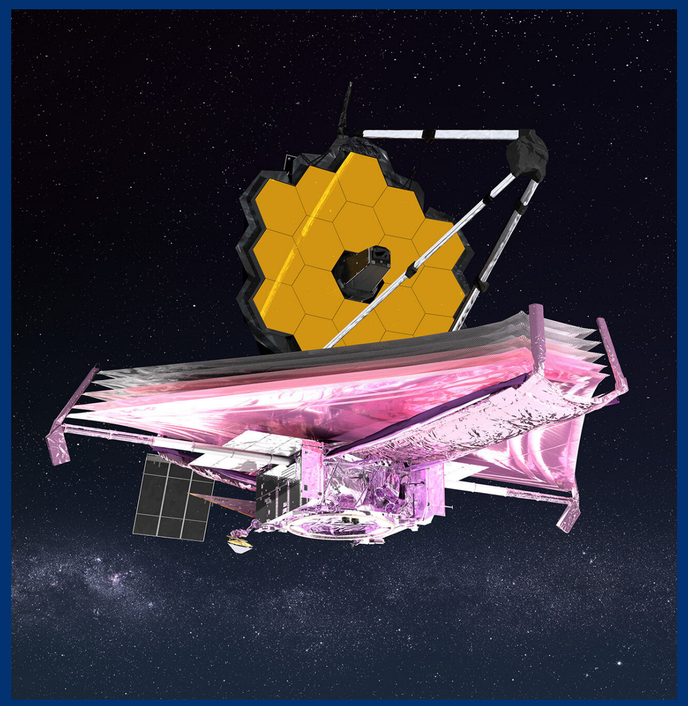
Exploring the Cosmos: Scientific Advances in Space Exploration

Space exploration is one of the most exciting and awe-inspiring achievements of human civilization. Over the past few decades, scientific advances have enabled us to venture beyond our planet and learn more about the universe we inhabit. Today, astronomers study the stars to develop theories about the origins and evolution of our universe.

Big Advances are Happening NOW!

Current space exploration missions continue to push the boundaries of our understanding of the universe. From exploring planets within our solar system to studying the most distant galaxies, current scientific space missions are making groundbreaking discoveries that are changing our understanding of the cosmos.



