



Tomáš Tůma & Pavel Gabzdyl



SPACEMANIA

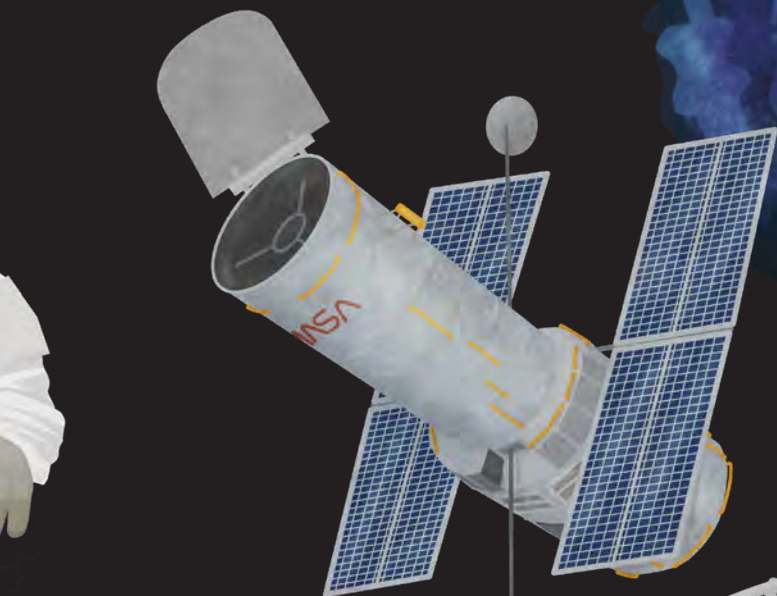
Encyclopedia of the Universe



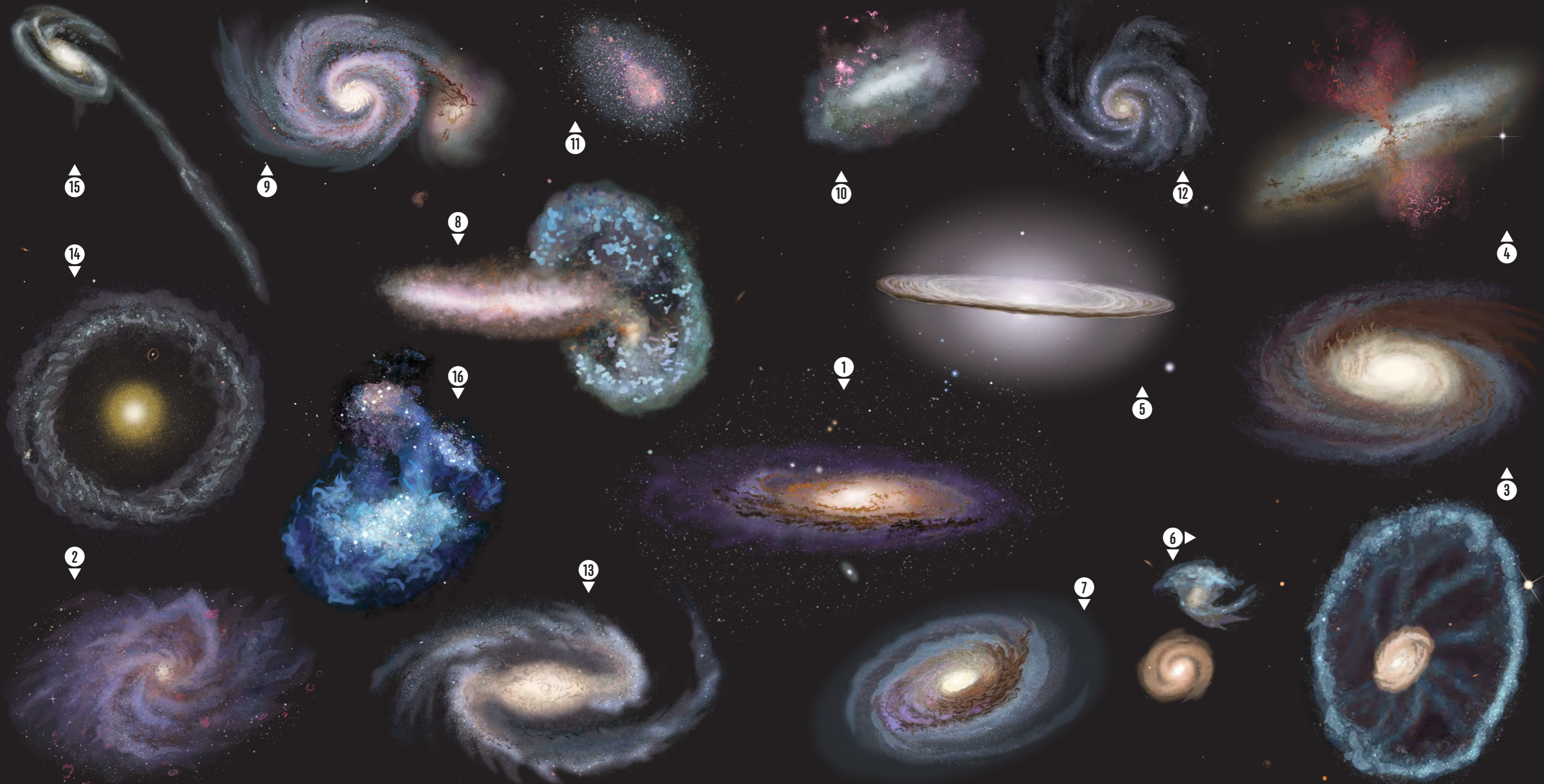
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Encyclopedia of the Universe

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Albatros



1. Galaxy M31 – Visible to the naked eye, the Andromeda Galaxy is located approximately 2.5 million light years away from us.
2. Galaxy M33 – Located roughly 3 million light years away from us, it's one of the most remote objects visible to the naked eye.
3. Galaxy M81 – The light of this galaxy takes 12 million years to reach us.
4. Galaxy M82 – This special irregular galaxy can be found near Galaxy M81.
5. Sombrero – Due to its prominent dust ring, Galaxy M104 looks sort of like a hat – specifically a wide-brimmed straw hat worn in Mexico, called a *sombrero*.

6. Cartwheel Galaxy – This single galaxy formed when two galaxies collided. Their arms broke down and created spokes connecting the outer rims.
7. Black Eye – Galaxy M64, with a dust belt near its center, looks like a heavy-lidded eye.
8. Galaxy Arp 148 – This galaxy is the result of a collision of two large starry islands located roughly 500 million light years away from us.
9. The Whirlpool Galaxy – Galaxy M51 is one of the most beautiful formations you can observe with a telescope.

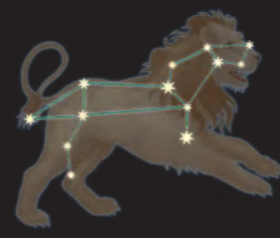
10. The Large Magellanic Cloud – A close neighbor of our own galaxy, it can be seen only from the southern hemisphere.
11. The Small Magellanic Cloud – It's located roughly 200,000 light years away from Earth, approximately 30,000 light years farther away than the Large Magellanic Cloud.
12. Pinwheel – The M101 is a face-on galaxy, meaning we can admire its arms to our heart's content.
13. Galaxy with a bar – The NGC 1300 galaxy has a noticeable bar in the middle.

