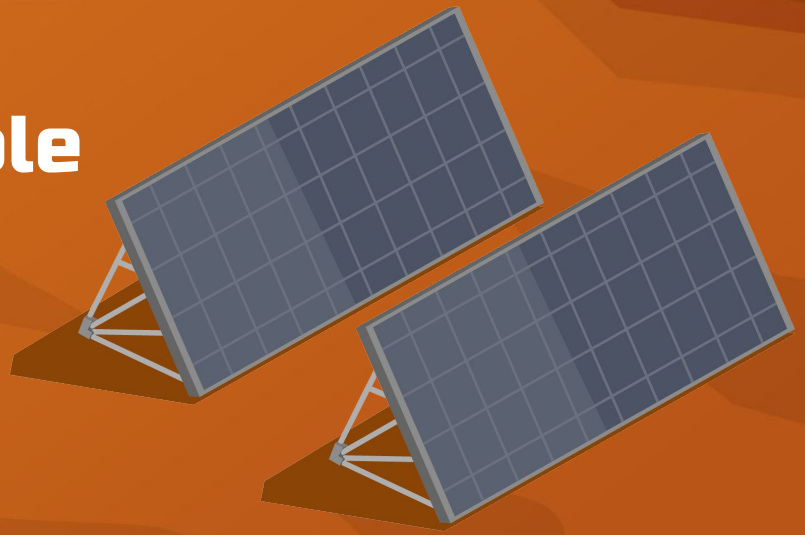
Expanding Humanity's Horizons: Our Journey Beyond Earth

Exploring the Cosmos: Our Journey to Becoming a Multiplanetary Civilization

“Equipped with his five senses, man explores the universe around him and calls the adventure science.”

~Edwin Powell Hubble

Famous American Astronomer



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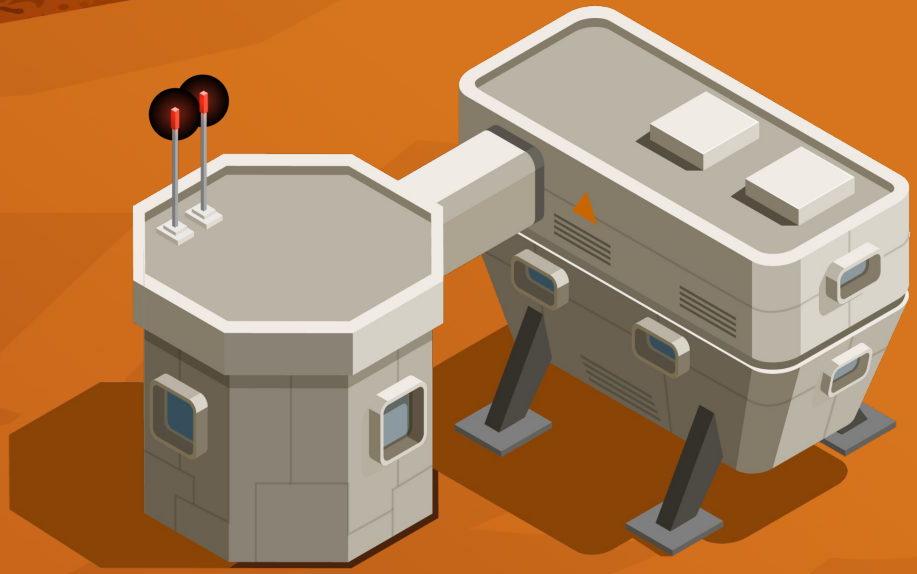


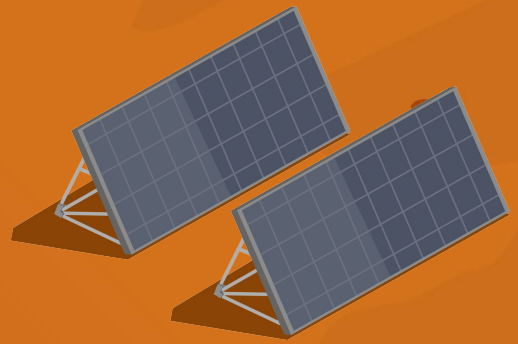
01

INTRODUCTION

Humanity’s Largest Dilemma - The Search

Hypothesis/Thesis

If advanced self-sustainable life systems are integrated into Mars, then humans can colonize the planet and thrive because the great innovations of mankind will help navigate the challenges of resource scarcity and environmental issues, ultimately leading to the creation of a self-sufficient civilization.



