

# Stories and Curiosities to Tell

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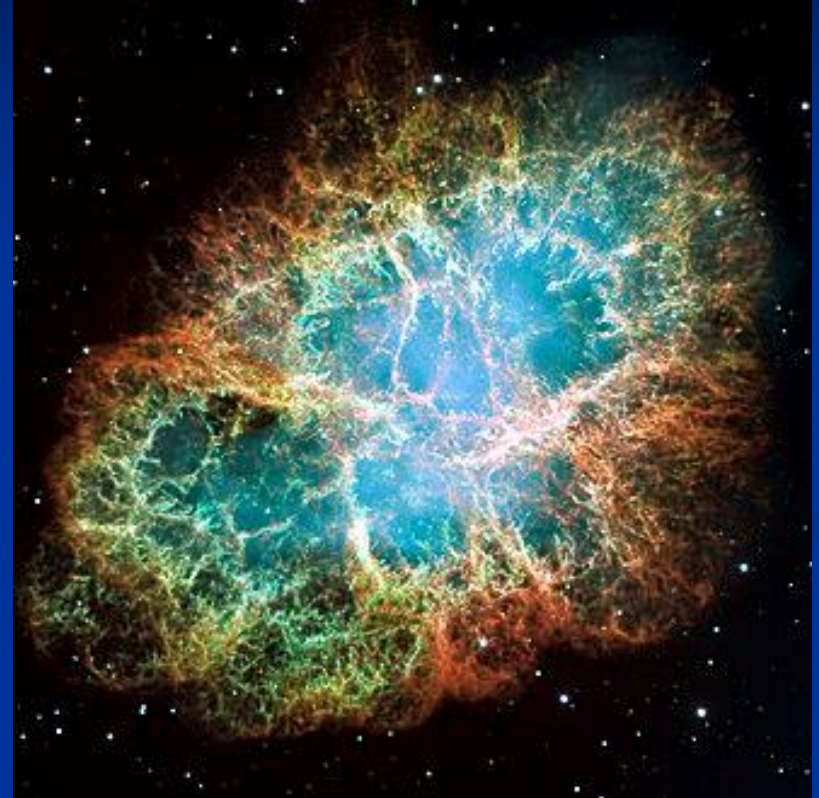
# Stories are presented to tell students about...

- "Star Parties" tells stories about stellar evolution and the HR diagram.
- "Neighboring Planets" shares interesting facts about Galileo Galilei's observations of Saturn.
- "Phases of the Moon" introduces Galileo's observations of the Moon and includes stories from different cultures.
- "Global Earth" tells stories about the first circumnavigation of the globe and a global Earth that acts as a sundial.
- "Orion's Sky" presents mythological stories about constellations.



# Stellar evolution: Crab Nebula

The Crab Nebula is the remnant of a supernova located in the constellation Taurus. The supernova was visible in broad daylight, reaching a peak brightness approximately ten times greater than that of Venus (the brightest astronomical object after the Sun and Moon).



Crab Nebula (Credit: NASA)

# Stellar evolution: Crab Nebula

It is the remnant of a supernova that exploded on July 4th, 1054. It was observed during the day for 23 days and at night for 22 months and was documented by Chinese astronomers.



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Documents confirming the observation of the guest star identified as the supernova of 1054. (Credit: Wikipedia)



# Stellar evolution: Crab Nebula

A pictograph found in Chaco Canyon (White Rock ruins, Pueblo culture, New Mexico, USA) may represent the supernova of July 4, 1054.

The crescent Moon represents the moon, the star to the left the supernova, and a life-size handprint indicates that the site is sacred.

Calculations show the moon was in the phase depicted and was  $3^\circ$  from the supernova, and its crescent was oriented as in the pictograph.



Pictogram of the 1054 supernova. (Credit: Jim O'Donnell)

# Stellar evolution: Crab Nebula

The first documented European observer was the Englishman John Bevis in 1750.



John Bevis (1695-1771)  
(Credit: Wikipedia)

In 1758, the French astronomer Charles Messier, a great observer of comets, began a Catalog of Diffuse Objects to distinguish them from comets. The first object in the Messier Catalog is M1, the Crab Nebula.

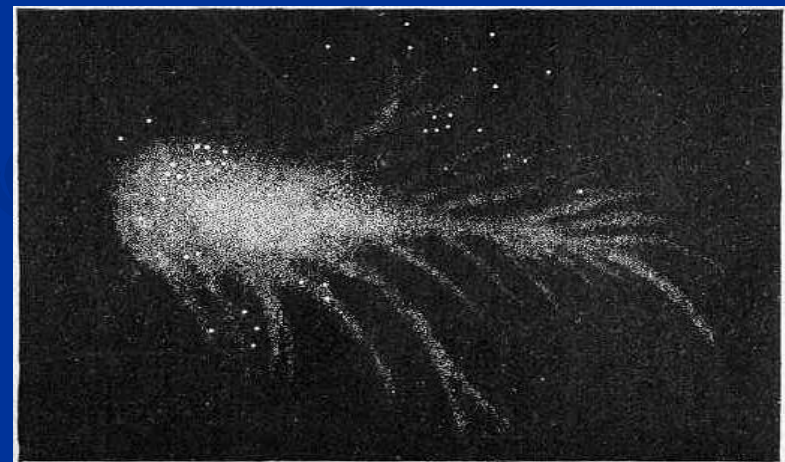
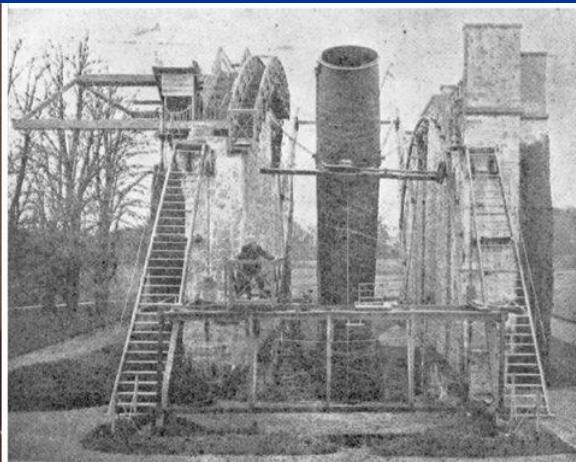


Charles Messier (1730-1817)  
(Credit: Wikipedia)



# Stellar evolution: Crab Nebula

In 1840, William Parsons, Earl of Ross, observed M1 with his telescope at Birr Castle and made the first detailed drawing, naming it after himself because it resembled a crab. However, it wasn't until 1892, when Isaac Roberts took one of the first photographs (photographic plates had low sensitivity).



William Parsons (1800-1867) and his telescope  
(Credit: Wikipedia)

Photograph from 1892  
(Credit: Isaac Roberts)



# Stellar evolution: Clown or Eskimo Nebula

It is a planetary nebula discovered in 1787 by Sir William Herschel.

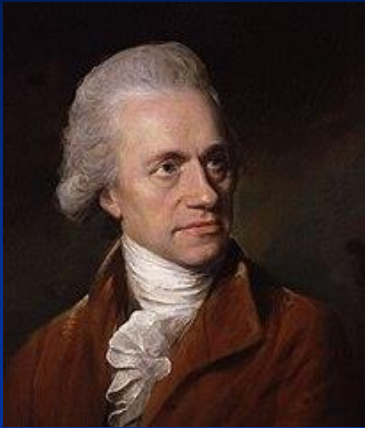
It is called the Clown Nebula or the Eskimo Nebula because it resembles the face of a person wearing a wig or hood

The "head" is a bubble of gas surrounding the dying star, and the "fur" is gaseous material moving away from the star.



