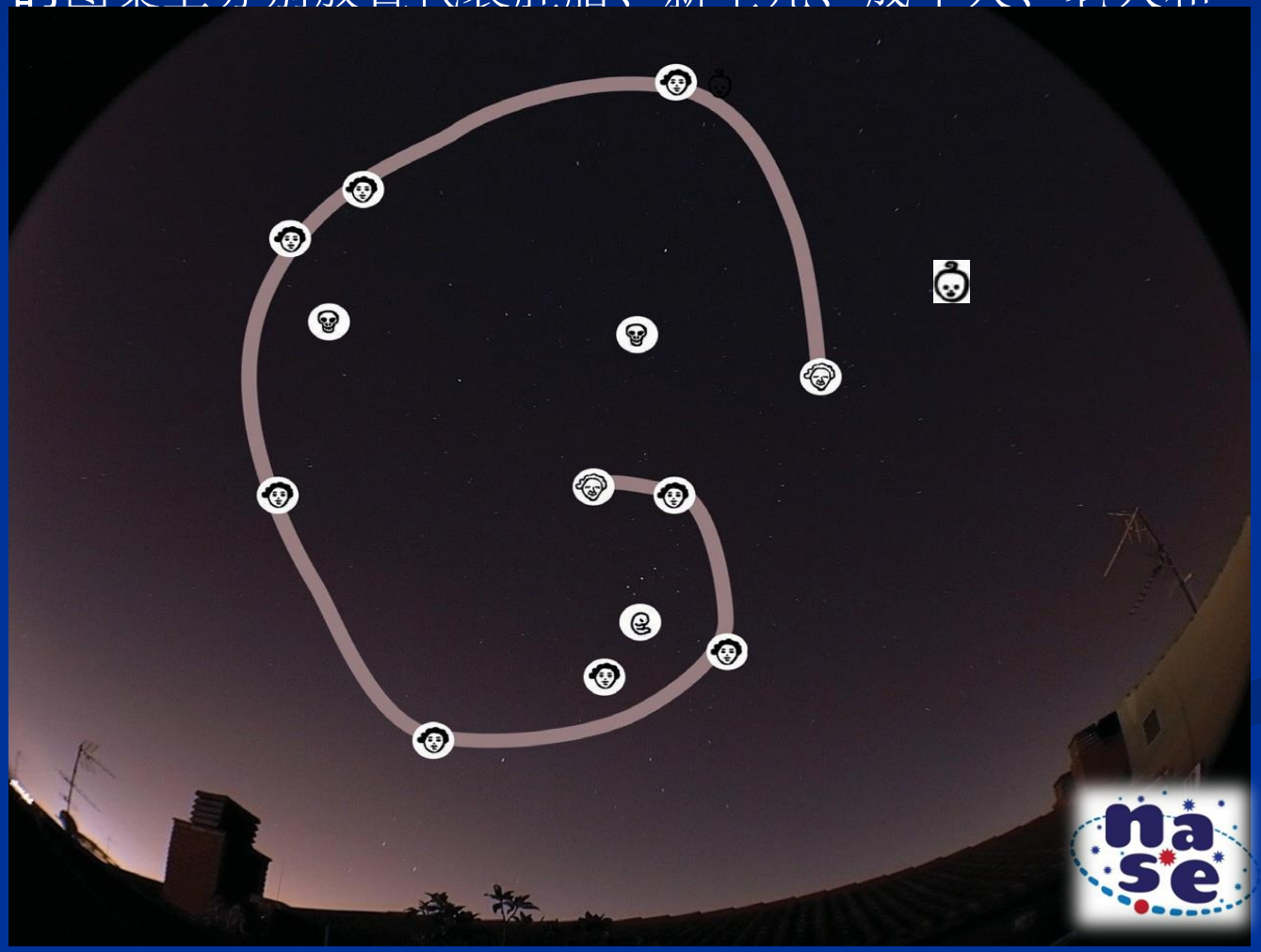

(fetus)（胚胎）


(new born)（新生儿）


(adult)（成年人）


(old)（老年人）


(skull)（骷髅）



Conclusions
结论

- Discover and enjoy the night sky
- 发现并享受夜空。

- Observe various types of objects.
- 观测各类天体。

Thank you very much
for your attention!
感谢您的关注！