14. Hoag's object – A ring galaxy, it likely formed from the collision of two different galaxies.
15. Tadpole Galaxy – This galaxy's tail is 280,000 light years long and full of young stars.
16. Distant galaxy – An artist's rendition of one of the most distant galaxies, known as CR7. Its light takes 12.9 billion years to reach us!



Claudius Ptolemy

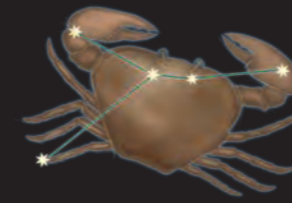
People have been giving names to groups of stars since ancient times. These names were usually of gods, mythical heroes, or everyday objects. The most famous names come from the constellations described by the Greek astronomer Claudius Ptolemy in 148 CE. It wasn't until 1930 that the International Astronomical Union tidied things up and introduced the 88 constellations we know today.



Leo – This constellation really does look like a resting lion, with the bright star Regulus for its heart.



Boötes is a northern constellation that includes the distinct star Arcturus. It is considered to be the guardian of the Ursa Major and Ursa Minor constellations.



Cancer – An inconspicuous constellation with the open Beehive Cluster, which, when the skies are clear, can be seen without a telescope.



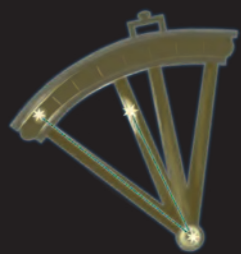
Lepus – Also called the Hare. It can be found near Orion, a figure who hunts hares.



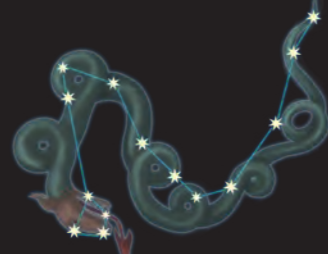
Monoceros – A modest constellation near Orion.



Cetus – The fourth biggest constellation in the sky. It symbolizes a sea monster sent by the god Poseidon.



Sextans – A small constellation, named after the sextant – a tool for measuring angles in the sky.



Draco – A large constellation that never goes down in the northern hemisphere.



Ursa Minor – Also known as the Little Dipper. It includes the North Star, which, in the northern hemisphere, shows where north is because it always stays in the same spot in the sky, like a celestial compass.



Ursa Major – The seven brightest stars of this large constellation make up the well-known formation called the Big Dipper.



Cygnus – A beautiful northern constellation shaped like a swan. Its Latin name even means “swan.” According to legend, the god Zeus could transform into a swan to walk among humans.



Delphinus – An adorable constellation that looks like a dolphin. According to Greek legend, a dolphin once saved the life of the poet Arion, who had been thrown into the sea by sailors.



Crux – A distinct constellation in the southern sky. It includes a bright part of the Milky Way and is the smallest of the 88 constellations.



Tucana – A modern constellation introduced by Dutch seafarers in the 17th century. It depicts a South American bird with a big, colorful beak.



Cassiopeia – An easily recognizable W-shaped constellation in the northern sky.



Corona Borealis – A small constellation that looks like a crown with an inset jewel – its brightest star is Gemma.



Taurus – This Latin name, meaning *Bull*, refers to a very distinct constellation containing the reddish star Aldebaran, which is visually like the bull's eye.



Orion is one of the most stunning constellations in the night sky. It's easy to spot because of the three bright stars that form its belt.



Columba – A hidden little constellation that symbolizes a biblical dove holding an olive leaf in its beak.



Phoenix – A southern constellation that depicts the mythical fiery bird called the Phoenix.



Volans – A quaint constellation named after a flying fish whose fins enable them to glide across the surface of water.



Pyxis – A small constellation that was named by French astronomers in 1754.