(Credit: Wikipedia)

# Stellar evolution: Clown or Eskimo Nebula



William Herschel (1738-1822)



Carolina Hetrshel (1750-1848)  
(Credit: Wikipedia)

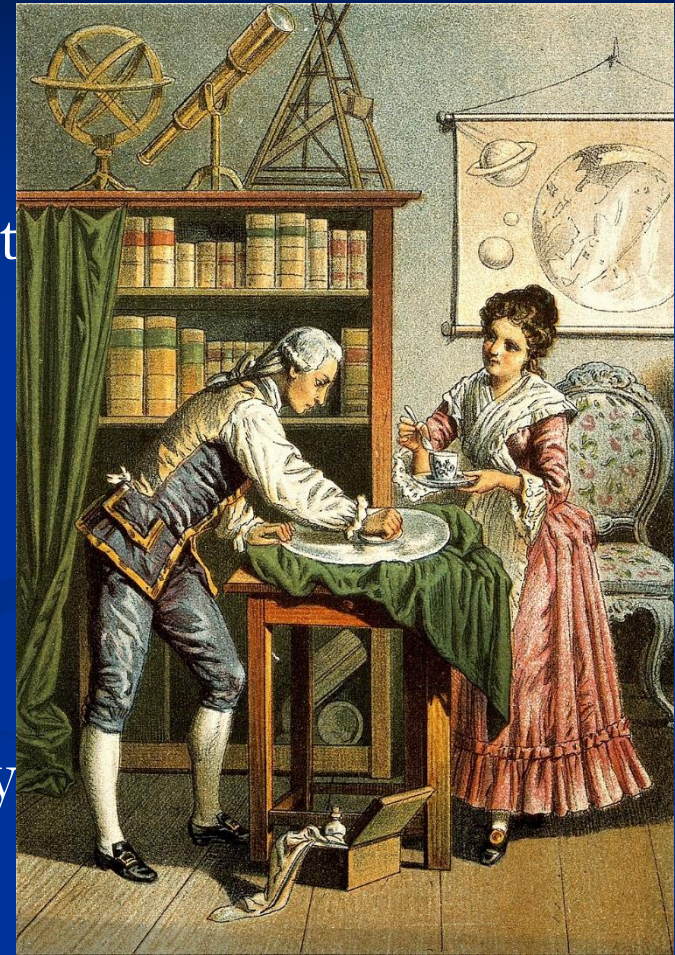
Friedrich William Herschel was a German musician who, after fighting in a battle at the age of 19, left his country and went to England where he became a conductor. In 1772, his 22-year-old sister, Caroline Herschel, went to live with him to train as a soprano.



# Stellar evolution: Clown or Eskimo Nebula

A few months later, on May 10, 1773, he bought a book (James Ferguson's "Astronomy") and liked it so much that he decided to dedicate the rest of his life to astronomy.

Thanks to his great manual dexterity, Herschel built his own telescopes and polished his own mirrors from the very beginning. Caroline Herschel worked with her brother in the observation and construction of telescopes.

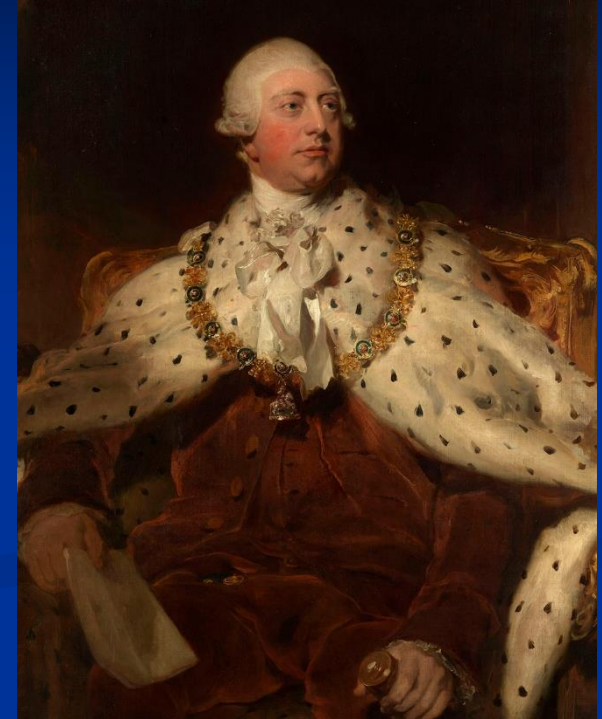


William and Caroline Herschel  
(Credit: Wikipedia)

# Stellar evolution: Clown or Eskimo Nebula

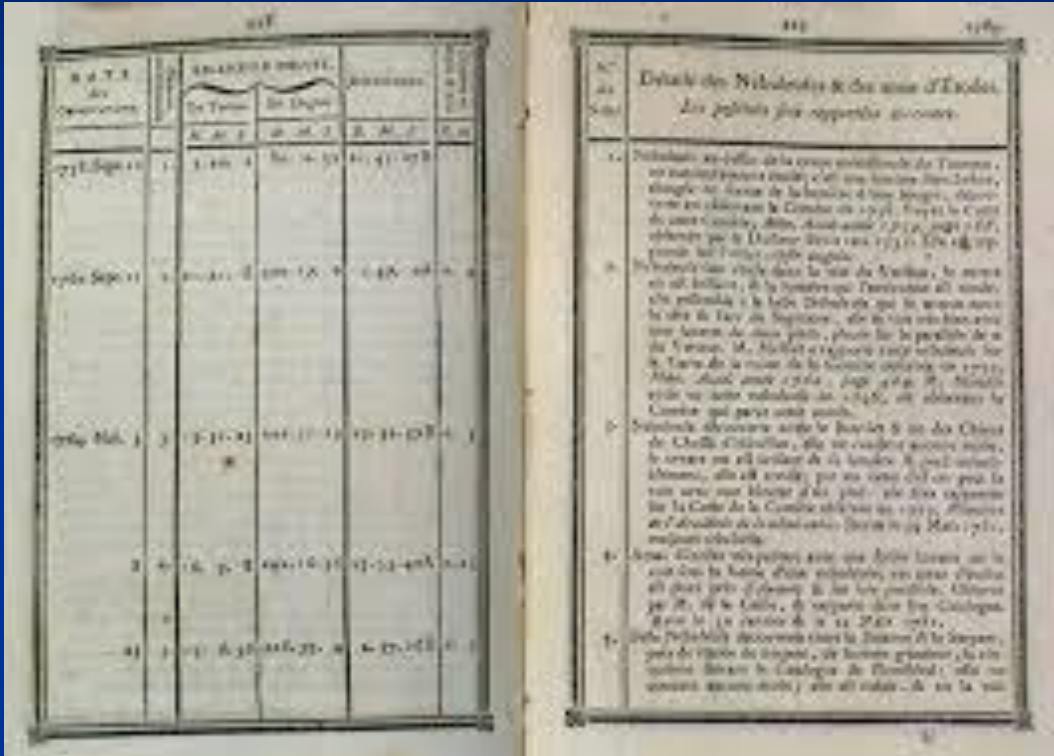
Herschel built his own telescopes. In 1781 he discovered a new planet, Uranus. King George III of England appointed him Astronomer Royal in 1782, and William was able to dedicate himself exclusively to astronomy, along with his sister.