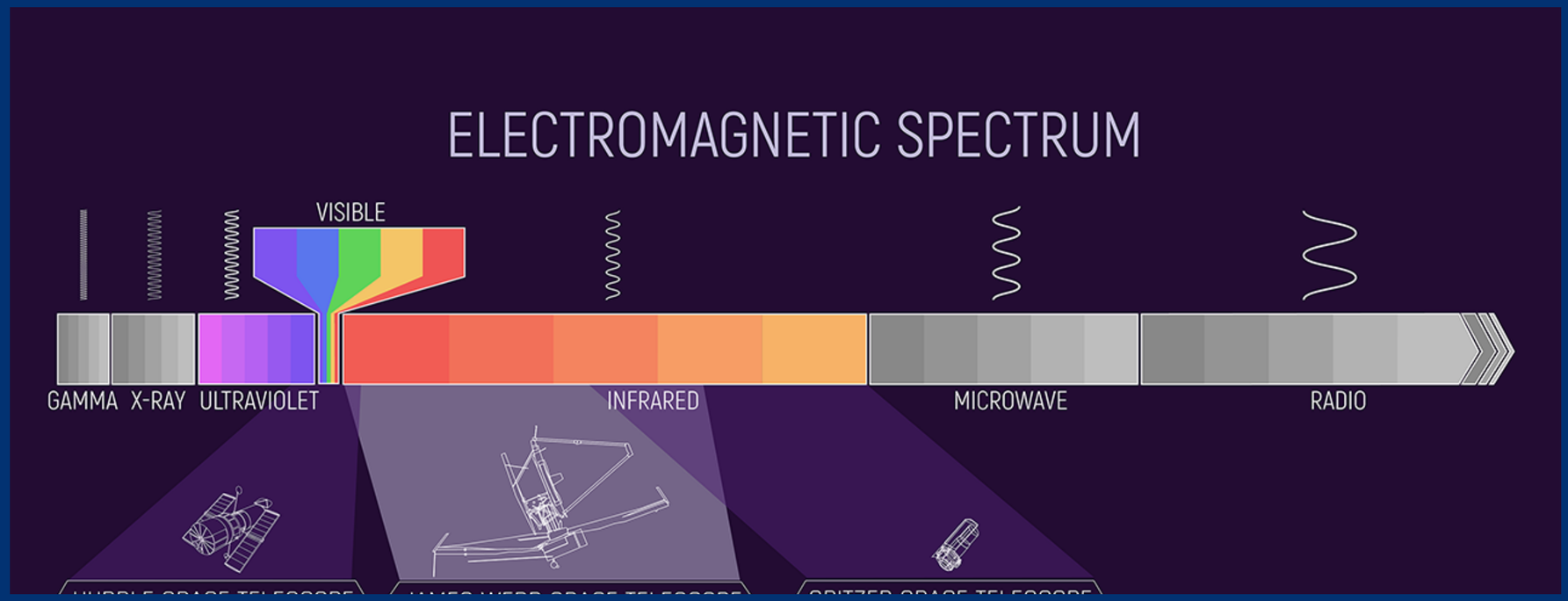
The James Webb Telescope

The James Webb Space Telescope (JWST) is a large, space-based observatory designed to explore the universe from its position, nearly one million miles from Earth. It is the largest, most powerful, and complex space telescope ever built. The JWST is an international collaboration between NASA, the European Space Agency, and the Canadian Space Agency. All findings will be shared with thousands of astronomers worldwide.

Photo courtesy of NASA

Built on the scientific discoveries of the Hubble Space Telescope, the JWST takes us even further in our understanding of the universe. It will provide a deeper understanding of how galaxies formed and evolved over time and help answer fundamental questions about the origins of life and the universe.

Photo courtesy of NASA



The JWST has a primary mirror that is over 21 feet in diameter, making it over 100 times more powerful than the Hubble Space Telescope. Its instruments are designed to observe the universe in the infrared spectrum, allowing it to study the earliest galaxies in the universe, the formation of stars and planets, and the atmospheres of exoplanets.

A number of innovative technologies have been developed for the JWST. These technologies include:

- An 18-segment primary mirror that can adjust its shape after being launched, made of ultra-lightweight **Beryllium** (**a strong, lightweight metal**)

- The largest feature of the JWST is a five-layer sunshield, roughly the size of a tennis court, that can **reduce the heat from the Sun by over a million times.**

- The JWST's four instruments, consisting of cameras and spectrometers, have highly sensitive detectors that are capable of recording extremely faint signals. One of these instruments, NIRSpec, includes programmable micro-shutters that enable observations of up to **100 objects at once.**

- Additionally, the JWST features a Cryocooler refrigerator that helps cool its many specialized instruments at a very cold, **7 Kelvin or -447.07 degrees Fahrenheit**

The Orion Spacecraft

Orion is NASA's next-generation spacecraft designed to take humans deeper into space than ever before. It is a key component of NASA's Artemis program, which aims to land the first woman and person of color on the Moon, establishing a sustainable human presence on and around the Moon by 2024.

Orion is designed to be a versatile spacecraft that can support a variety of missions. It can carry up to four crew members and provide them with living quarters, life support systems, emergency abort capability, allow for safe re-entry from deep space return velocities and sustain the crew during space travel.

Orion is the only human-rated spacecraft designed for deep space travel, not only will it return humans to the Moon, it can also be used for missions to asteroids and eventually to Mars.

But there is more to these missions than spacecrafts!!!

The Lunar Gateway

The Lunar Gateway is a small orbiting space station circling the Moon designed as a versatile base for missions to the moon and beyond.

Unlike the Space Station, the Lunar Gateway will not be permanently occupied. Rather, it will serve as a temporary residence for astronauts over brief periods.

Upon docking with the Gateway, the Orion module will allow astronauts to transfer to the lunar landing module.

The Space Launch System

Developed at NASA for most of the last decade, the new Space Launch System (SLS) is a new class of super heavy-lift rocket.

Taller than the Statue of Liberty at 322 ft, the SLS is the most powerful rocket in the world and is 15% more powerful than the original Saturn V launcher that first took astronauts to the Moon.