1. Holmdel Horn Antenna (1959)

Diameter of 20 feet

2. Super-Kamiokande Neutrino Detection Experiment (1983)

3. Hubble Space Telescope (1990)

Diameter of 8 feet

4. Solar and Heliospheric Observatory spacecraft (1996)

5. Chandra X-Ray Observatory (1999)

Diameter of 4 feet

6. Spitzer Space Telescope (2003)

Diameter of 2.5 feet

7. Gran Telescopio Canarias (2007)

Diameter of 34 feet

8. Kepler Space Telescope (2009)

Diameter of 3 feet

9. Atacama Large Millimeter Array (2011)

66 radio telescopes, diameter of 40 and 22 feet

10. James Webb Space Telescope (2022)

Diameter of 21 feet

11. Extremely Large Telescope (2027)

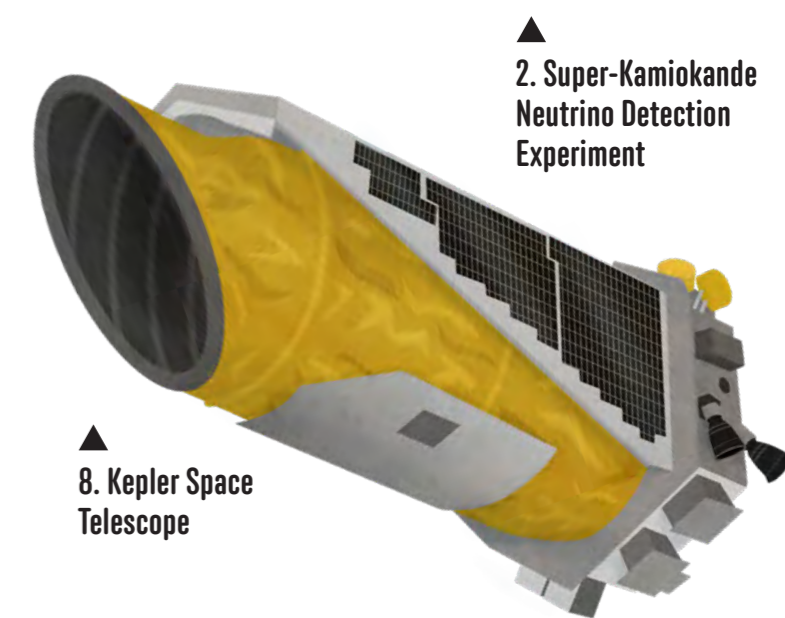
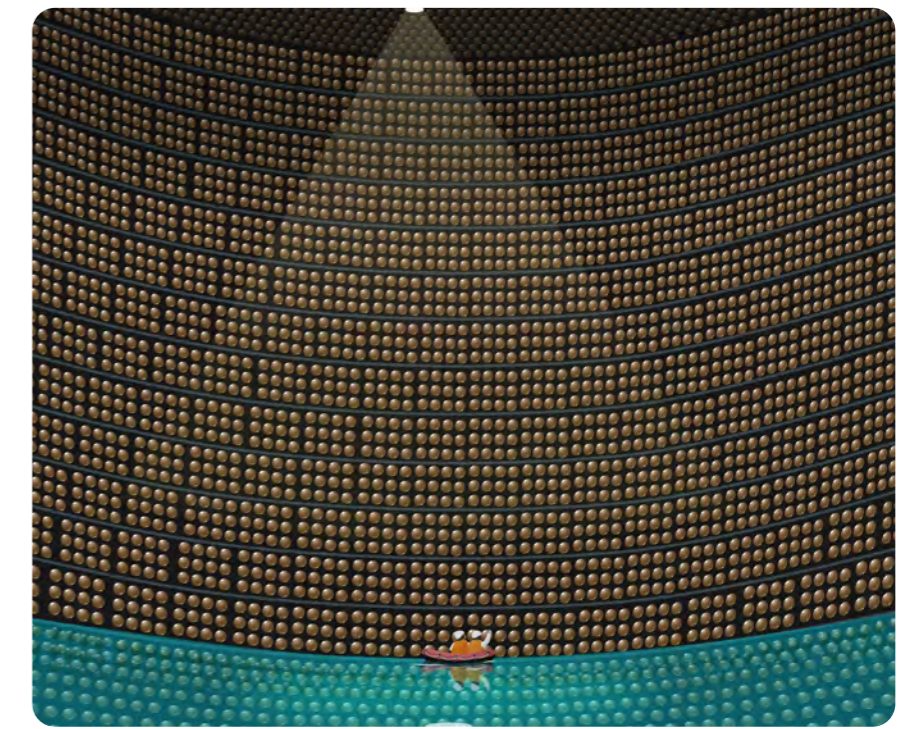
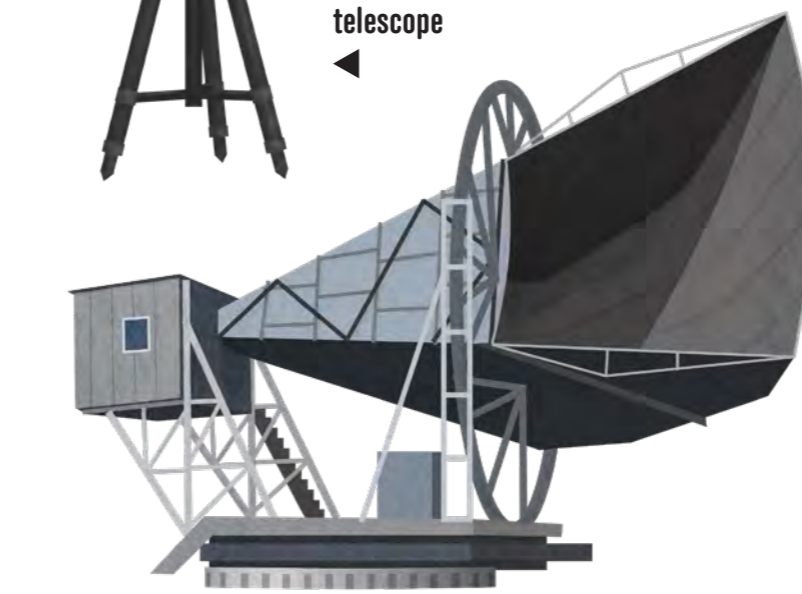
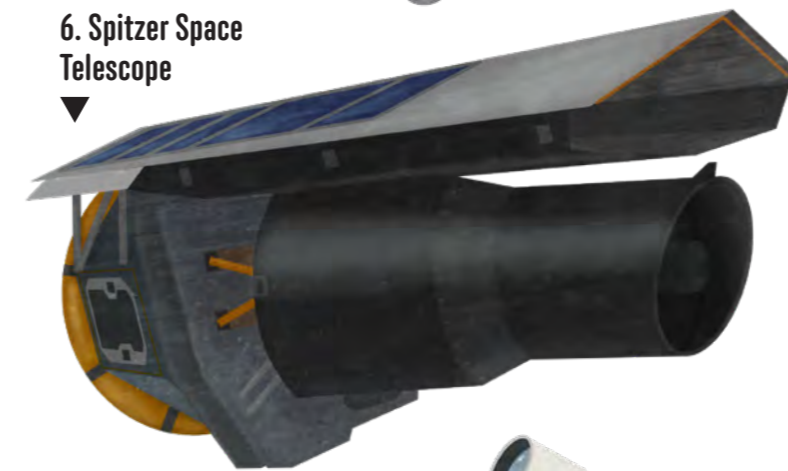
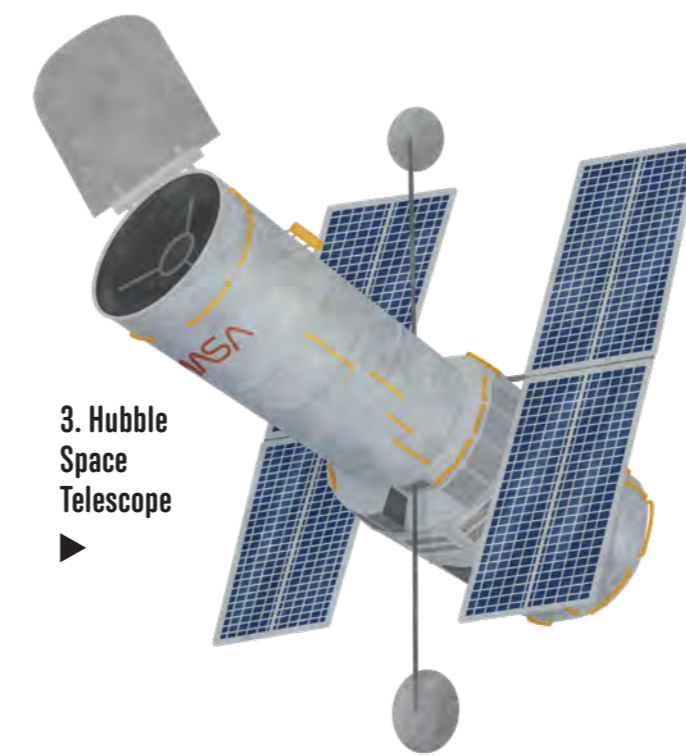
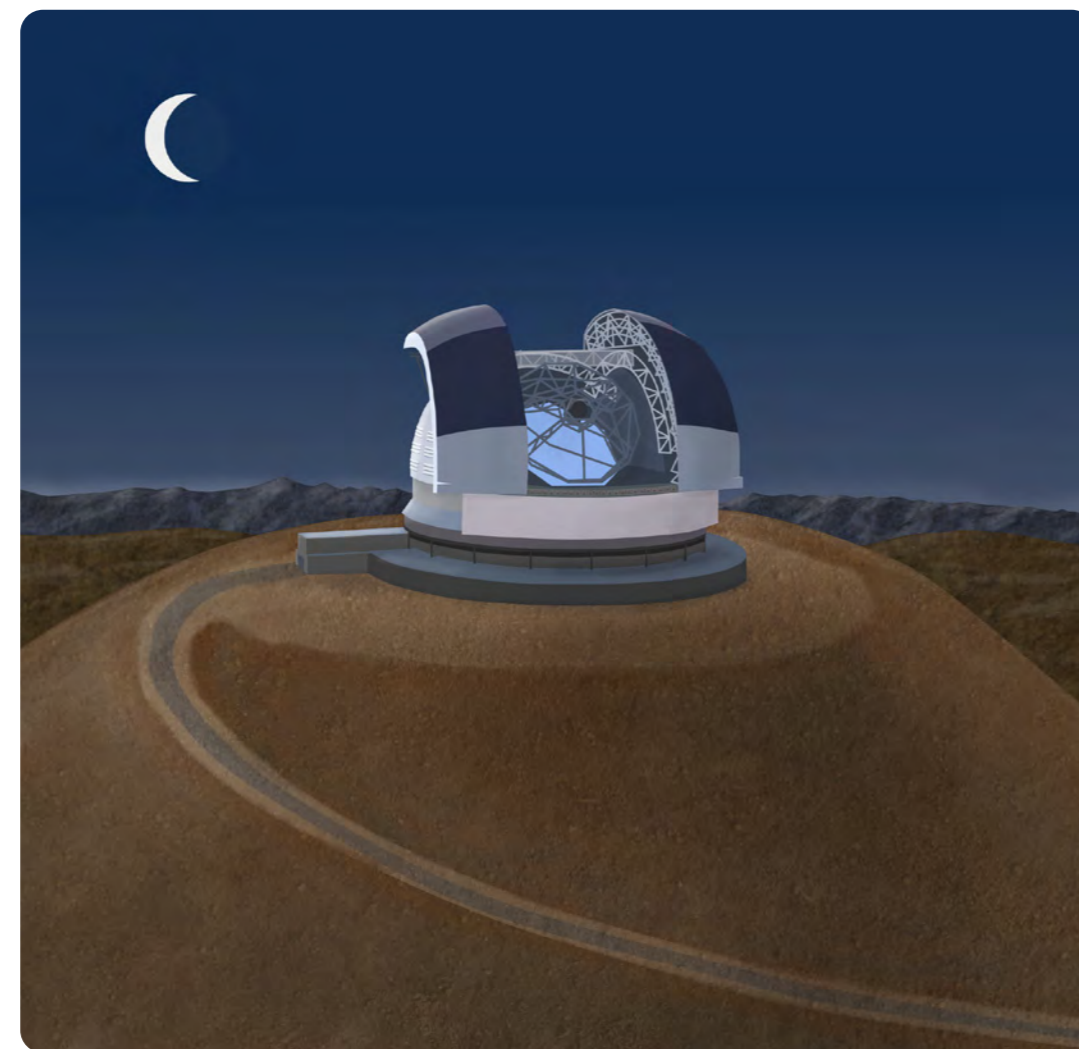
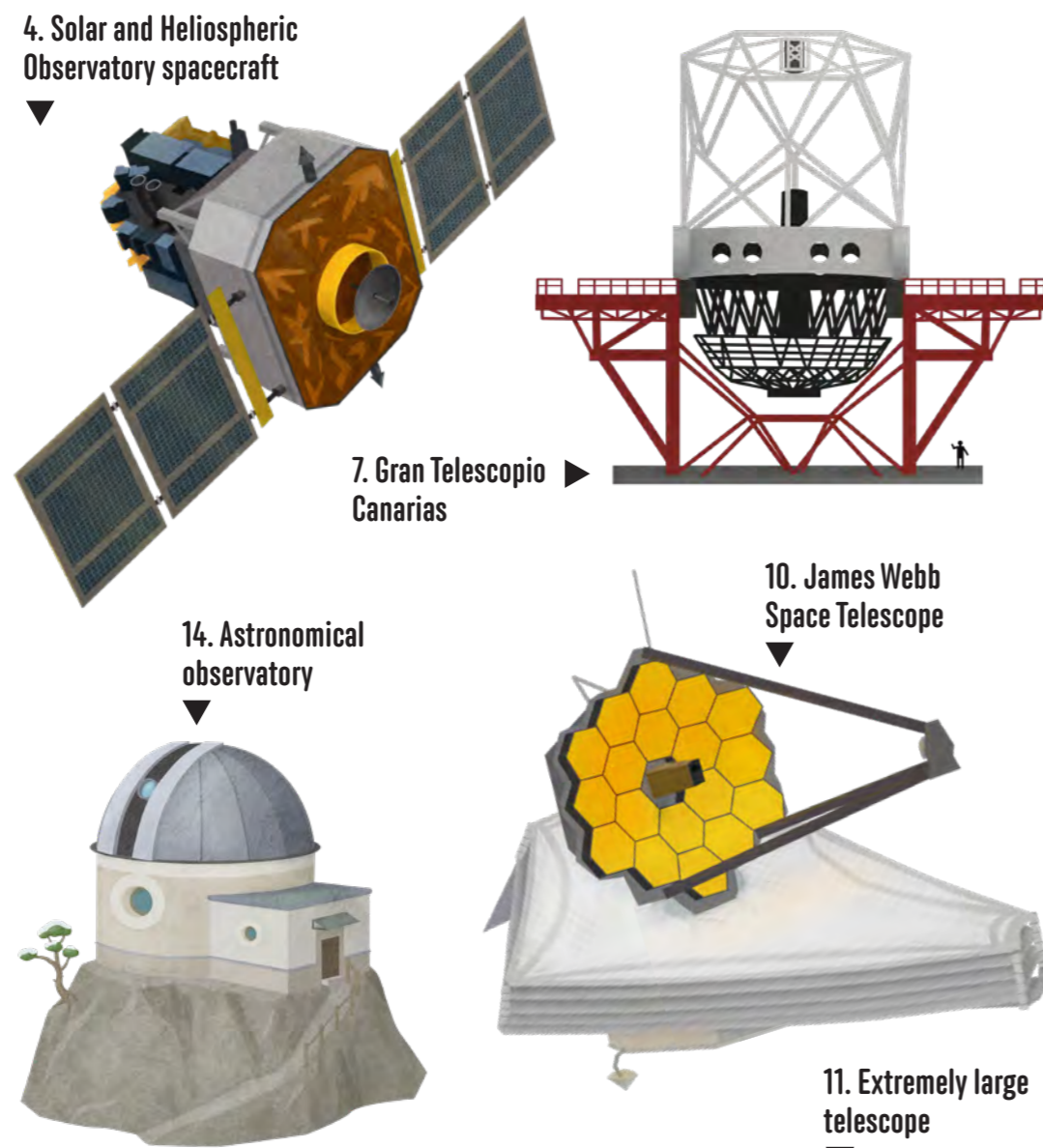
Diameter of 128 feet