Initially, Herschel named it "George" in honor of the king, but that name was not well received outside of his country. Finally, it was given the name Uranus (the father of Saturn and grandfather of Jupiter).



George III (1760 – 1800)  
(Credit: Wikipedia)

# Stellar evolution: Clown or Eskimo Nebula



Messier Catalog  
(Credit: Wikipedia)

In 1782, a colleague gave him a Messier catalog, which motivated him to observe these objects with his telescopes.

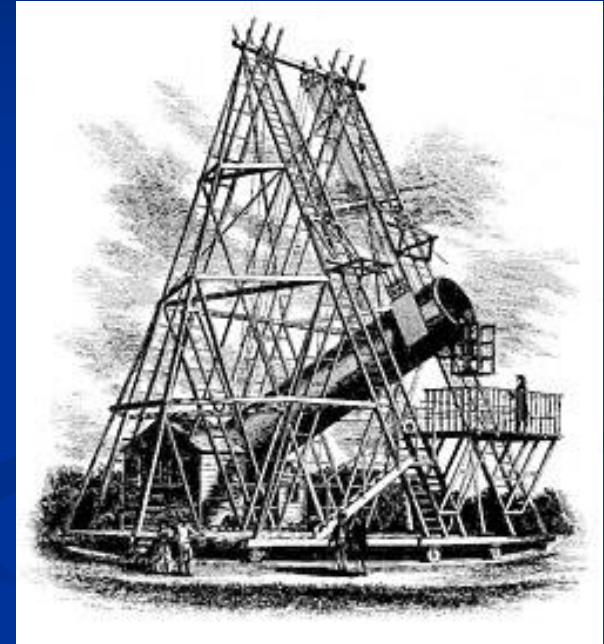
A month later, he began a systematic search for diffuse objects in the sky.

In six years, from 1783 to 1789, he discovered more than 2,000 objects (globular clusters, nebulae, and galaxies).



# Stellar evolution: Clown or Eskimo Nebula

In 1789 he finished building his largest telescope, the so-called "40-foot telescope" because of the length of its tube. With a diameter of 1.2 meters, when he first pointed it at the sky, he discovered a satellite of Uranus in just a few minutes, and in the following days he discovered several more.



40-foot telescope  
(Credit: Wikipedia)

# Stellar evolution: Clown or Eskimo Nebula

Caroline Herschel was the first woman to discover a comet. Between 1786 and 1847, she discovered eight comets.

She was the first woman to receive an official salary for her scientific work, the first professional astronomer.



Carolina Herschel (1750-1848)  
(Credit Wikipedia)



# Stellar evolution: Clown or Eskimo Nebula

In 1880, using the observations of William Herschel and his son John Herschel, the famous NGC (New General Catalogue) was compiled.

It contains more than 7,000 objects; for example, the Clown Nebula, also known as the Eskimo Nebula, is NGC 2382.



John Herschel (1792-1871)  
(Credit Wikipedia)



# Stellar evolution: Orion Nebula

In the Orion Nebula, more than 3,000 stars are forming from a cloud of gas and dust. In 100,000 years, it will form a bright open cluster of young stars surrounded by gas and dust (like the Pleiades are now).



Orion Nebula  
(Credit: NASA/ESA)

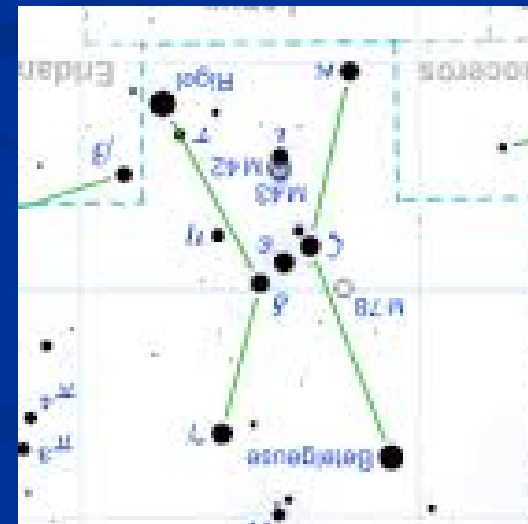


# Stellar evolution: Orion Nebula

The Orion Nebula (M42) is one of the few nebulae visible to the naked eye.

It is located in the center of the Hunter's Sword, which hangs from Orion's Belt (in the Northern Hemisphere).

It is located in the center of the Hunter's Sword, which is above Orion's Belt (in the Southern Hemisphere).

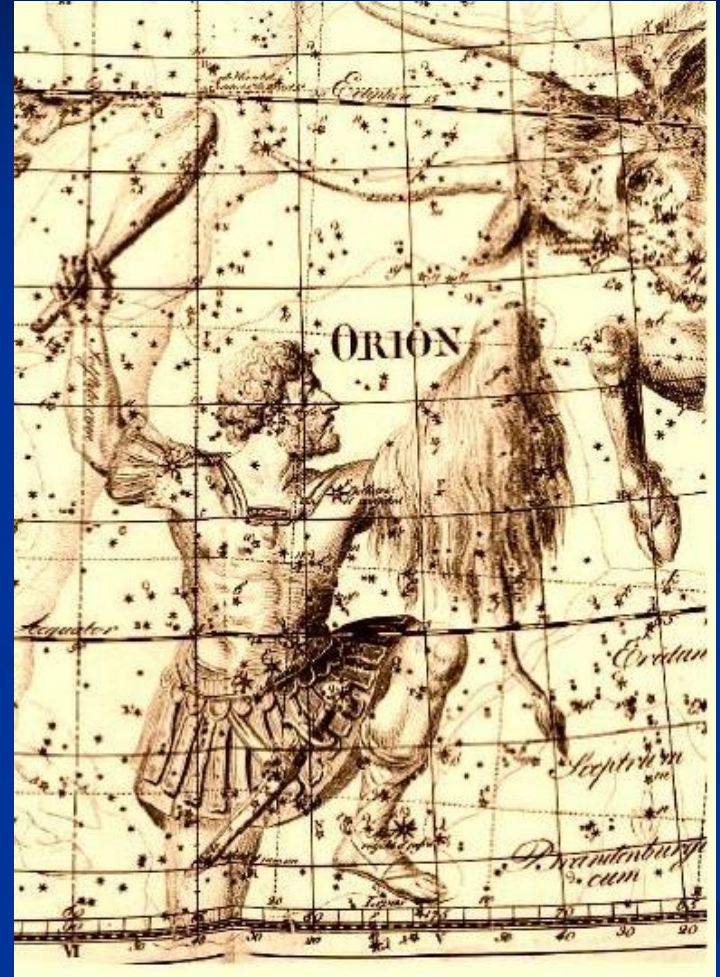


(Credit Wikipedia)

# Stellar evolution: Orion Nebula

The Orion Nebula is currently visible to the naked eye as a diffuse patch. But ancient astronomers (like Ptolemy) considered it only a faint star. It is believed that the nebula's brightness may have increased as very luminous stars have formed within it.

It is surprising that Galileo, although he was observing the stars in the area, does not mention the nebula.



(Credit Wikipedia)



# Stellar evolution: Orion Nebula

In 1610 Nicolas-Claude Fabri de Peiresc discovered the Orion Nebula, although he did not make it public and only noted it in his field notebook, and it was not until 1916 that Guillaume de Bigourdan made it known.

