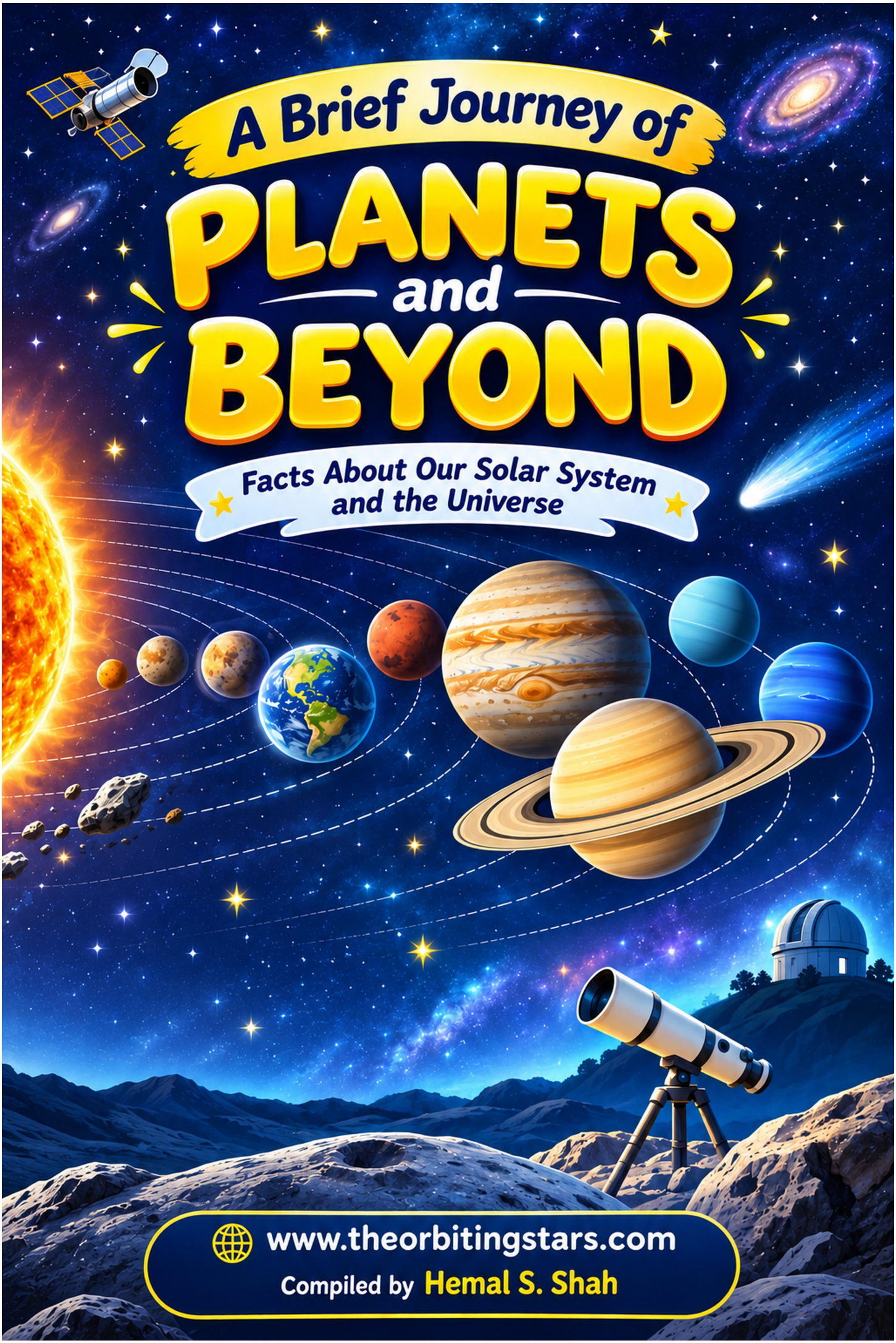

A Brief Journey of
PLANETS
and
BEYOND
Facts About Our Solar System
and the Universe
www.theorbitingstars.com
Compiled by Hemal S. Shah

Foreword

A Brief Journey of Planets and Beyond

"Think Beyond Earth."

— Inspired by Dr. A. P. J. Abdul Kalam

The Universe is an extraordinary place, filled with countless stars, planets, galaxies, and mysteries waiting to be explored. Every time we look up at the night sky, we are reminded of how vast the cosmos is and how much there is still to discover.