12. Simple refracting telescope (using lenses to gather and bend light)

13. Simple reflecting telescope (using mirrors to bounce and focus light)

14. Astronomical observatory

Note: The sizes of the individual telescopes and observatories here are not shown in relation to one another. Some of this stuff is very big, and some is very small.



Earth



The Moon (diameter: 2,159 miles)
Humans have landed there.



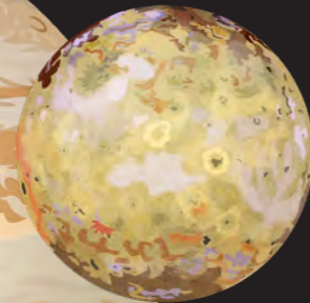
Phobos (dimensions: 17 × 14 × 13 miles)
A satellite with a huge crater.



Deimos (dimensions: 10 × 8 × 7 miles)
A potato-shaped moon.



Callisto (diameter: 2,995 miles)
An ice moon with many craters.

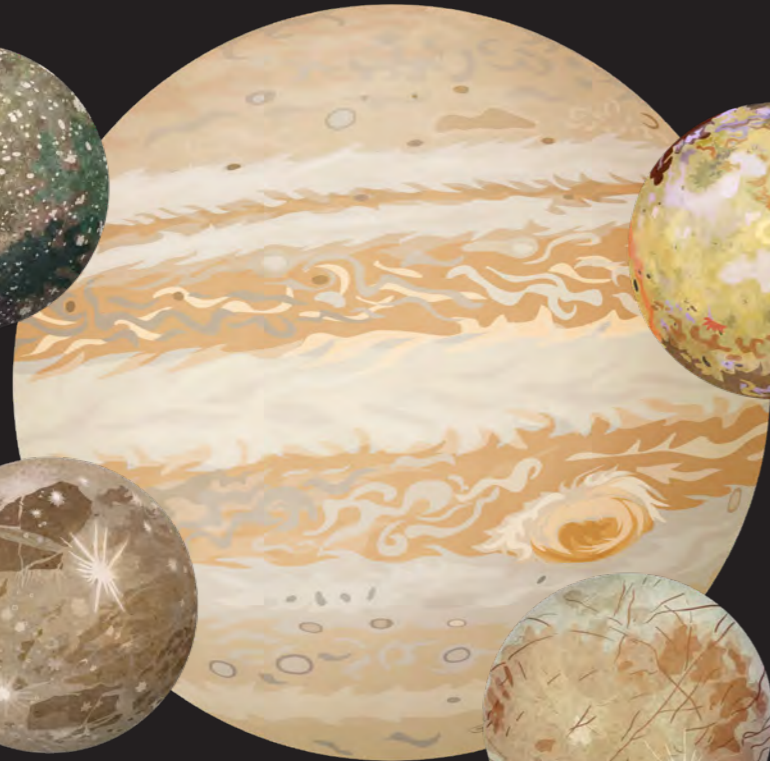


Io (diameter: 2,263 miles)
A scorching moon with many volcanoes.

Mars



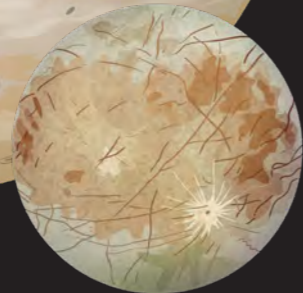
Jupiter



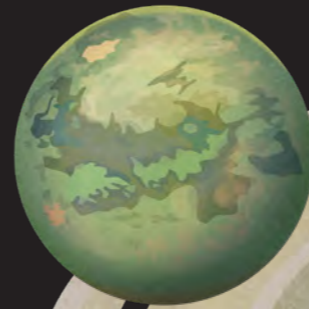
Ganymede (diameter: 3,273 miles)
The largest moon in the Solar System.



Europa (diameter: 1,949)
A moon with an ice shell, full of cracks.



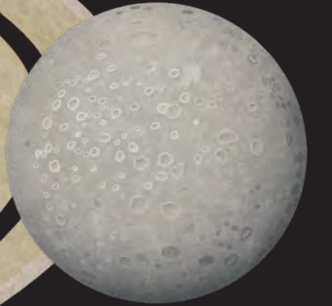
Titan (diameter: 3,200 miles)
The only moon with a thick atmosphere.



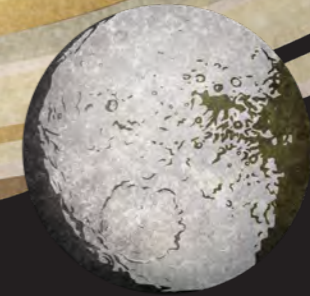
Saturn



Rhea (diameter: 950 miles)
A moon consisting mostly of water ice.

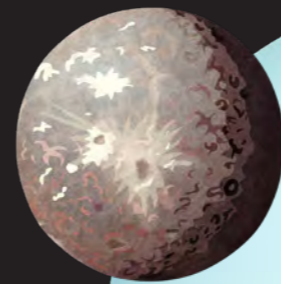


Iapetus (diameter: 892 miles)
It has a dark hemisphere.

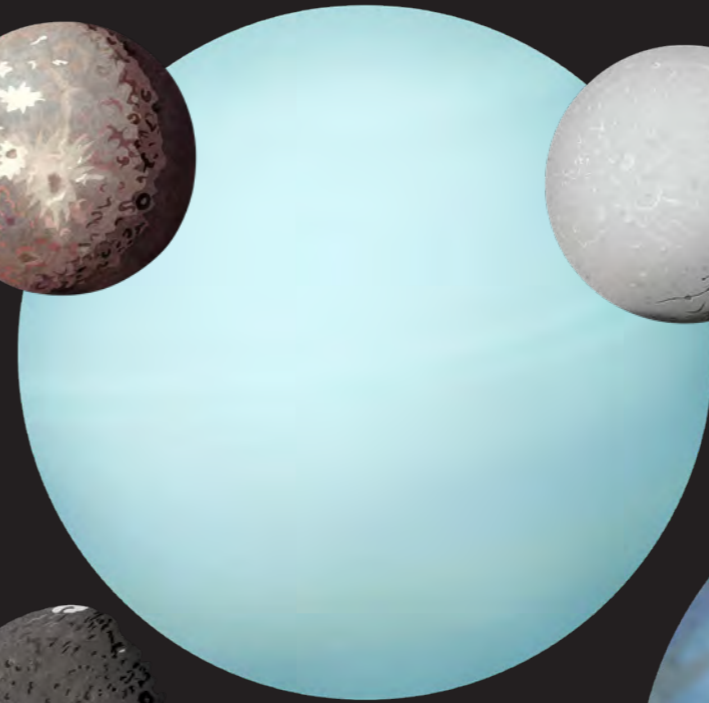


Uranus

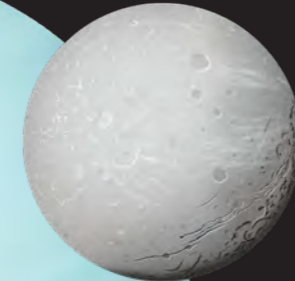
Oberon (diameter: 945 miles)
Made of ice and rocks.