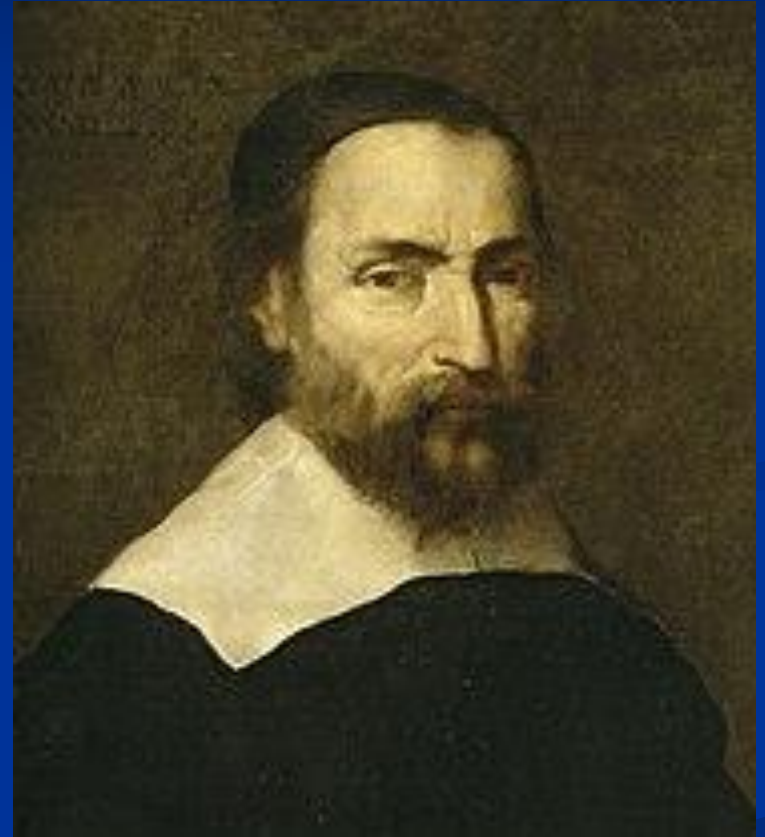


Orion Nebula  
(Credit: NASA/ESA)



# Stellar evolution: Orion Nebula

Nicolas-Claude Fabri de Peiresc was a lawyer, a member of Parliament, as well as an astronomer, botanist, numismatist, collector of antiquities, archaeologist, Egyptologist, and scientific scholar. He dedicated himself to physiology, conducting experiments on human and cat cadavers. He was truly peculiar.



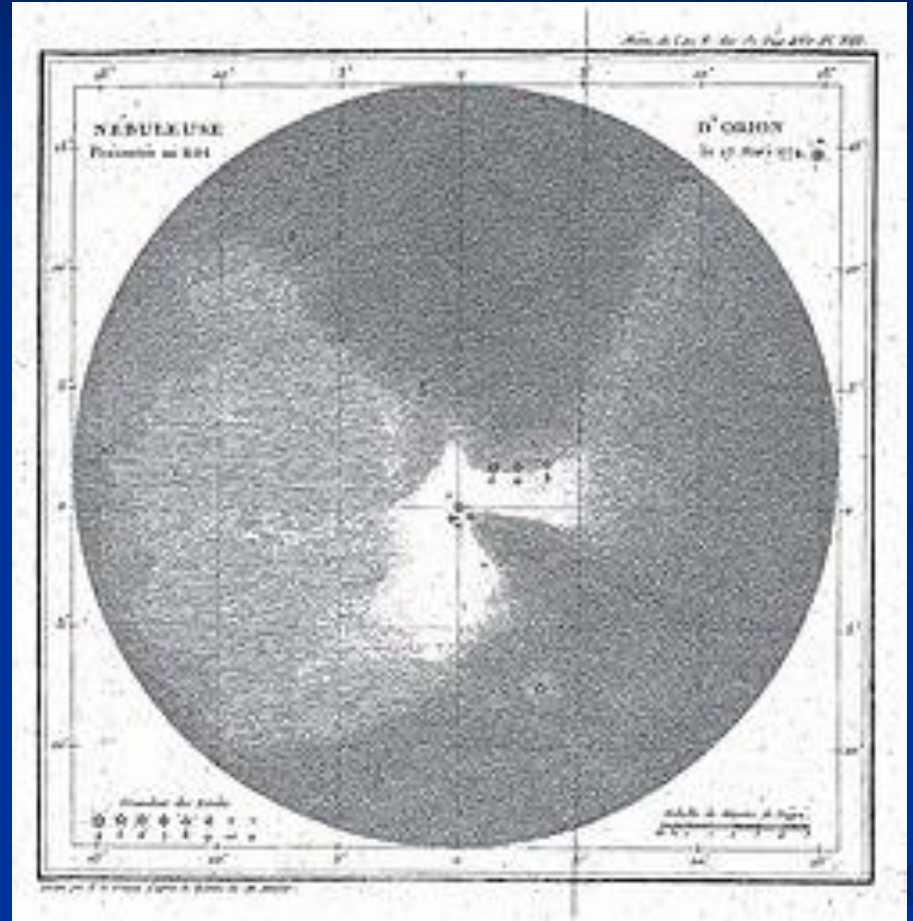
Nicolas-Claude Fabri de Peiresc  
(Credit: Wikipedia)



# Stellar evolution: Orion Nebula

Charles Messier observed the Orion Nebula in 1769 and later included it in his catalog as M42.

In 1774, Herschel observed it with one of his telescopes, and it was later included in the New General Catalogue as NGC 1976.



Drawing of the Orion Nebula made by Messier in 1771

# Stellar evolution: HR diagram

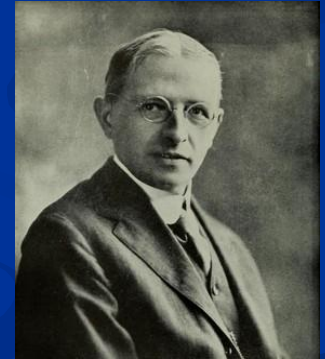
The Dane Hertzsprung was a chemical engineer who worked at the University of Copenhagen Observatory on astronomical photography techniques.

In 1909, he suggested his first diagram, which organized and classified the stars on two axes. Since Hertzsprung was unknown, his "invention" went largely unnoticed.

Meanwhile, in North America, a renowned astronomer, Professor Russell, without any contact with Hertzsprung, began to design a similar diagram, organizing the stars.



Ejnar Hertzsprung (1873-1967)  
(Credit: Wikipedia)



Henry N. Russell (1877-1957)  
(Credit: Wikipedia)



# Solar System: telescope

It is not known who invented the telescope.

For many years it was believed to be the Dutchman Hans Lippershey because he presented a telescope in 1608 to the Dutch prince Maurice of Nassau, but he did not patent it because many others were also building them.