Our journey begins with the familiar neighbourhood of our Solar System, where eight fascinating planets orbit the Sun. From the scorching surface of Mercury to the icy depths of Neptune, each celestial body has a remarkable story to tell. But our exploration does not end there. Beyond the planets lie dwarf planets, asteroids, distant stars, magnificent galaxies, and some of the most extraordinary objects in the Universe.

A Brief Journey of Planets and Beyond has been thoughtfully compiled to introduce readers to these wonders through interesting facts, colourful illustrations, and simple scientific explanations. The aim is to make astronomy accessible, engaging, and enjoyable for curious minds of all ages, particularly young learners taking their first steps into space science.

(Continued on Next Page ▶)

Foreword

A Brief Journey of Planets and Beyond

(Continued)

At ***The Orbiting Stars***, we believe that understanding the Universe begins with curiosity. A simple question such as “Why does the Moon shine?” or “How far away are the stars?” can open the door to a lifetime of learning and discovery.

Through this book, we hope to encourage readers not merely to memorise astronomical facts, but to observe, question, imagine, and develop a deeper understanding of the world beyond our own.

As you turn these pages, remember that every great scientific discovery began with someone asking a question.

Keep Looking Up. Keep Wondering. Keep Exploring.

For the Universe has much more to reveal.

Hemal S. Shah
Founder, The Orbiting Stars
www.theorbitingstars.com

Sun

Our Solar System's Star

The Sun is the star at the centre of our solar system. Its light and warmth make life on Earth possible, and its gravity holds the planets in orbit.



Quick Facts

Type	:	G2V yellow dwarf star
Age	:	About 460 crore years (4.6 billion years)
Distance from Earth	:	About 15 crore km (1 AU)
Diameter	:	About 14 lakh km
Mass	:	About 3,33,000 Earth masses
Rotation	:	About 25 Earth days at equator, 36 at poles
Photosphere temperature	:	About 5,500°C
Core temperature	:	About 1.5 crore °C

Key Features

- Made mostly of hydrogen and helium.
- Produces energy through nuclear fusion in its core.
- Has no solid surface, only hot plasma.
- Its gravity holds the solar system together.
- Sunspots, solar flares and solar wind originate in solar activity.
- It contains about 99.8% of the solar system's mass.

Fun Facts

- Sunlight reaches Earth in about 8 minutes 20 seconds.
- Sun's volume can fit around 13 lakh Earths.
- The Sun is a star in the Milky Way.
- Its corona can reach about 20 lakh °C.

Did You Know?

The Sun takes about 23 crore years to travel once around the centre of the Milky Way!



Moon

Earth's Natural Satellite

The Moon is Earth's only natural satellite. It does not produce its own light, but shines by reflecting sunlight. It is the closest large celestial body to Earth.



Quick Facts

Type	:	Natural satellite (of Earth)
Average distance from Earth	:	3,84,400 km (≈ 2.57 lakh km)
Diameter	:	3,474 km (about 1/4 of Earth)
Mass	:	7.35×10^{22} kg (about 1.2% of Earth)
Orbital period (around Earth)	:	27.3 days (sidereal)
Rotation period (on its axis)	:	27.3 days (same as orbital period)
Average temperature	:	About −173°C to +127°C
Moons	:	0

Key Features

- Has a rocky, cratered surface with mountains and plains (maria).
- Is tidally locked with Earth, so we always see the same side.
- Causes ocean tides on Earth due to its gravity.
- Has no atmosphere, so there is no air, weather or sound.
- Experiences extreme temperatures from very cold to very hot.
- Has played an important role in Earth's history and life.

Fun Facts

- Humans first landed on the Moon on 20 July 1969 (Apollo 11).
- The Moon's gravity is only about 1/6th of Earth's, so you can jump much higher there.
- It has thousands of craters, the largest being the South Pole–Aitken Basin (about 2,500 km wide).
- It takes about 29.5 days to complete one full cycle of phases (new moon to new moon).

Did You Know?

The Moon is slowly moving away from Earth at about 3.8 cm per year!



Mercury

The Swiftest Planet

Mercury is the closest planet to the Sun and the smallest planet in our solar system. It travels around the Sun faster than any other planet.