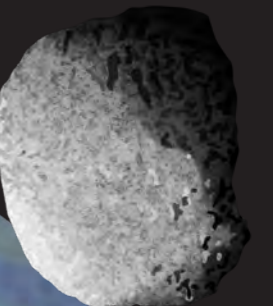
Uranus



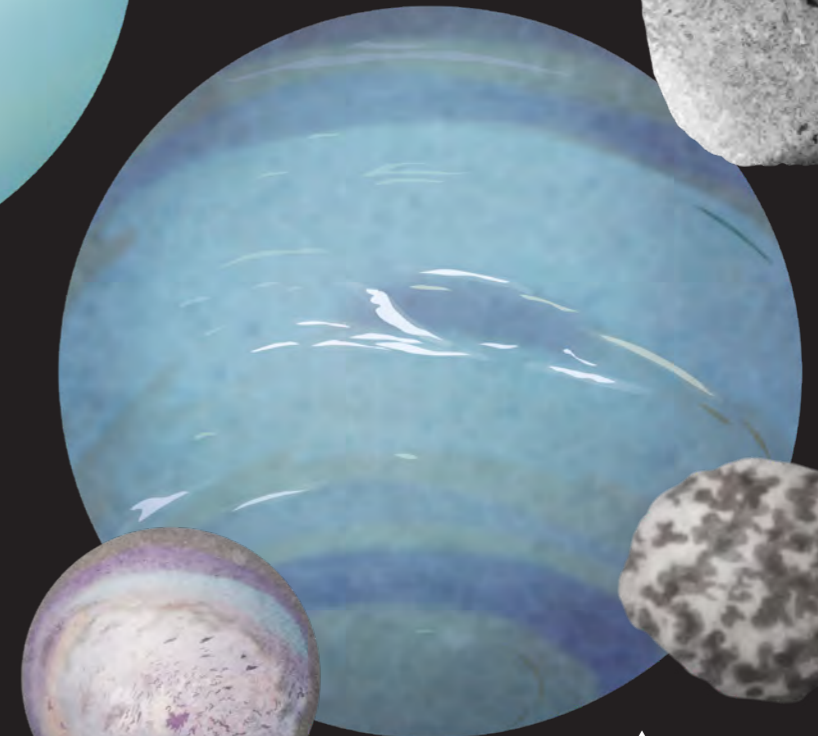
Titania (diameter: 980 miles)
Uranus's largest moon.



Proteus (diameter: 260 miles)
It has an unusually elongated shape.



Neptune



Umbriel (diameter: 726 miles)
Its surface contains a bright ring that might be frost deposits from an impact crater.

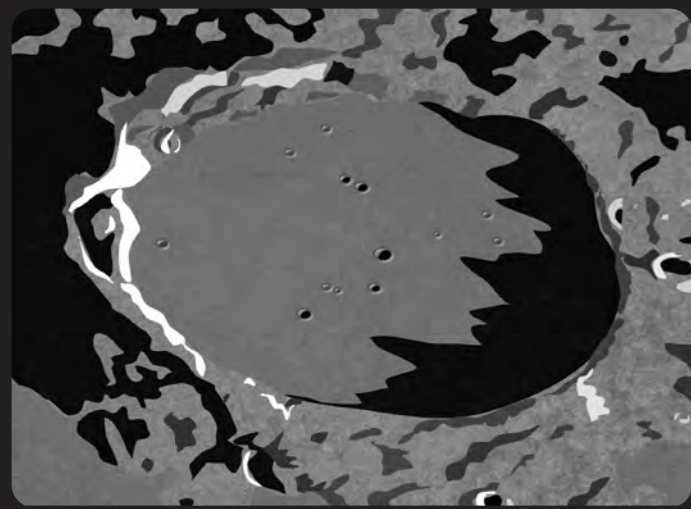


Triton (diameter: 1,680 miles)
An unusual moon with peculiar volcanoes.

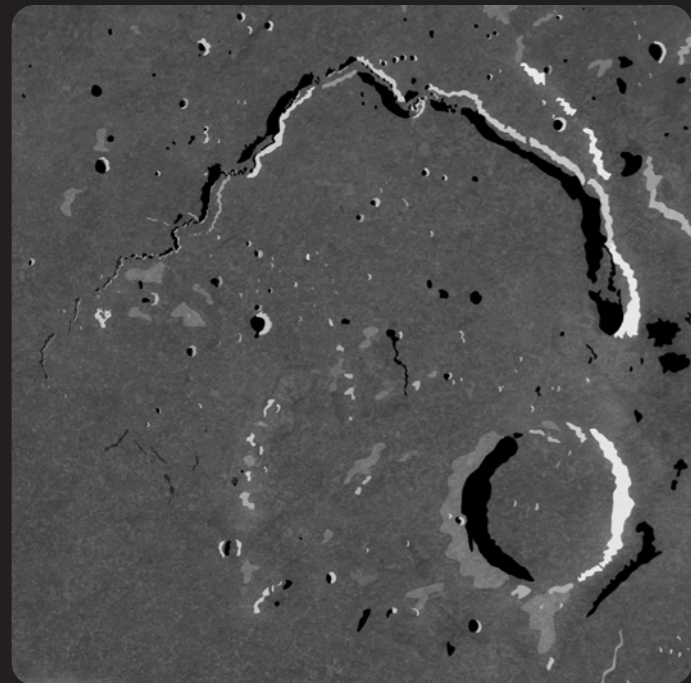


Larissa (diameter: 134 × 126 × 104 miles)
A small, irregular moon.





Filled-in crater
The Plato crater is full of solidified lava.



Schroter's Valley
A winding valley, once hollowed out by flowing lava.



The far side of the Moon
You can't see it from Earth. It has much fewer lunar large dark plains (called *mares*) than the near side does. ▼



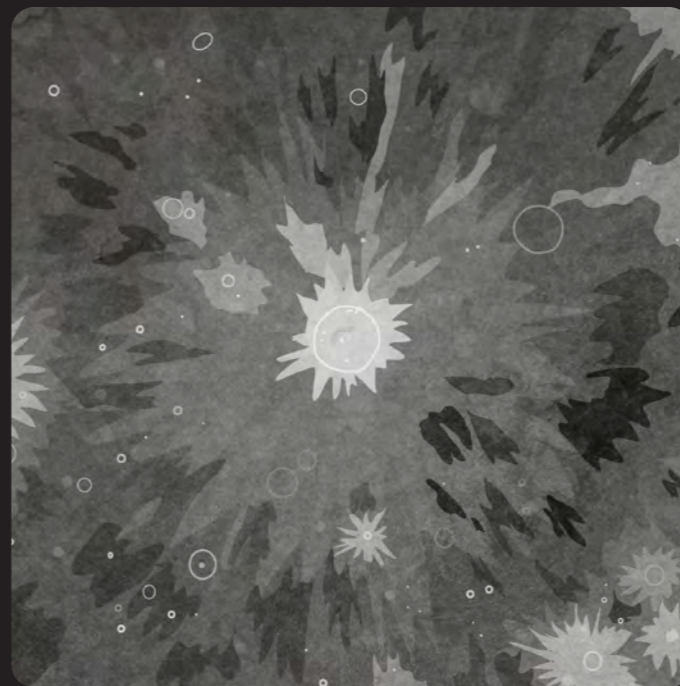
A map of the Moon's near side.

The radial Tycho
A crater named after the famous Danish astronomer. It's surrounded by bright lines spreading out like spokes from the center of a wheel.



Tycho Brahe ▶

Copernicus crater
One of the youngest large craters on the Moon.

