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Black Holes

OUTER SPACE ODYSSEY

- Black holes have gravity so strong that nothing, not even light, can escape.
- They form when massive stars collapse at the end of their life cycles.
- The event horizon is the point beyond which nothing can return.
- Scientists use special telescopes, like the Event Horizon Telescope, to study black holes.

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The first-ever photo of a black hole was captured in 2019!

Kennedy Space Center, Florida, USA - A hub for space science and black hole research.

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The Milky Way Galaxy

OUTER SPACE ODYSSEY

- The Milky Way is a spiral galaxy with over 100 billion stars.
- It has four major spiral arms and a supermassive black hole at its center.
- The Solar System is in the Orion Arm, about 27,000 light-years from the center.
- The Milky Way is part of a galactic neighborhood called the Local Group.

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It takes the Solar System about 225 million years to orbit the Milky Way once!

The Dark Sky Reserve, New Zealand - One of the best locations to view the Milky Way.

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Stars and Constellations

OUTER SPACE ODYSSEY

- Stars are massive balls of gas, producing energy through nuclear fusion.
- The brightness of a star depends on its size, temperature, and distance from Earth.
- Constellations are patterns of stars, such as Orion and Ursa Major.
- The North Star, Polaris, is nearly aligned with Earth's axis of rotation.

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Some stars spin so fast they complete hundreds of rotations per second!

Jantar Mantar, India - A historic observatory for studying stars and constellations.

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Asteroids and Comets

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- Asteroids are rocky objects, mostly found in the Asteroid Belt between Mars and Jupiter.
- Comets are icy bodies that develop glowing tails when they heat up near the Sun.
- The famous Halley's Comet appears every 76 years.
- Some asteroids, called near-Earth asteroids (NEAs), pass close to Earth.

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Some asteroids have their own moons orbiting them!

Paranal Observatory, Chile - A leading site for studying asteroids and comets.

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Dwarf Planets

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- Dwarf planets orbit the Sun but haven't cleared their orbits of other debris.
- Pluto was reclassified as a dwarf planet in 2006.
- Other known dwarf planets include Eris, Haumea, Makemake, and Ceres.
- Ceres, in the Asteroid Belt, is the smallest dwarf planet.

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A day on Haumea is only four hours long, making it the fastest spinning large object in the Solar System!

Arecibo Observatory, Puerto Rico - Studied distant dwarf planets and small Solar System bodies.

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Planets

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- There are eight planets in the Solar System, divided into rocky terrestrial planets and gas/ice giants.
- Jupiter is the largest planet, while Mercury is the smallest.
- Planets orbit the Sun in elliptical (oval-shaped) paths.
- Venus rotates backward, and Uranus tilts on its side.

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A day on Venus is longer than a year on Venus due to its slow rotation!

Mauna Kea Observatory, Hawaii, USA - A world-famous site for planetary observations.

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The Moon - Phases

OUTER SPACE ODYSSEY

- The Moon's phases change as it orbits Earth, completing a full cycle in about 29.5 days.
- The eight phases include New Moon, Waxing Crescent, First Quarter, Waxing Gibbous, Full Moon, Waning Gibbous, Last Quarter, and Waning Crescent.
- The Moon's light is reflected sunlight—it does not produce its own light.
- A lunar eclipse happens when Earth blocks sunlight from reaching the Moon.

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The Moon is slowly moving away from Earth at about 1.5 inches per year.

Stonehenge, England - A prehistoric site believed to track the Moon's movements.

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The Sun

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- The Sun is a giant ball of plasma, producing energy through nuclear fusion.
- It makes up 99.8% of the Solar System's mass and provides light and heat.
- The Sun has layers, including the core, radiative zone, convective zone, and outer atmosphere (corona).
- The solar wind, a stream of charged particles, extends far beyond Pluto.

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The Sun's surface is about 10,000°F, but its corona can reach millions of degrees!

Chichen Itza, Mexico - A Mayan site built to track the Sun's movements.

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The Solar System

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- The Solar System consists of the Sun, eight planets, dwarf planets, moons, asteroids, and comets, all bound by gravity.
- It formed about 4.6 billion years ago from a massive cloud of gas and dust.
- The Kuiper Belt and Oort Cloud contain icy bodies and comets at the system's edge.
- The four inner planets are rocky, while the four outer planets are gas or ice giants.

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If you could drive to the Sun at 60 mph, it would take over 170 years!

Greenwich Royal Observatory, England - An important site for early Solar System navigation.