Quick Facts

Type	: Terrestrial (rocky)
Average distance from Sun	: 579 lakh km (0.387 AU)
Mean diameter	: 4,879 km
Mass	: 0.0553 Earth masses
Orbital period (Year)	: 87.97 Earth days
Rotation period (Day)	: 58.65 Earth days
Surface temperature	: About −180°C to 430°C
Moons	: 0

Key Features

- Smallest planet and closest to the Sun.
- Rocky, heavily cratered surface.
- Large metallic core (about 85% of its radius).
- Very thin exosphere, not a thick atmosphere.
- No natural moons or rings.
- Water ice may exist in permanently shadowed polar craters.

Fun Facts

- An orbit takes only about 88 Earth days.
- A full solar day lasts approximately 176 Earth days.
- Mercury is not the hottest planet — Venus is.
- Sunlight takes about 3.2 minutes to reach Mercury.

Did You Know?

Mercury has the shortest year of all eight planets!



Venus

The Hottest Planet

Venus is the second planet from the Sun. It is similar in size to Earth but is the hottest planet in our solar system due to its thick atmosphere.



Quick Facts

Type	: Terrestrial (rocky)
Average distance from Sun	: 1,082 lakh km (0.723 AU)
Mean diameter	: 12,104 km
Mass	: 0.815 Earth masses
Orbital period (Year)	: 224.70 Earth days
Rotation period (Day)	: 243.03 Earth days (retrograde)
Surface temperature	: About 462°C (average)
Moons	: 0

Key Features

- Second planet from the Sun and similar in size to Earth.
- Hottest planet in our solar system (about 462°C).
- Thick atmosphere, mainly carbon dioxide (about 96.5%).
- Extremely high surface pressure (about 92 times that of Earth).
- Rotates in the opposite direction to most planets (retrograde).
- Has a dense, long-lasting cloud cover of sulfuric acid.

Fun Facts

- Venus is often called Earth's "sister planet" because of its similar size.
- Its thick clouds reflect about 75% of the sunlight, making it the brightest planet in our night sky.
- A day on Venus (243.03 Earth days) is longer than its year (224.70 Earth days).
- It can be easily seen with the naked eye, usually near sunrise or sunset.

Did You Know?

Venus is the brightest planet in the night sky after the Moon!



Earth

Our Home Planet

Earth is the third planet from the Sun and the only known planet that supports life. It has air, water, land and a suitable temperature for living beings.



Quick Facts

Type	:	Terrestrial (rocky)
Average distance from Sun	:	1,496 lakh km (1.000 AU)
Mean diameter	:	12,742 km
Mass	:	1 Earth mass (5.972×10^{24} kg)
Orbital period (Year)	:	365.25 Earth days (1 year)
Rotation period (Day)	:	23.93 hours (≈ 24 hours)
Average surface temperature	:	About 15°C
Moons	:	1 (the Moon)

Key Features

- Third planet from the Sun and our home.
- Only known planet that supports life.
- About 71% of its surface is covered by water (oceans).
- Has a life-supporting atmosphere (mainly nitrogen ~78% and oxygen ~21%).
- A dynamic planet with weather, seasons and a strong magnetic field.
- Has one natural satellite — the Moon.

Fun Facts

- Earth is the only known planet with life.
- It is often called the "Blue Planet" because of its vast oceans.
- Its axis is tilted by about 23.5°, which gives us seasons.
- It has the highest and lowest points on land — Mount Everest (8,848 m) and the Mariana Trench (≈10,984 m).

Did You Know?

Earth is the only planet in our solar system with liquid water on its surface in large amounts!



Mars

The Red Planet

Mars is the fourth planet from the Sun. It is known as the "Red Planet" because of the iron-rich dust on its surface, which gives it a reddish look.



Quick Facts

Type	: Terrestrial (rocky)
Average distance from Sun	: 2,279 lakh km (1.524 AU)
Mean diameter	: 6,779 km
Mass	: 0.107 Earth masses
Orbital period (Year)	: 686.98 Earth days (1.88 Earth years)
Rotation period (Day)	: 24.62 hours (≈ 1 day 37 minutes)
Average surface temperature	: About −63°C (range: −125°C to 20°C)
Moons	: 2 (Phobos and Deimos)

Key Features

- Fourth planet from the Sun and the next major target for space exploration.
- Known as the Red Planet due to iron oxide (rust) on its surface.
- A cold and dry planet with a thin atmosphere (about 0.6% of Earth's).
- Has two small, irregular moons: Phobos and Deimos.
- Has the largest volcano in the solar system — Olympus Mons (about 22 km high).
- Shows strong evidence of ancient water (rivers, lakes and minerals) on its surface.