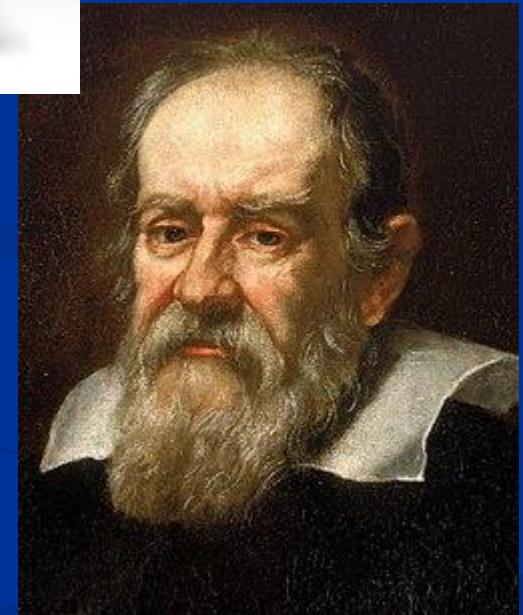
According to research from the late 20th century, Joan Roget was the inventor around 1590. The Roget brothers, of French origin, settled in Spain where they manufactured long-sighted telescopes. Several wills from Barcelona merchants bequeath these instruments. For example, in 1593, a will bequeathed a "long-sighted telescope covered in brass" measuring 20 cm in length.



# Solar System: Big-eared Saturn

By the late 1500s, eyeglasses were being sold in Europe as a form of entertainment. Galileo didn't invent them, but he introduced several improvements.

In 1609, Galileo presented his telescope to the Grand Duke of Venice for its potential military applications, but when this proved unsuccessful, he decided to focus it on the sky.

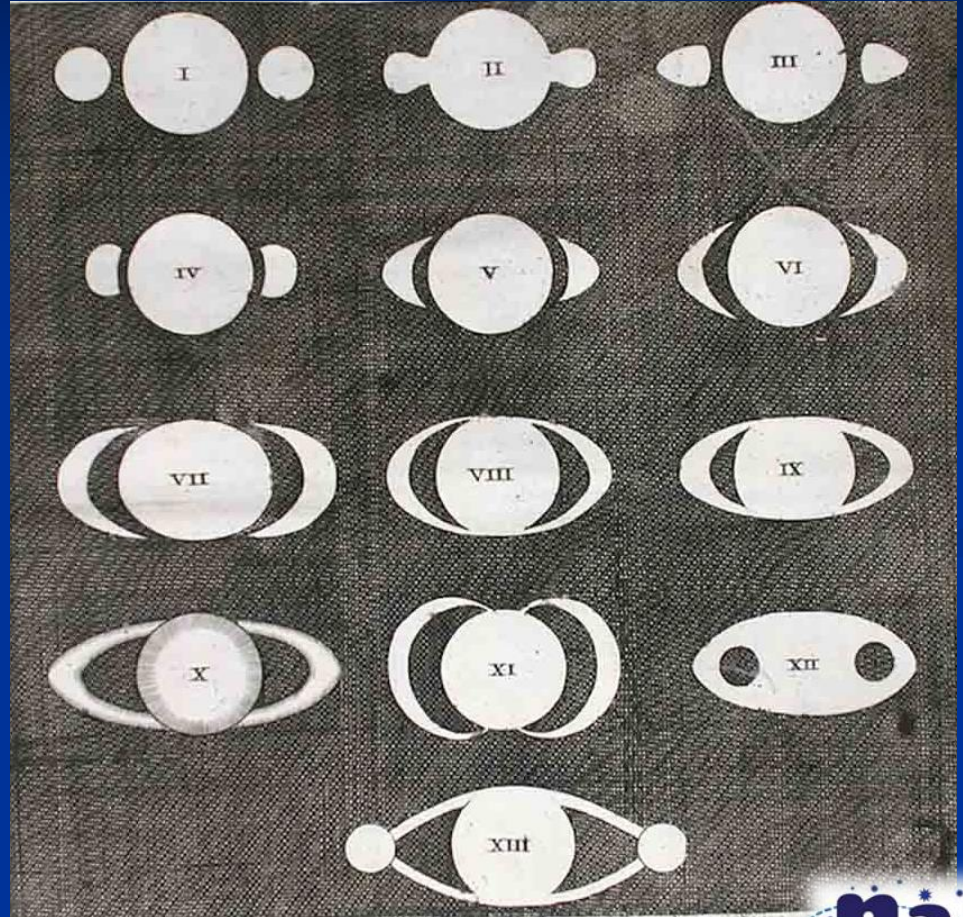


Galileo Galilei (1564-1642)  
and his telescope  
(Credit: Wikipedia)



# Solar System: Big-eared Saturn

When Galileo first observed Saturn in 1610, he did not understand the object as a planet surrounded by a thin ring, but interpreted it as a star with three bodies (a star with ears).



Saturn by Galileo Galilei  
(Credit: Wikipedia)



# Solar System: Big-eared Saturn

For years the structure of Saturn was misinterpreted.



(Credit: Wikipedia)

For example, in the painting that Rubens made between 1636-1638, he painted three stars to symbolize Saturn according to Galileo's recent discovery.



# Solar System: Big-eared Saturn

In 1655, Christiaan Huygens suggested that Saturn's "ears" were a thin, flat disk of matter located in the equatorial plane. Depending on the relative positions of Saturn and Earth in their orbits, this disk appears from Earth as either a thin line or a wide ellipse.

(The ring cycle, like Saturn's orbit, lasted 29 years).



Christiaan Huygens (1629-1695)  
(Credit: Wikipedia)



# Solar System: Big-eared Saturn

It is currently known that Saturn has a system of seven rings separated by gaps. The rings are composed of blocks of water ice and ice-covered rocks, ranging in size from that of a house to grains of sand. In addition, Saturn has 24 spherical moons and more than a hundred irregularly shaped moons, some several kilometers in size.



(Credit: NASA)



# Solar System: Titius-Bode Law

In 1771, the German astronomer Johann Bode, considering the work of another German astronomer, Johann Titius, formulated the well-known Titius-Bode law on the distances from the Sun to the known planets, which predicted the existence of others.



Johann Daniel Titius (1729-1796)  
(Credit: Wikipedia)



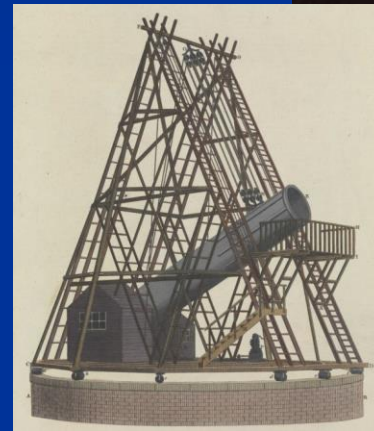
Johann Elert Bode (1747-1826)  
(Credit: Wikipedia)



# Solar System: Titius-Bode Law

En 1781 William Herschel descubrió Urano situado a la distancia predicha por la ley de Titius-Bode y pareció confirmarse.

Herschel attempted to name the planet after his king, George III, calling it "Georgium Sidus" or "Planet **George**." This name was not well received outside of Great Britain, and Johann Bode eventually proposed naming it **Uranus** (the father of Saturn in Greek mythology).

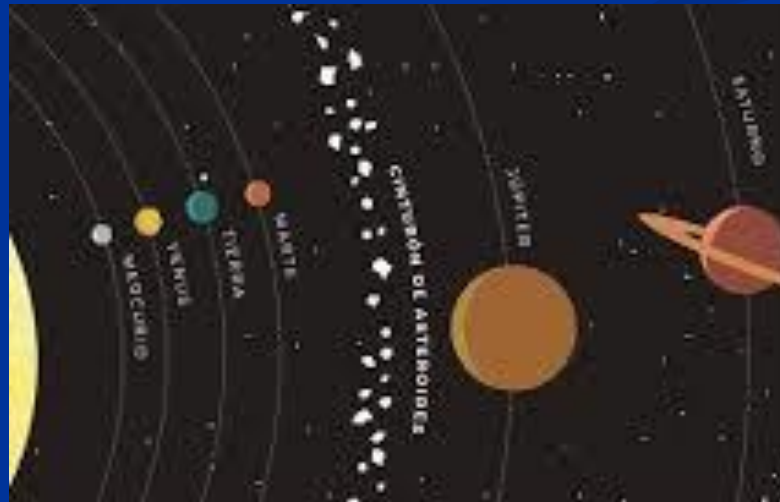


William Herschel (1738-1822)  
and his telescope,  
(Credit: Wikipedia)



# Solar System: Titius-Bode Law

In 1796 at the Gotha Astronomical Congress, astronomers divided up the zodiac zone and began the search for a new planet between Mars and Jupiter from 1800 onwards. These observers were called the "celestial police" and discovered several asteroids but failed to find the planet that Titus-Bode said was missing.