Key Vocabulary

- **Habitable Zone**: The orbital region around a star (in the centre) where conditions could allow liquid water; also referred to as the ‘Goldilocks Zone’
- **Terraforming**: The process of modifying a planet’s environment to make it habitable for life to exist.
- **Quantum Computing (QC)**: A supercomputer using qubits (the basic unit of info in a QC) leveraging quantum mechanics for faster and deeper processing scales.
- **Exoplanet**: A planet outside the Milky Way.
- **Reusable Rockets**: Rockets designed to return to Earth for reuse, reducing costs (e.g., SpaceX’s Starship).
- **ISRU (In-Situ Resource Utilization)**: Is the method of harnessing energy and natural resources in a local environment instead of taking it from Earth
- **Biodiversity:** the variety of life in a given, environment, ecosystem, world, or habitat

Reasons to Colonize Celestial Bodies

Safehaven

If catastrophic global adversity creates significant negative impact on the Earth's vitality, Mars could serve as a backup- an Earth 2.0

Economy

Could spark new economic opportunities and give the chance for new industries to arise

- Mining for rare minerals
- Develop new forms of agriculture and sustainable living

Technological Advancements

Will drive innovation and discoveries in fields like medicine, engineering, and energy production

Comparison - Earth vs. Mars

	EARTH	MARS
GRAVITY	1G	0.371G
MOONS	One	Two
WATER	Abundant	Scarce (hidden)
TEMPERATURE	13.85ºC	-55.15ºC
DAY DURATION	24 hours	24 hours, 39 minutes and 35.244 seconds

Cautions of Mars

01 — Toxic Soil

Mars' soil contains a toxic and reactive substance known as perchlorate, which is harmful to many forms of life.

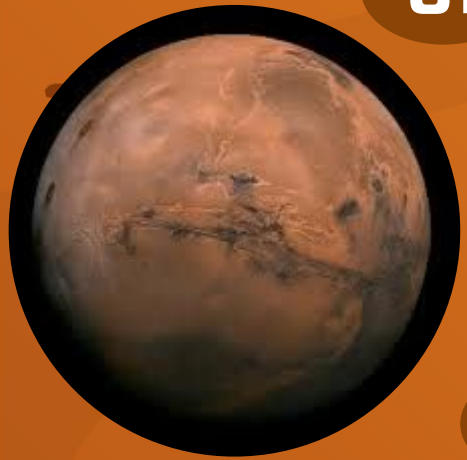
02 — Thin Atmosphere

The thin atmosphere and the lack of a magnetic field make it vulnerable to collisions with interstellar asteroids.

03 — Microgravity Effects

The lower gravity level could cause muscle atrophy, bone density loss, and bring up many other issues to the astronauts regarding their health.

Feasible Solutions



01

Wearing proper equipment and growing plants using the process of hydroplaning, we could easily avoid interaction with the soil.

02

The construction of defense missiles could address the problem of external debris impacting Mars. To combat the radiation risk, humanity could establish habitats within large domes or entirely subterranean abodes.

03

Due to the significant difference in the gravity level, astronauts can participate frequent workout routines to maintain their physical wellbeing.

02

Optimizations with Quantum Computing

When Physics and Biology Merge to Create New Prospects

The Role of QC on Humanities Mission

Enhancing Spacecraft Performance:

- Perfecting airborne vehicle trajectories
- Raising the bar and heightening the standard for modern propulsion systems
- Assist in the invention of newer articles with more resistance to harsher conditions in space

Preparatory Simulations of Atmospheric and Geological Conditions of Exoplanets:

- Through complex quantum systems, scientists can rationalize the reality of environmental conditions of planetary structures in and out of the Milky Way, deepening our knowledge and extending our limitations of the impossible regarding space exploration and biology