Fun Facts

- Olympus Mons on Mars is about 3 times higher than Mount Everest (on Earth).
- There is strong evidence that liquid water once flowed on Mars billions of years ago.
- A year on Mars is about 687 Earth days (almost 2 Earth years).
- Mars has powerful dust storms that can cover the entire planet and last for weeks.

Did You Know?

A day on Mars is very similar to Earth — about 24 hours 39 minutes!



Asteroid Belt

The Rocky Ring of Our Solar System

The Asteroid Belt is a wide region filled with millions of rocky objects that orbits the Sun between Mars and Jupiter.



Quick Facts

Type	Region of small rocky bodies (asteroids)
Location	Between Mars and Jupiter
Distance from Sun	About 33 to 48 crore km (2.2 to 3.2 AU)
Width (thickness)	About 3 crore km (≈ 0.2 AU)
Number of objects	Millions (> 10 lakh, larger than 1 km)
Largest object	Ceres (diameter ≈ 940 km)
Age	About 4.6 billion years (same as the solar system)

Key Features

- A ring-like region of asteroids between Mars and Jupiter.
- Contains rocky and metallic bodies of many sizes, from a few metres to hundreds of kilometres.
- Ceres, the largest object, is a dwarf planet.
- Formed from leftover material from the early solar system.
- The gravity of Jupiter keeps most of these objects in this region.
- It is not a solid ring — there is vast empty space between asteroids.

Fun Facts

- Ceres, in the Asteroid Belt, contains water ice beneath its surface.
- Some asteroids are rich in metals like iron, nickel and platinum.
- NASA's Dawn spacecraft studied Ceres and the asteroid Vesta in this region (2011–2018).
- A few asteroids from this belt can sometimes be pushed and orbit closer to Earth.

Did You Know?

The Asteroid Belt contains more than a million asteroids larger than 1 kilometre!



Jupiter

The Giant Planet

Jupiter is the fifth planet from the Sun and the largest planet in our solar system. It is a giant ball of gas, mostly hydrogen and helium.



Quick Facts

Type	: Gas giant
Average distance from Sun	: 77.85 crore km (5.20 AU)
Equatorial diameter	: 1,42,984 km
Mass	: 317.8 Earth masses
Orbital period (Year)	: 4,333 Earth days (11.86 Earth years)
Rotation period (Day)	: 9.9 hours
Atmospheric temperature	: About −110°C (at 1-bar pressure level)
Moons	: 95 (as of 2024)

Key Features

- A massive atmosphere mainly made of hydrogen and helium.
- Has the giant Great Red Spot, a long-lasting storm larger than Earth.
- Has a faint ring system made of dust particles.
- Possesses a powerful magnetic field, the strongest among the planets.
- Has four large moons called the Galilean moons — Io, Europa, Ganymede and Callisto.

Fun Facts

- Jupiter has the shortest day of all eight planets — just 9.9 hours.
- Ganymede, one of Jupiter's moons, is the largest moon in the solar system.
- Europa, another moon, may have a large ocean of liquid water beneath its icy crust.
- Sunlight takes about 43 minutes to reach Jupiter.

Did You Know?

Jupiter is so large that more than 1,300 Earths could fit inside it by volume!



Saturn

The Ringed Planet

Saturn is the sixth planet from the Sun. It is famous for its magnificent ring system and is the second largest planet in our solar system, after Jupiter.



Quick Facts

Type	:	Gas giant
Average distance from Sun	:	About 143 crore km (9.58 AU)
Equatorial diameter	:	1,20,536 km
Mean diameter	:	1,16,464 km
Mass	:	95.16 Earth masses
Orbital period (Year)	:	About 10,756 Earth days (29.46 Earth years)
Rotation period (Day)	:	About 10.7 hours
Cloud-top temperature	:	About −139°C

Key Features

- Sixth planet from the Sun and the second-largest planet in our solar system.
- Made mostly of hydrogen and helium.
- Has an immense ring system made mainly of ice, with dust and rock particles.
- Has no solid surface; it is a giant ball of gas and liquid.
- Has a very low average density of about 0.69 g/cm³.
- Has many moons, including Titan, its largest moon.
- Experiences powerful winds in its atmosphere.

Fun Facts

- Saturn's rings stretch huge distances but are comparatively very thin, only a few tens of metres thick in many places.
- Titan, Saturn's largest moon, has lakes and seas of methane and ethane.
- A year on Saturn is about 29.5 Earth years.
- Winds on Saturn can reach about 1,800 km/h.