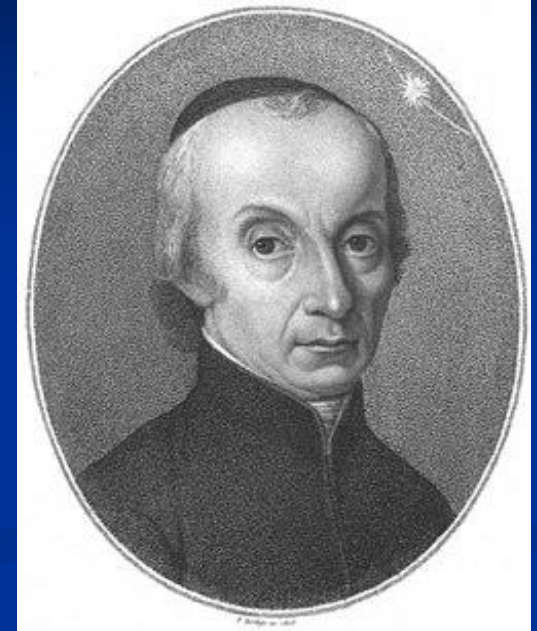


(Credit: Wikipedia)



# Solar System: Titius-Bode Law

The Catholic priest Giuseppe Piazzi, who had not yet been invited to participate in the search, discovered Ceres in 1801, which fit well with the Titius-Bode law.



Giuseppe Piazzi (1746 – 1826)  
(Credit: Wikipedia)

Therefore, in 1801 the solar system consisted of the planets: Mercury, Venus, Earth, Mars, Ceres, Jupiter, Saturn, Uranus and Neptune.



# Solar System: Titius-Bode Law

Astronomers discovered various asteroids in the first asteroid belt between Mars and Jupiter. In the 1850s, Ceres was cataloged as an asteroid along with the others: although it was the largest of them all, it was no longer considered a planet.



# Solar System: Titius-Bode Law

Various irregularities in the movements of Uranus and Neptune could only be explained by the existence of a new planet. Many embarked on a search for this new planet, but it wasn't until 1930 that the American astronomer Tombaugh detected it by comparing photographs of the sky. It was named Pluto, after the Roman god of the underworld.



Clyde Tombaugh (1906 -1997)  
(Credit: Wikipedia)



# Solar System: Titius-Bode Law

Pluto became so famous that Walt Disney, when creating the dog that accompanies Mickey Mouse, gave it the name Pluto, and in 1941 the new chemical element discovered was named Plutonium.



(Credit: Wikipedia)

So in 1930 we have a solar system with the planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto.



# Solar System: Titius-Bode Law

With technological advances, more bodies beyond Pluto were discovered. For example, Eris, discovered in 2005, was larger than Pluto, and its inclusion as a tenth planet was considered. However, new discoveries of similar objects led the IAU to conclude that the concept of a planet needed to be clearly defined.

At the IAU General Assembly in Prague in 2006, a definition of a planet was established that reduced the solar system to only eight planets, excluding Pluto.



# Solar System: Titius-Bode Law

The IAU defined a planet as a celestial body that:

- a) has sufficient mass for its own gravity to overcome the forces of rigid bodies so that it achieves a nearly spherical shape,
- b) is in orbit around a star, and
- c) must also clear its orbit of other bodies.

IAU Pluto vote  
in Prague 2006



(Credit: IAU)



# Solar System: Titius-Bode Law

Bodies that meet the first two criteria but are not large enough to clear their orbits are defined as dwarf planets. Consequently, Pluto, after 76 years, ceased to be a planet and was grouped with Ceres, Eris, and other bodies in the dwarf planet category.

**Since 2006 the solar system includes the planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.**

Since 2014, new orbital anomalies have been detected, and astronomers are searching for the possible existence of a new planet far beyond...



# Solar System

In 1801 the solar system included 9 planets:  
Mercury, Venus, Earth, Mars, **Ceres**, Jupiter,  
Saturn, Uranus and Neptune.

In 1930 the solar system included 9 planets:  
Mercury, Venus, Earth, Mars, Jupiter, Saturn,  
Uranus, Neptune and **Pluto**.

As of 2006, the solar system includes 8 planets:  
Mercury, Venus, Earth, Mars, Jupiter, Saturn,  
Uranus, and Neptune.



# Mountains on the Moon

On November 30, 1609, Galileo observed the Moon for the first time with a small telescope. At the time, it was believed that the Moon was a smooth, perfect sphere, but Galileo discovered that the Moon had mountains, craters, and valleys.

The lunar surface showed irregularities at the terminator (the line dividing the illuminated and dark sides), and Galileo even calculated the height of its mountains from their shadows.

Galileo saw plains that were darker than the rest of the lunar surface and called them seas.



(Credit: Wikipedia)



# Mountains on the Moon

The IAU currently recognizes 9,137 craters, which it names after scientists and explorers.

Craters are the result of meteorite or asteroid impacts, and it is believed that the lunar mare (seae) were formed by giant impacts.

Since there is no water, atmosphere, or tectonic plates on the Moon, there is very little erosion, and some craters are over two billion years old.



(Credit: Wikipedia)



# A Rabbit on the Moon

In some cultures, a rabbit is seen on the face of the Moon, formed by dark spots.



(Credit: Wikipedia)



# A Rabbit on the Moon

In East Asia, a rabbit (or a hare) is seen pounding the elixir of life, medicines, or cakes with a mortar and pestle (depending on whether the observer is Chinese, Japanese, Korean, or Vietnamese).



(Credit: Xiahpop)



# A Rabbit on the Moon

According to a Buddhist tale: a monkey, an otter, a jackal, and a rabbit decided to practice charity on the day of the full moon. An old man asked them for food; the monkey gave him fruit from the trees, the otter fish, the jackal a lizard, but the rabbit, who only knew how to gather grass, offered his body by throwing himself into the fire the man had lit. The rabbit was not burned, and the old man, who was the god Shakra, moved by the rabbit's virtue, drew his image on the moon for all to see.



Tsukimi consists of contemplating the Moon on the first day of autumn because according to mythology, on that day rabbits can be seen running around on the Moon.

(Credit: Wikipedia)



# A Rabbit on the Moon

According to an Aztec and Mayan legend, the god Quetzalcoatl (the feathered serpent), hungry after a journey, without food or water, thought he would die. Then, a rabbit grazing nearby offered itself as food to save his life.

Quetzalcoatl, moved by the rabbit's noble offering, raised it to the moon, saying, "There is your image in the light, for all peoples and forever."