03

Cutting-Edge Solutions

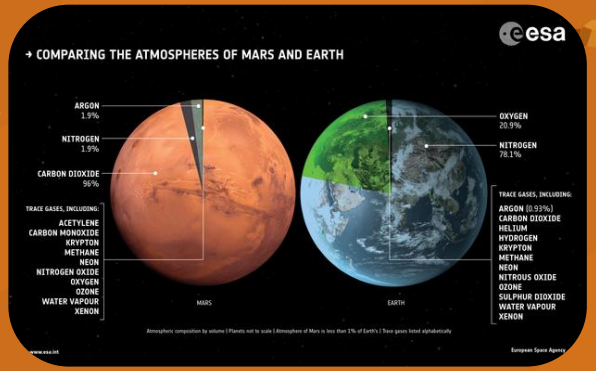
Diverse Range Remedies

Terraforming Mars with Lasers

Our plan:

An ideal atmosphere would consist of:

- 21% oxygen
- 79% nitrogen
- 0.05% carbon dioxide
- Average temperature of 14ºC
- Under one bar of pressure



In the present, Mars contains a atmosphere which is far from being from an ideal atmosphere for human beings. Mars was once very similar to Earth having an oxygen-rich atmosphere and held countless bodies of water. Due to the Sun's ultraviolet rays and solar wind, the water has been trapped beneath the surface and the oxygen along with the carbon dioxide has been confined in the Martian rocks.

Terraforming Mars with Lasers (2)

Use of Lasers for Terraforming:

With futuristic technology enhanced with quantum computing, we can create a laser system to complete this process.

Solar-charged orbital lasers, combined with a sophisticated network of mirrors, are the most effective solution for rapidly terraforming the planet within a 50-year timeframe.

All the stored water on Mars will evaporate into water vapor, which will then condense into clouds and result in rainfall. This process will help remove harmful substances like chlorine.

As shallow oceans will soon arise, we can pave paths and shape large bodies of water like lakes, streams, and seas.

Terraforming Mars with Lasers (3)

Shipping Nitrogen from Titan:

Our next major process would be to import nitrogen into Mars' atmosphere, as it otherwise would have an abundance of oxygen, still leaving it uninhabitable.

Reintroducing Titan as part of the movement, we could take advantage of its major nitrogen supply and ship the resource Mars.

Powered by our lasers, we can construct automated factories upon Titan's surface to absorb the gas in the atmosphere, compress the substance into a liquid which will finally be transported by a mass driver to Mars.

Terraforming Mars with Lasers (4)

Finishing Touches:

We can gradually introduce phytoplankton into water systems and present plants that are native to volcanic areas. These plants will be placed in zones enriched with microorganisms to improve the soil and establish the foundation for new ecosystems.

Lastly, to ensure the avoidance of solar wind and radiation from our Sun, we can position a large superconducting ring powered by nuclear facilities to act as an magnetic field for Mars.

By this stage, Mars' transformation will finalized and ready for the first human colonies; this entire terraforming process could take anywhere from 100 to 250 years to put into place.

Dome Eco-Systems

Alternatively, instead of terraforming Mars in its entirety, we could adopt a targeted approach by focusing on specific plots of interest. This can serve as either a temporary solution or a permanent one until Mars is fully terraformed.

The concept involves creating domes or other structures that can maintain a stable environment by pumping in oxygen and other necessary gases. Within these domes, smaller living quarters can be built for people, alongside areas designated for farming and industrial activities.

Dome Eco-System (2)

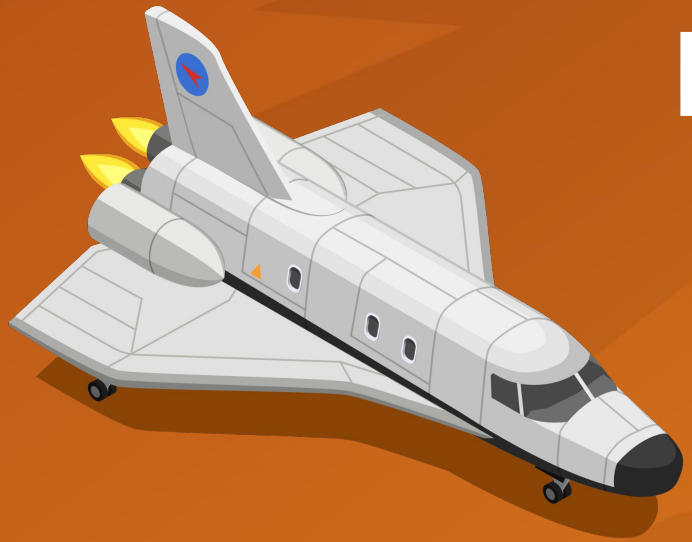
- To temporarily pump oxygen into the dome, a groundbreaking discovery known as MOXIE (Mars Oxygen In-Situ Resource Utilization Experiment) was deployed on the Perseverance rover.
- Its purpose was to separate oxygen molecules from carbon dioxide through an electrochemical process. The experiment was successful and operated throughout the Martian year.
- Although the amount of oxygen generated was small, if enough devices are used, we can produce enough oxygen to fill our domes.