Did You Know?

Saturn's average density is about 0.69 g/cm³, which is less than that of water (1 g/cm³).



Uranus

The Tilted Planet

Uranus is the seventh planet from the Sun. It is an ice giant known for its blue-green colour and its unusual sideways tilt, which makes it look like it is rolling around the Sun.



Quick Facts

Type	:	Ice giant
Average distance from Sun	:	About 287 crore km (19.2 AU)
Mean diameter	:	50,724 km
Mass	:	14.54 Earth masses
Orbital period (Year)	:	30,687 Earth days (84.01 Earth years)
Rotation period (Day)	:	About 17.2 hours (retrograde)
Cloud-top temperature	:	About −224°C
Moons	:	29 known moons

Key Features

- Seventh planet from the Sun and an ice giant.
- Made mostly of water, ammonia and methane ices, with hydrogen and helium.
- Rotates on its side with an axial tilt of about 98°.
- Has 13 known rings.
- Its blue-green colour comes from methane in the atmosphere.
- Has 29 known moons, including Titania, Oberon, Umbriel, Ariel and Miranda.

Fun Facts

- A single season on Uranus lasts about 21 Earth years.
- Uranus was the first planet discovered using a telescope, in 1781.
- It is the coldest planet in our solar system.
- Winds on Uranus can blow at speeds of up to about 900 km/h.

Did You Know?

Uranus is tilted by about 98°, so it rotates almost on its side!



Neptune

The Windiest Planet

Neptune is the eighth and farthest planet from the Sun. This distant ice giant is known for its powerful winds, cold atmosphere and beautiful blue appearance.



Quick Facts

Type	:	Ice giant
Average distance from Sun	:	About 450 crore km (30.1 AU)
Equatorial diameter	:	49,528 km
Mean diameter	:	49,244 km
Mass	:	17.15 Earth masses
Orbital period (Year)	:	About 60,190 Earth days (164.8 Earth years)
Rotation period (Day)	:	About 16.1 hours
Atmospheric temperature	:	About −200°C (upper atmosphere, approximate)
Moons	:	16 known moons (as of 2026)

Key Features

- Eighth and most distant planet from the Sun.
- An ice giant with hydrogen, helium and methane in its atmosphere.
- Has no solid surface.
- Powerful winds can exceed 2,000 km/h.
- Has five main rings and ring arcs.
- Triton is its largest moon and orbits backward.

Fun Facts

- Discovered in 1846 after astronomers predicted its location using mathematics.
- Sunlight needs about four hours to reach Neptune.
- Each season lasts more than 40 Earth years.
- Voyager 2 is the only spacecraft to have visited Neptune, in 1989.

Did You Know?

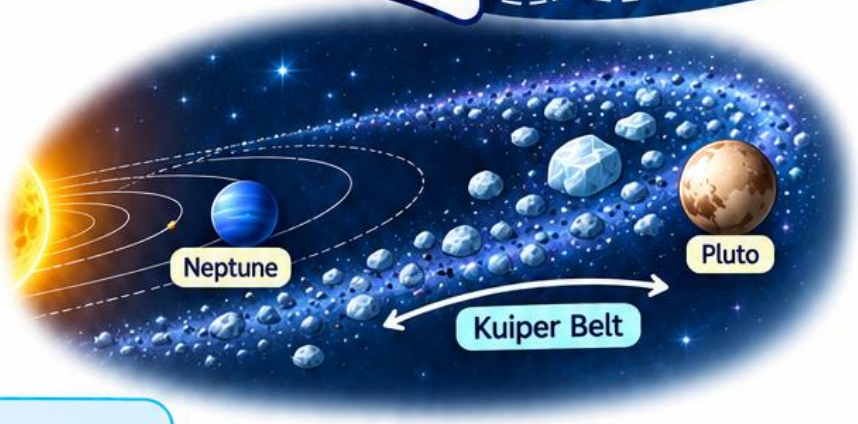
Neptune has the strongest winds of any planet in our solar system — over 2,000 km/h!



Kuiper Belt

The Icy Realm Beyond Neptune

The Kuiper Belt is a vast region of icy bodies beyond Neptune, filled with frozen worlds, including dwarf planets like Pluto, Haumea and Makemake.