(Credit: Wikipedia)

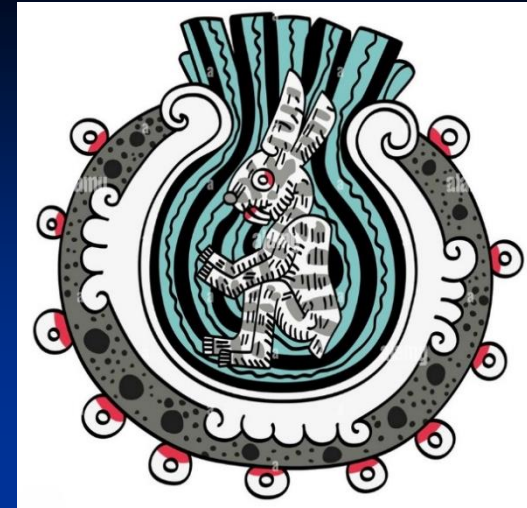


(Credit: Wikipedia)



# A Rabbit on the Moon

The Mexica believed that the Moon was their goddess Coyolxauhqui inside a vessel, which illuminated the Earth in varying ways depending on its position inside the vessel.



(Credit: Wikipedia)

According to another Mesoamerican legend, the humble Nanahuatzin sacrificed himself in the fire to become the new sun, but the wealthy god Tecciztecatl hesitated four times before setting himself ablaze and becoming the moon. Because of his cowardice, the gods believed the moon should not be as bright as the sun, and one of them threw a rabbit at its face to dim its light.

# A Rabbit on the Moon

A legend in Canada and the United States tells of a young rabbit who longed to ride the Moon. A crane offered to take him there. During the journey, the rabbit clung tightly to the crane's legs, which stretched out, just as cranes' legs appear today. Upon reaching the moon, the rabbit touched the crane's head with a bloody paw, leaving a red mark. According to the legend, on clear nights, the rabbit can still be seen riding on the Moon.

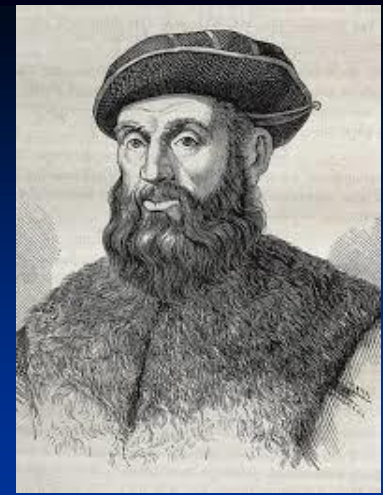


(Credit: Wikipedia)



# Around the World

In the 3rd century BC, Eratosthenes had already calculated the radius of the Earth, but it wasn't until Magellan and Elcano's first circumnavigation of the globe that it was conclusively proven. From September 20th, 1519, to September 8th, 1522, the voyage was extremely complicated, as there were no nautical charts of that part of the world at the time, and they had to rely on their astronomical knowledge.



Fernando de Magallanes (1480-1521)  
(Credit: Wikipedia)



Juan Sebastián Elcano (1486-1526)  
(Credit: Wikipedia)



# Around the World

Ferdinand Magellan, on a previous voyage under the auspices of the King of Portugal in 1505, had already named the constellation the Southern Cross (used to locate the South Celestial Pole, since there is no star that points to the South Pole).

Magellan made the Large Magellanic Cloud known in Europe, which he observed during his voyage under the auspices of King Charles I of Spain. Both Magellanic Clouds were known in the Middle East. In 964, the Persian astronomer Abd al-Rahman al-Sufi named them al-Baker (White Ox). But they remained invisible and unknown in Europe.



Large Magellanic Cloud (Credit Wikipedia)



# Around the World

Magellan proposed the "Spice Expedition" to King Carlos I of Spain as a means of preserving food (a proposal rejected by Manuel I, King of Portugal).

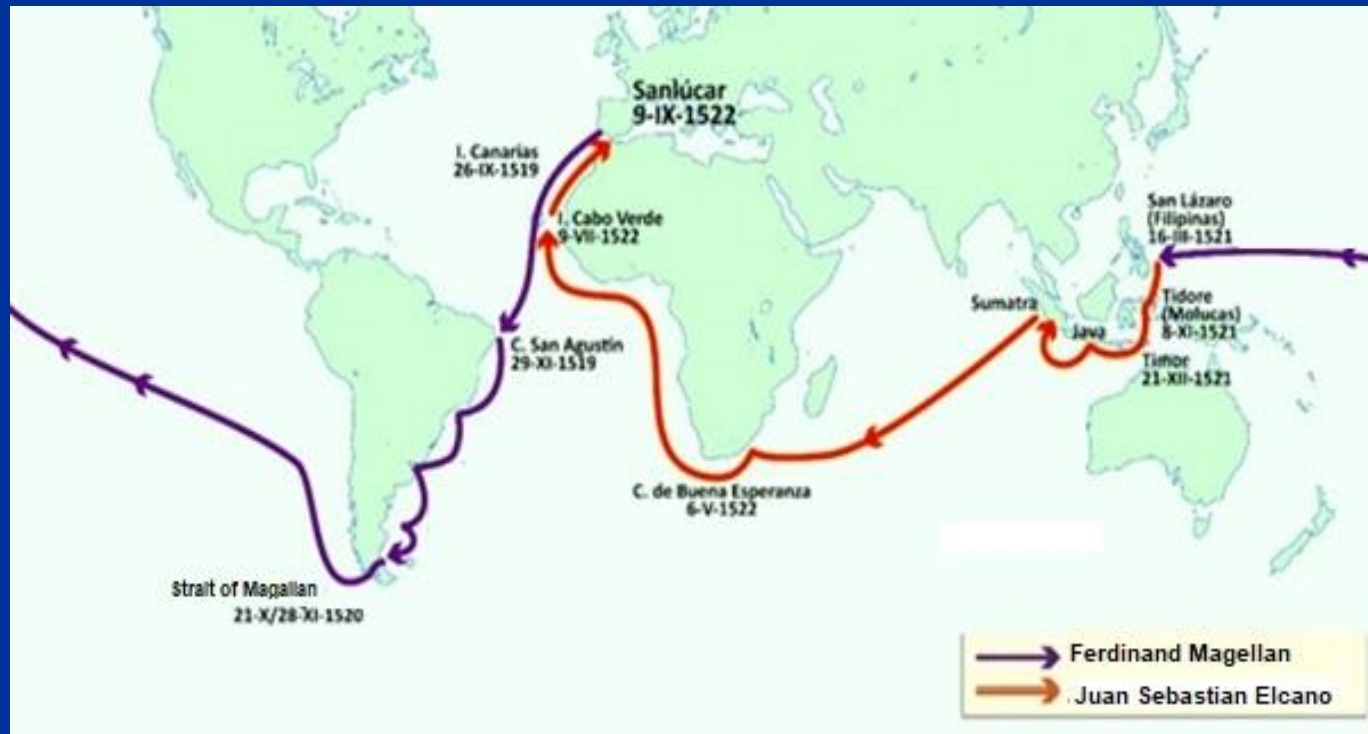
When, in 1518, Carlos I decided to finance this expedition, sailing west instead of east as had been the practice until then, he was only 18 years old.



Carlos I, (1500-1558), aged 17  
(Credit: Bernard van Orley)

# Around the World

Carlos I financed five ships under the command of Ferdinand Magellan, which departed from Seville in 1519 with a total of 239 sailors. Only 17 survivors returned, under the command of Juan Sebastián Elcano, in a single ship, the Victoria. Magellan died in the Philippines in April 1521, and the Spaniard Elcano took command.