Artemis Missions

The Artemis program represents a significant milestone in human space exploration. These missions will enable us to learn more about the Moon, its resources, and its potential as a platform for future exploration. The success of the Artemis I mission, completed in December of 2022, has been a critical step towards realizing this vision, and will pave the way for a new era of exploration and discovery.

Artemis I

The Artemis I mission was an uncrewed test flight of the Space Launch System rocket and the Orion spacecraft. During the mission, the spacecraft orbited the Moon and tested its systems, including its heat shield, propulsion, and communications. It also carried a number of scientific payloads that will study the Moon and deep space.

COMPLETED

Artemis I
Landing Update

Since landing back on Earth on December 11, 2022, post-flight teams have been assessing any damage or misfires that occurred during Artemis I's spaceflight. Engineers are reviewing flight data to understand the source of any issues, and plan to conduct testing in a flight-like configuration. This near perfect test mission will help ensure the safety of the flying crew for the Artemis II mission.

Artemis II

The pioneering four-person crew will fly the Orion module 7402 km beyond the far side of the moon, complete a lunar flyby and return to Earth. The mission will take about eight to ten days and collect valuable flight data as it orbits Earth twice to pick up speed. This will be the first mission to carry humans to the moon’s vicinity since 1972. This mission is currently scheduled to launch **November 2024**.

Artemis III

During the Artemis III mission, the astronauts will conduct scientific work both inside and outside of their Starship, which includes a series of moonwalks. To explore the surface, they will utilize the new Axiom Extravehicular Mobility Unit spacesuits and exit through an airlock, descending on Starship's elevator.

Artemis III

Moonwalks

Throughout their moonwalks, they will take photos and videos, examine the geology, retrieve samples, and collect other data to achieve specific scientific objectives. The South Pole region of the Moon will appear vastly different from the previous moon photos we have seen from the Apollo Mission in 1961. The South Pole region is much darker and will require the crew to navigate using headlamps and other navigational tools.

Artemis III

Returning to Earth

Once their surface expedition is complete, the two astronauts will ascend from the Moon's surface and return to the Lunar Gateway station, where they will reunite with their crewmates in Orion. Following the docking procedure, the crew will spend up to five days in orbit, transferring samples between the spacecraft and preparing for their journey back to Earth.

A New Generation of Spacesuits: Axiom Extravehicular Mobily Unit Suit

Developed for the Artemis III mission. The AxEMU also features advanced life-support systems that are designed to keep astronauts safe during their time on the moon. The suit has a built-in system that removes carbon dioxide from exhaled air, which is then replaced with fresh oxygen. The suit also has a waste-management system that collects and stores astronaut waste.

The Future is Bright!

As technology continues to advance, we will likely see an exciting new space industry emerge. Space outposts, mining, and even tourism is close to becoming reality.

Space Mining:
An All-Metal Asteroid!

Psyche is an asteroid that was discovered in 1852 orbiting the sun between Mars and Jupiter. NASA's Psyche Mission, led by Arizona State University, aims to journey to the asteroid. The Psyche spacecraft will take a 280-million-mile voyage to reach the asteroid.