Quick Facts

Type	:	Icy region (beyond Neptune)
Location	:	Beyond Neptune (≈ 30 to 50 AU)
Distance from Sun	:	About 4,500 to 7,500 crore km (30 to 50 AU)
Width (thickness)	:	About 20 AU (≈ 3,000 crore km)
Number of objects	:	Millions (likely many more)
Notable objects	:	Pluto, Haumea, Makemake, Quaoar, Eris and many others
Age	:	About 4.6 billion years (same as the solar system)

Key Features

- A distant, ring-shaped region of icy objects beyond Neptune.
- Made mostly of ice (water, methane, ammonia) and rock.
- Home to several dwarf planets like Pluto, Haumea, Makemake and Eris.
- A source of many short-period comets.
- Helps us understand the early solar system, as its objects are ancient and less changed.
- It is not a solid ring — objects are spread across a wide region.

Fun Facts

- The objects here are extremely cold, typically −200°C to −240°C.
- Many comets that vist the inner solar system are believed to come from the Kuiper Belt.
- It includes some of the largest known dwarf planets: Pluto, Eris, Haumea and Makemake.
- NASA's New Horizons spacecraft through this region after its flyby of Pluto in 2015.

Did You Know?

The Kuiper Belt is about 20 times wider than the distance between the Sun and Neptune!



Pluto

The Dwarf Planet

Pluto is a dwarf planet in the Kuiper Belt, a distant region beyond Neptune. It was once called the ninth planet of our solar system, but was reclassified as a dwarf planet in 2006.



Quick Facts

Type	:	Dwarf planet (icy-rocky)
Average distance from Sun	:	About 590 crore km (39.5 AU)
Diameter	:	About 2,377 km
Orbital period (Year)	:	About 248 Earth years
Rotation period (Day)	:	About 153 hours (6.4 Earth days; retrograde)
Average temperature	:	About −232°C
Moons	:	5

Key Features

- Located in the distant Kuiper Belt beyond Neptune.
- Its orbit is elliptical and tilted.
- Has an icy surface with mountains, plains and glaciers.
- A thin atmosphere mainly of nitrogen, with methane and carbon monoxide.
- Five moons; Charon is the largest.
- No known rings.

Fun Facts

- Discovered in 1930 by Clyde Tombaugh.
- The large bright heart-shaped region is called Tombaugh Regio.
- NASA's New Horizons spacecraft flew past Pluto in 2015.
- Sunlight takes about 5.5 hours to reach Pluto.

Did You Know?

Pluto was reclassified as a dwarf planet in 2006 because it has not cleared its orbital neighbourhood.

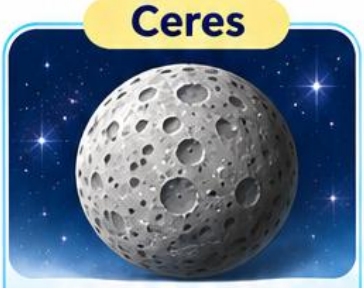


Dwarf Planets

Four Small Worlds Beyond the Planets

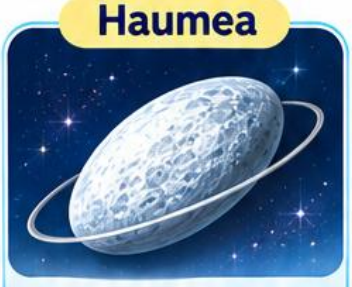
Five dwarf planets are officially recognized in our solar system.
Pluto has its own page; meet the other four!

Ceres



The largest object in the asteroid belt.

Haumea



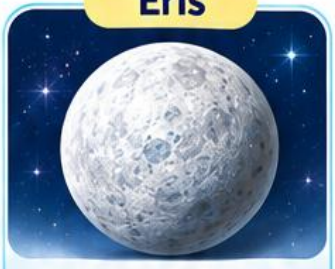
An icy, fast-spinning world with a ring.

Makemake



A cold, bright world in the Kuiper Belt.

Eris



A distant, icy world in the scattered disc.

Quick Facts

Dwarf Planet	Location	Distance from Sun (average)	Size (across)	Orbit period	Moons
Ceres	Main asteroid belt (between Mars and Jupiter)	~ 41.3 crore km	~ 940 – 950 km	4.6 Earth years	0
Haumea	Beyond Neptune	~ 650 crore km	Elongated (fast spinning ~ 4 hours)	~ 285 Earth years	2 (and a ring)
Makemake	Kuiper Belt (beyond Neptune)	~ 690 crore km	~ 1,430 km	~ 305 Earth years	1 (provisional moon MK 2)
Eris	Distant scattered disc (beyond Neptune)	~ 1,000 crore km	~ 2,326 km	~ 557 Earth years	1 (Dysnomia)

Key Features

- Ceres is the largest object in the asteroid belt.
- Haumea spins so fast that its shape is stretched.
- Makemake is a cold, bright world with methane ice.
- Eris helped scientists rethink the definition of a planet in 2006.