# Around the World

Upon traveling to the Southern Hemisphere, new constellations began to be defined, named after instruments and machines used at the time or after animals native to the Americas.

The constellations discovered during the 16th and 17th centuries are Triangulum Australe, Hydrus, Musca, Pavo, Phoenix, Tucana, Camelopardalis, Lynx, Sextans, Horologium, Microscopium, Octans, Puppis, Telescopium, and Vela.

Ancient constellations often have a name based on Greek mythology, such as: Leo, Scorpius, Taurus, Aquarius, Aries, Auriga, Cancer, Canis Major, Canis Minor, Capricornus, Gemini, Libra, Orion, Pisces, Sagittarius, Virgo.



# Global Earth of 1884

The Ciutadella Park in 1888, hosted the Barcelona Universal Exposition. It was a science and cultural park, designed to showcase the scientific advances achieved in the 19th century. The park included an Umbracle, a Greenhouse, a botanical garden, and museums of Geology and Zoology and the Zoo.

Stood a meteorological park, designed in 1884, which included a meteorological column with a thermometer, a barometer, a hygrometer but the mechanisms have been lost



(Credit: G. Ribera)



# Global Earth of 1884

The column was oriented to the four cardinal points and supporting the oriented spherical sundial (which is actually an oriented parallel Earth) where the illuminated area of the sphere indicated the time. Sphere surrounded by a band of Roman numerals along its equator. It actually works correctly.

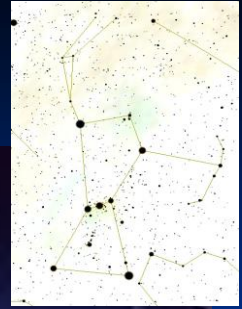


(Credit: G. Ribera)



# Orion Mythology

Orion was a giant from Boeotia (Greece), of great beauty and physical strength. He was so tall that he could walk along the seabed with his head above water. He loved hunting and did so with a bronze club. Orion died as a result of a scorpion's sting, so the gods placed Orion and the scorpion at opposite ends of the sky, one visible in winter and the other in summer.



(Credit: Ricardo Moreno)



# Mythology of the Orion region

Orion had two dogs: an older dog named Sirius, and a younger dog named Maira. After being with Orion, Maira had another owner. When that owner died, his dog began to moan and cry until her eyes swelled up, and she stayed on the grave, without eating or drinking, until she died. As a reward for her loyalty, she was placed in the sky.

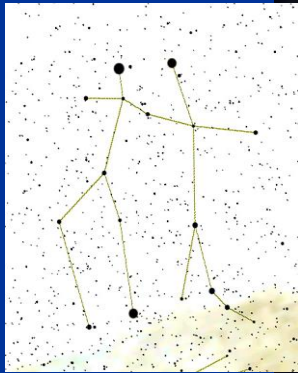
The brightest star, Procyon, was called Algomaisa by the Arabs, meaning "she of the weeping eyes."



(Credit: Wikipedia)

# Gemini Mythology

Zeus fell in love with Leda, queen of Sparta, and disguised as a swan, gave her two eggs. From one hatched Pollux, and from the other, Castor. They were placed in the sky holding hands, a symbol of brotherhood and friendship.

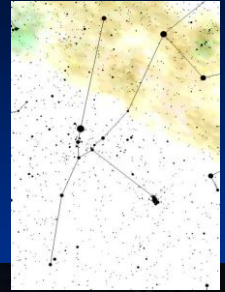


(Credit: Ricardo Moreno)

# Mythology of Taurus

Europa, daughter of the king of Phoenicia, was picking flowers when she saw a bull with a glossy, soft coat, Taurus, grazing peacefully. It was Zeus disguised, for he was in love with Europa. She approached him and stroked his hair. The animal sat down on the ground. Suddenly, he rose and, with the young woman, sailed until they reached Crete.

In the sky, the head of Taurus is surrounded by the Hyades, eight nymphs who raised the god Dionysus. This god placed them in the sky as a reward.



(Credit: Ricardo Moreno)



# Mythology of the Taurus region

The Pleiades were seven sisters (Maia, Taygete, Electra, Alcyone, Celaeno, Sterope, and Merope). Orion pursued them for five years. They begged Zeus for help, and he placed them in the sky.



(Credit: Wikipedia)

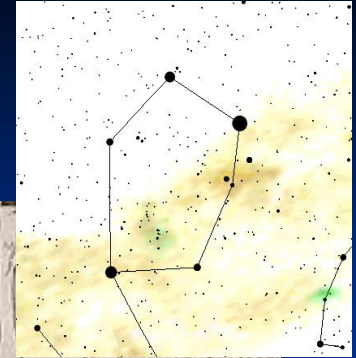
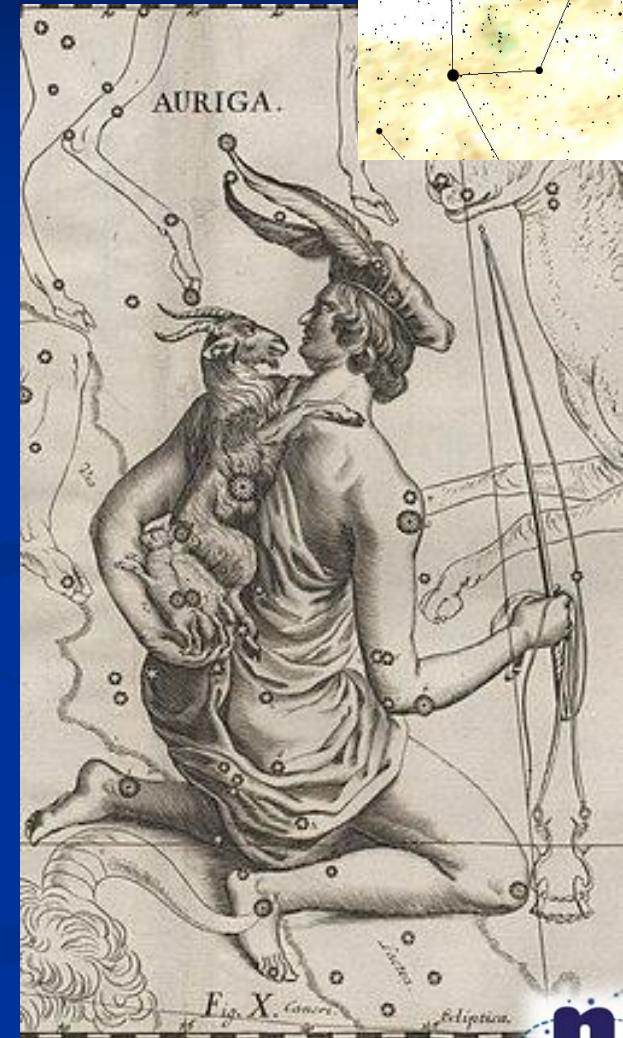
In ancient Greece, this constellation were used to test the visual acuity of archers: if all seven stars could be seen, their eyesight was good; if only six could be seen, it was not so good.



# Mythology of the Auriga

The Auriga represents the king of Athens, invented the chariot drawn by four horses, called a quadriga. The Sun was the first god to drive a quadriga.

Among the Romans, charioteers competed in circus races. They usually came from humble backgrounds, although some became wealthy.



(Credit: Ricardo Moreno)



Thank you very much  
for your attention!