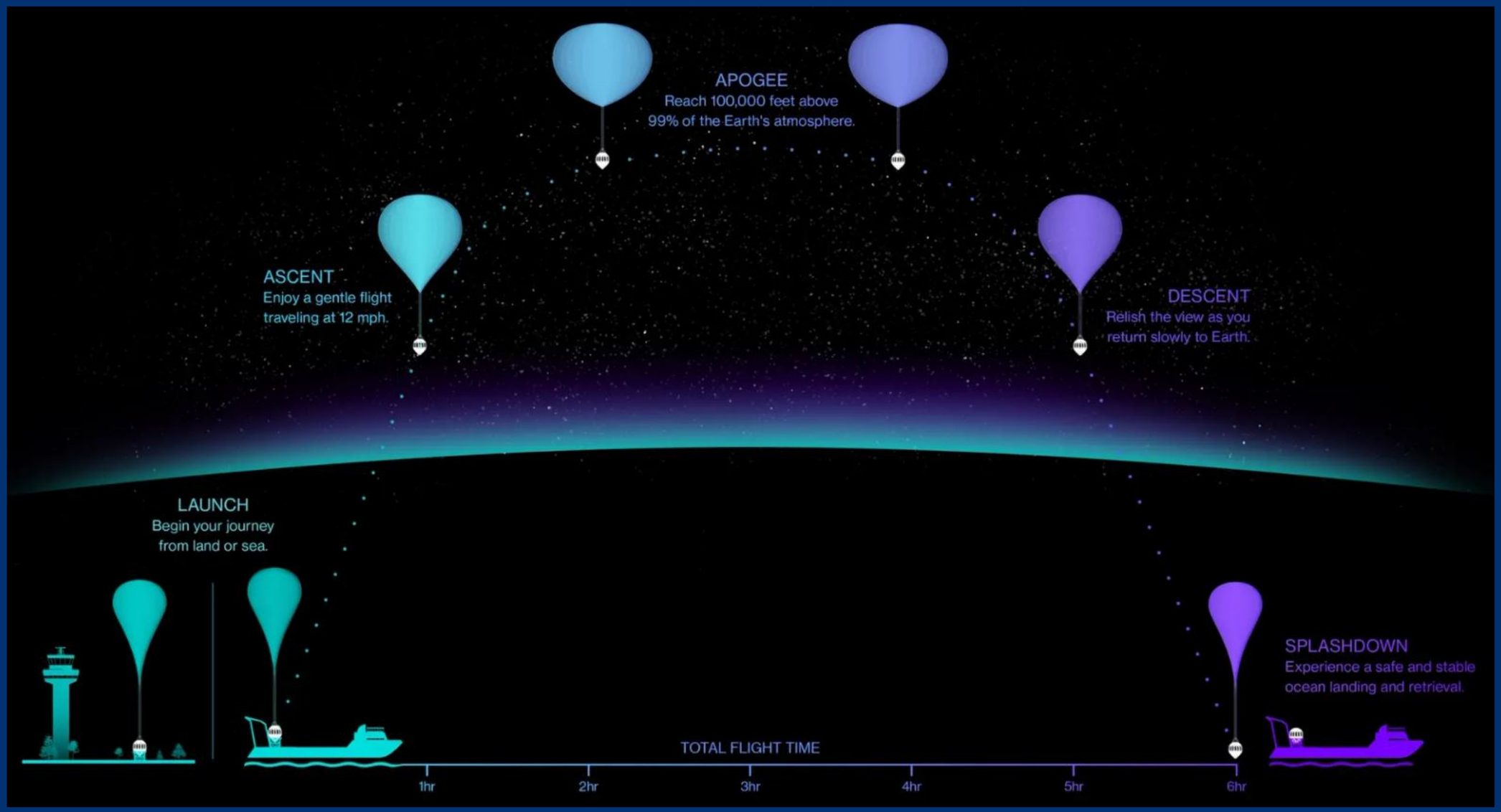
The Psyche asteroid is unique because it might be the exposed nickel-iron core of an early planet. The planet might have been stripped of its outer layers by violent collisions during the formation of our solar system about 4.5 billion years ago.

Space Tourism:
A New Era of Luxury Travel!

The spaceflight company Space Perspective is currently accepting reservations at $125,000 a seat to travel into space. Their Spaceship Neptune is the first carbon-neutral way to space travel. It is propelled by a 650-foot tall space balloon – technology that NASA has used for decades. Unlike a rocket, Spaceship Neptune provides its passengers with a gentle flight free of g-forces.

The 650-foot tall balloon requires no rockets to take to the sky. Instead, renewable hydrogen propels the space balloon at 12 miles per hour. In addition to the primary flight system, Spaceship Neptune is equipped with a backup descent system. This system consists of four parachutes located between the capsule and the balloon.

Within the pressurized capsule is a luxurious space lounge complete with comfortable seating, bathrooms, a bar, plants, and Wi-Fi. The spacious Space Lounge allows the passengers to stand and move around freely. During the 6-hour flight, the passengers can eat a meal while listening to music and watching the planet drift away.



Spaceship Neptune will rise into space for 2 hours until it reaches the maximum altitude of 100,000 feet. For the following 2 hours, the spaceship will continue to glide at the maximum altitude. It will take the remaining 2 hours to descend gently back to Earth. Spaceship Neptune will land in the ocean and upon landing be retrieved via ship.