Fun Facts

- NASA's Dawn spacecraft reached Ceres in 2015.
- Haumea has two moons and a ring.
- Makemake was discovered in 2005.
- Eris has a moon called Dysnomia.

Did You Know?

Dwarf planets orbit the Sun and are nearly round, but have not cleared their orbital neighbourhood.



Alpha Centauri

Our Nearest Star System Beyond the Sun

Alpha Centauri is the closest star system beyond the Sun, and has three gravitationally linked stars.



Quick Facts

Type	:	Triple-star system
Constellation	:	Centaurus
Members	:	Alpha Centauri A, Alpha Centauri B, Proxima Centauri
Nearest star	:	Proxima Centauri
Proxima distance	:	About 4.25 light-years
A & B distance	:	About 4.35 – 4.37 light-years
A & B orbital period	:	About 80 Earth years
Alpha Centauri A	:	Sun-like yellow G-type star
Alpha Centauri B	:	Smaller orange K-type star
Proxima Centauri	:	Faint red dwarf

Key Features

- Proxima Centauri is the closest individual star to the Sun.
- Alpha Centauri A and B orbit each other.
- Proxima Centauri is much farther from the pair and loosely orbits them.
- Alpha Centauri A is about 1.1 Sun masses and B is about 0.9 Sun masses.
- Proxima Centauri has at least two confirmed exoplanets.
- Proxima Centauri is a flare star.

Fun Facts

- Proxima Centauri cannot be seen with the naked eye.
- Light takes more than 4 years to arrive from these stars.
- The bright Alpha Centauri A/B pair is visible from much of the southern hemisphere.
- Proxima b orbits Proxima Centauri every about 11.2 days.

Did You Know?

Even traveling at the speed of light, a trip to Proxima Centauri would take about 4.25 years!



Milky Way Galaxy

Our Home in the Universe

The Milky Way is the galaxy that contains our Sun, Earth and solar system. We live inside its vast disc of stars, gas and dust.



Quick Facts

Type	:	Barred spiral galaxy
Diameter	:	About 1,00,000 light-years
Stars	:	Approximately 10,000–40,000 crore
Sun's distance from centre	:	About 26,000 light-years
Sun's galactic orbit	:	About 23–24 crore years
Central black hole	:	Sagittarius A*
Location	:	Local Group
Age	:	Roughly 13 billion years (estimate)

Key Features

- Spiral arms curve from a central stellar bar.
- Our solar system lies in the Orion Spur.
- Contains stars, nebulae, gas, dust and dark matter.
- A supermassive black hole occupies its centre.
- Andromeda is a nearby large galaxy.

Fun Facts

- From Earth, it appears as a pale band across a dark sky.
- The Sun travels around the galactic centre with the planets.
- We cannot photograph our entire galaxy from outside.
- One light-year is about 9.46 lakh crore kilometres.

Did You Know?

Our solar system takes about 23 crore years to orbit the Milky Way once!



Andromeda Galaxy

Our Nearest Major Galactic Neighbour

Andromeda, also called M31, is the nearest major galaxy to our Milky Way. Its light takes about 25 lakh years to reach Earth.



Quick Facts

Type	:	Spiral galaxy
Other name	:	Messier 31 (M31)
Distance from Earth	:	About 25 lakh light-years
Diameter	:	Roughly 2,20,000 light-years (estimate)
Stars	:	Approximately 1 trillion (estimated)
Constellation	:	Andromeda
Group	:	Local Group
Visibility	:	Faintly visible to the naked eye in dark skies

Key Features

- Nearest large galactic neighbour to the Milky Way.
- Contains billions of stars in its spiral arms, with a bright nucleus and dark dust lanes.
- Has two main satellite galaxies: M32 and M110.
- Appears elongated from Earth's perspective.
- Its gravity and dark matter influence its motion.

Fun Facts

- The light we see from Andromeda left the galaxy about 25 lakh years ago.
- M31 can be seen without a telescope under very dark skies.
- Edwin Hubble showed in the 1920s that Andromeda was another galaxy.
- Andromeda and the Milky Way are approaching one another.