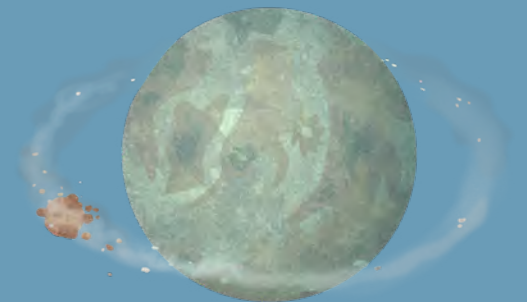


Origins of the Moon

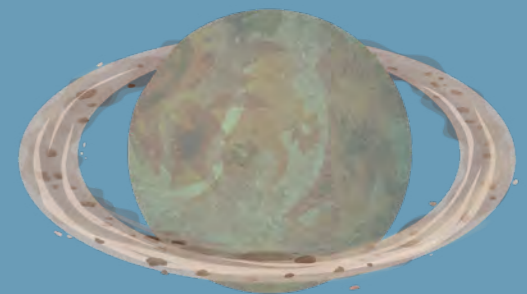
Approximately 4.4 billion years ago, a minor planet called Theia hit Earth.



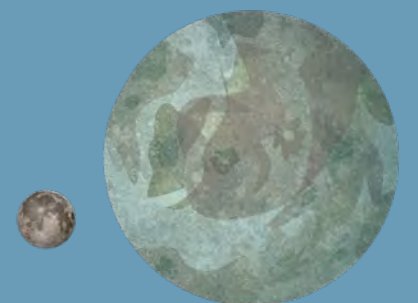
After this enormous collision, a large dust ring formed around Earth.



Various clusters of matter gradually formed in the ring of Earth's and Theia's debris.



The largest cluster of matter turned into our Moon which, along with Earth, attracted the remaining debris.





1957
The Soviet rocket **Sputnik** took the **Sputnik 1** satellite into orbit.



1958
The rocket **Redstone** took the first U.S. satellite, **Explorer 1**, into orbit.



1965–1975
The first type of the Soviet rocket **Soyuz** brought the eponymous spacecraft into orbit.



1960–1991
Vostok rockets were used to launch the **Vostok** spacecraft and **Luna** satellites.



1963–1976
Voskhod rockets were used to launch the **Voskhod** spacecraft and satellites orbiting Earth.



1957–1959
Vanguard rockets for releasing American satellites



1968–2020
Soviet carrier rocket **Kosmos-3M**



1965–1975
French carrier rocket **Diamant**



1965–1975
Saturn 1B rockets were mostly used to bring **Apollo** ships into low Earth orbit.



1967–1973
The huge **Saturn V** rockets took humans to the Moon.



1969–1972
The unsuccessful Soviet **N-1** rocket was meant to take humans to the Moon.



1989–2011
The American **Delta II** rockets took navigation satellites and probes to Mars.



Since 2002
Delta IV rockets take cargo into Earth's orbit.



Since 2004
Delta IV Heavy rockets are a more powerful version of the **Delta IV** rockets.



1962–1987
The American **Titan II** rocket launched the **Gemini** spacecraft and took satellites into Earth's orbit.



1966–1987
The American **Titan III B** rocket was used mostly to take military satellites into orbit.



1989–2005
Titan IV was the strongest version of the **Titan** series and took the **Cassini** probe to Saturn



1981–2011
The six shuttles of the **Space Shuttle** program: *Enterprise*, *Columbia*, *Challenger*, *Discovery*, *Atlantis*, and *Endeavour*.



1988
The unmanned Soviet shuttle **Buran** took only one test flight.



1985–2017
The **Zenit** family were Ukrainian rockets (originally Soviet). **Zenit 2** was the first one.



1977–2009
The Soviet launch vehicle **Tsyklon-3** took satellites into low Earth orbit.

SPACE ADVENTURERS

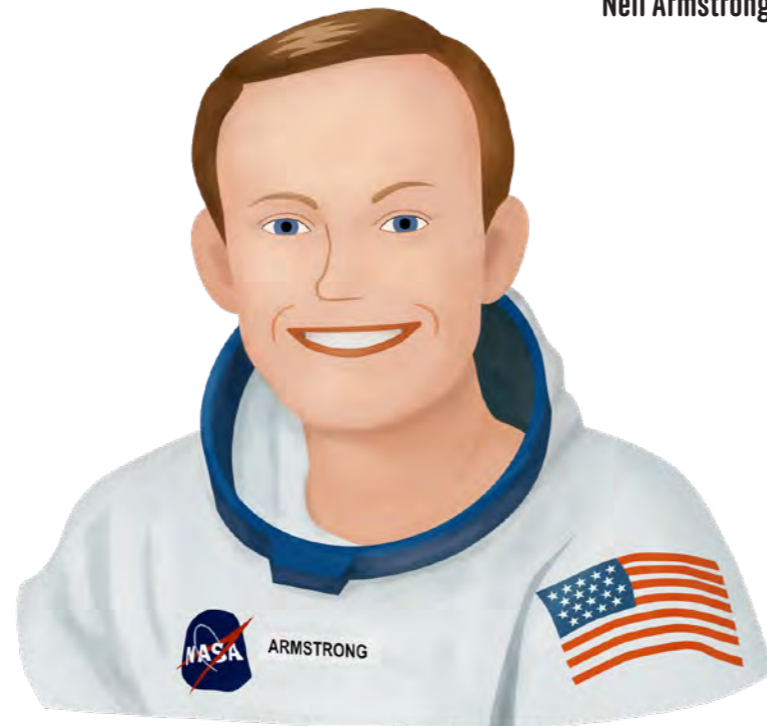
Yuri Gagarin



The first person in outer space

The first person to ever travel into outer space was Soviet cosmonaut Yuri Gagarin. On April 12, 1961, he lifted off from the Baikonur Cosmodrome, and about an hour and forty minutes later, safely landed back on Earth in a Vostok space capsule as part of the Vostok spaceflight program. He became the first person in history to see our planet from outer space and describe its beauty.

Neil Armstrong



The first person on the Moon

In July 1969, the crew of the American space mission Apollo 11 landed in the Moon's Mare Tranquillitatis region. Two astronauts were on board: Buzz Aldrin and Neil Armstrong. Armstrong was the first to leave the lunar module and set foot on the Moon. After Apollo 11's successful landing, there were five other missions, which transported 10 astronauts in total. The last mission was in December 1972, which was also the last time, to date, that a person has been on the Moon.

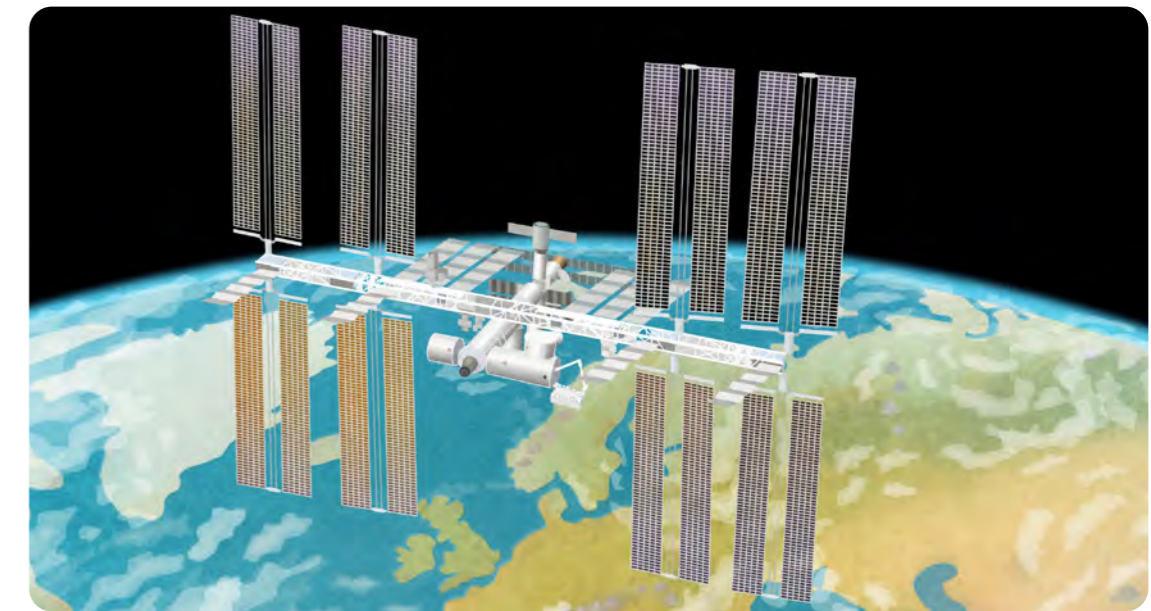
How fast do you need to fly to get to outer space?