Did You Know?

A 2025 study found that a merger with the Milky Way is NOT certain: roughly a 50% chance over the next 10 billion years.



Local Group

Our Nearby Family of Galaxies

The Local Group is the small galaxy group that includes our Milky Way and more than 50 nearby galaxies. Most of its members are dwarf galaxies, while the three biggest are the Milky Way, Andromeda and Triangulum.



Quick Facts

Type	: Galaxy group
Total members	: 50+ galaxies
Diameter	: About 1 crore light-years
Biggest members	: Milky Way, Andromeda, Triangulum
Main subgroups	: Milky Way subgroup and Andromeda subgroup
Nearest major galaxy	: Andromeda (about 25 lakh light-years)
Many members are	: Dwarf galaxies
Future event	: Milky Way and Andromeda may merge in about 450 crore years

Major Members

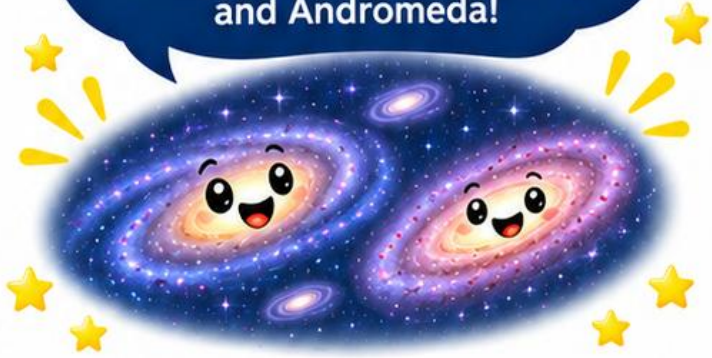
Milky Way	– 0 light-years	• Our barred-spiral home galaxy.
Andromeda (M31)	– about 25 lakh light-years	• Largest galaxy in the Local Group.
Triangulum (M33)	– about 27 lakh light-years	• Third-largest spiral galaxy.
Large Magellanic Cloud	– about 1.61 lakh light-years	• Largest satellite of the Milky Way.
Small Magellanic Cloud	– about 2 lakh light-years	• Irregular companion of the LMC.
M32	– about 25 lakh light-years	• Compact elliptical satellite of Andromeda.
M110	– about 26.5 lakh light-years	• Dwarf elliptical satellite of Andromeda.
Barnard's Galaxy (NGC 6822)	– about 16 lakh light-years	• Isolated dwarf irregular galaxy.

Fun Facts

- Most Local Group members are tiny dwarf galaxies.
- The light from Andromeda we see today began its journey about 25 lakh years ago.
- The Large and Small Magellanic Clouds are visible from the Southern Hemisphere.
- The Local Group itself is part of the larger Laniakea Supercluster.

Did You Know?

Although the Local Group has 50+ known galaxies, most of its mass is concentrated in just two giants — the Milky Way and Andromeda!



Exotic Objects

Black Holes, Neutron Stars & More

Exotic cosmic objects are some of the most extreme things in the universe. They include black holes, neutron stars, pulsars, magnetars and quasars — each one helps scientists understand gravity, energy and matter under extraordinary conditions.



Quick Facts

Black hole	:	Gravity so strong that even light cannot escape.
Neutron star	:	Ultra-dense collapsed core of a massive star.
Pulsar	:	A fast-spinning neutron star that sends beams of radiation.
Magnetar	:	A neutron star with an extremely powerful magnetic field.
Quasar	:	A brilliantly bright active galaxy powered by a supermassive black hole.

Key Features

- Black holes can be stellar-mass or supermassive.
- Neutron stars pack more mass than the Sun into a sphere only about 20 km wide.
- Pulsars appear to flash because their beams sweep across space as they spin.
- Magnetars have the strongest known magnetic fields in the universe.
- Quasars can shine brighter than entire galaxies.
- These objects help astronomers study extreme gravity and high-energy physics.

Fun Facts

- A teaspoon of neutron-star matter could weigh about 100 crore tonnes on Earth. (100 crore t)
- The first image of a black hole was released in 2019.
- Some pulsars spin hundreds of times every second.
- Many quasars are seen from billions of light-years away, so they show the early universe.

Did You Know?

If the Sun were magically replaced by a black hole of the same mass, Earth would still orbit it — but there would be no sunlight!