1. If a rocket is moving at a slow speed, it falls back to Earth.
2. If a rocket goes faster than 17,670 miles per hour, it starts to orbit the Earth.
3. Once it reaches a speed of 40,320 miles per hour, it can escape the Earth's gravitational pull and head off to the Moon, for example.



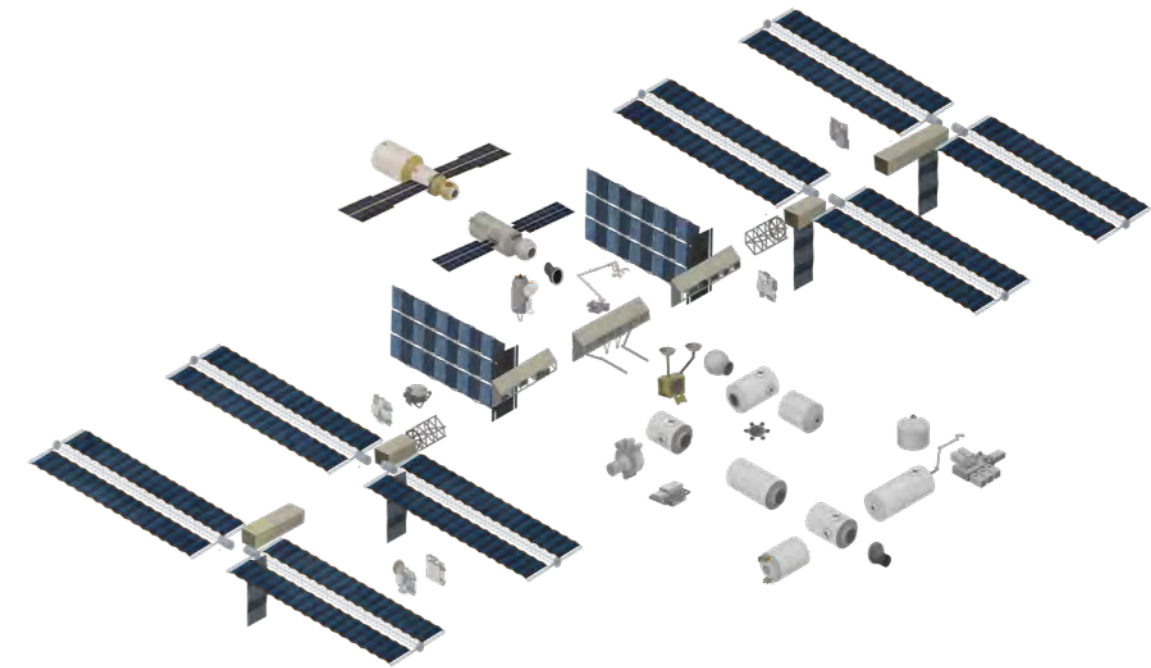
Space Stations

These are large cosmic stations orbiting Earth. Astronauts travel here in small ships that park at the station and then are used to travel back. The stations are sort of like "summer camps" where astronauts go to fulfill scientific tasks.



International Space Station (ISS)

The International Space Station (ISS) is the largest cosmic station in the world, involving many countries and five space agencies. It is like a set of building blocks, measuring over 328 feet long, which started being constructed in 1998. The ISS is located about 248 miles above Earth, and has a crew of 7 astronauts that rotates every couple of months.



Russian spacecraft Soyuz for transporting astronauts to the ISS



Russian cargo ship Progress for regular supplies of materials and food

Cygnus automated cargo ship

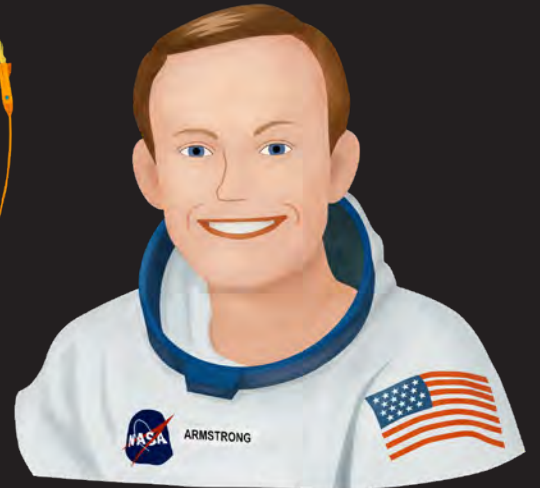
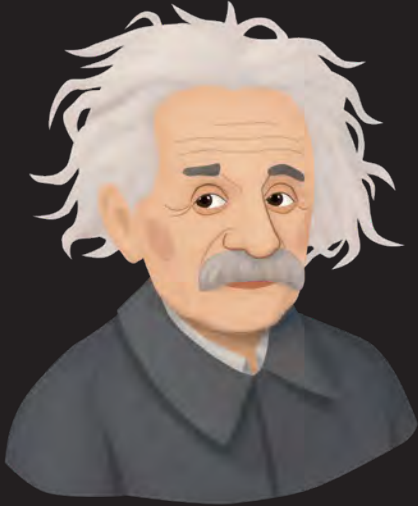
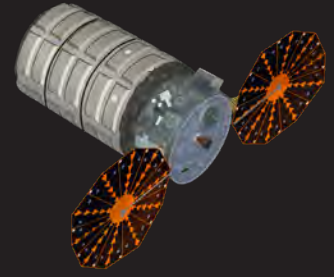


European ATV cargo ship

Japanese HTV cargo ship



Manned Dragon spacecraft of the private company SpaceX



SPACEMANIA

Encyclopedia of the Universe



The world of stars, planets, galaxies, celestial bodies, and space flights is as endlessly fascinating as the universe itself. From the very first moment when humans looked up at the night sky, it was clear that humankind would never stop being excited and astonished by outer space; that people would study it for as long as it remained shrouded in mystery, full of unexplained things happening. While a single book can't ever hope to contain everything there is to know about the universe, it can at least give you a list of the most interesting things. And that's what *Spacemania* is all about. Be it the origin of the universe, the celestial bodies that can be found in its depths, or its conquest by humans – this book will introduce you to everything important and worthy of exploring about space.

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