An Image of MOXIE device being placed into perseverance

04

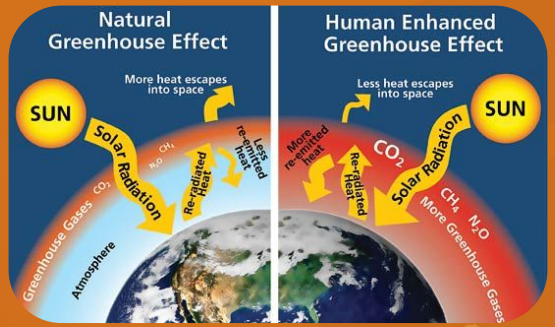
Universal Predicaments

Addressing Worldwide Issues and Introducing Solutions



Climate Change

- 2024 was the hottest year recorded in the history of our planet, this happened precisely due to the greenhouse effect.
  - The greenhouse effect occurs when energy and radiation from the Sun reaches Earth's atmosphere. A small amount of that energy is reflected back into space and the remaining stays within the atmosphere which traps heat
  - The natural greenhouse effect is required for our planet to stay warm and for use to live. But it has been modified and prolonged by human nature causing rapid temperature increase(s) which can lead to catastrophes like mass floodings, frequent natural disasters, submerged land mass.



Climate Change (2)

- Oceans can absorb 25%-30% of CO2
  - Consequences attached → vast amounts of CO2 absorbed can lead to ocean *acidification*
  - Harm marine life, especially those who need calcium carbonate to build shells + skeletons like corals, mollusks, and few plankton species
  - Eliminating various creatures from the lower levels of the food chain creates a chain reaction, leading to a lack of food for creatures higher up the chain, gradually resulting in the decline of ocean life.

Solution

Our emerging planet must be capable of providing resources for future generations, and Mars could serve as an essential supplier. With the projected global population expected to reach around 9.7 billion by 2050, Mars offers the necessary landmass and space to expand our civilization. If the various challenges facing our current world become overwhelming, Mars may serve as the much-needed sanctuary we seek.

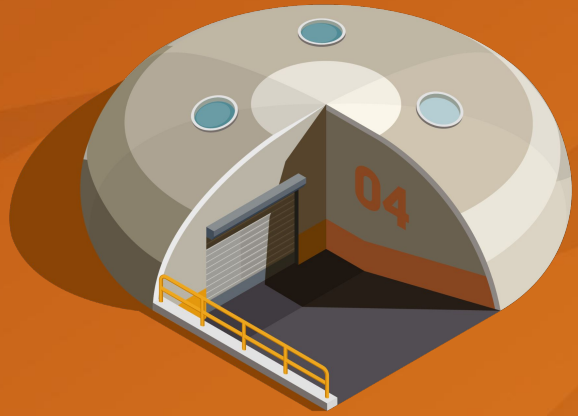
In summary:

- Overpopulation
- Resource Scarcity
- Potential as Earth 2.0

05

Conclusion + Credits

Summary and References



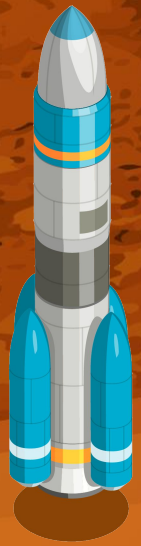
Conclusion

Since the birth of mankind, our passion always lied in the stars of the night sky before us, our curiosity met with our strong will and determination is what has led us to our present innovations, discoveries, and realities.

With the rapid advancements in technology, especially since the late 20th century, we have made significant advancements in many fields of science including astronomy, biology, and medicine. Recent advancements like the boom in quantum physics and computing will enable us to open and explore multiple verisimilitude we could have never imagined before.

As of now, we haven't seemed to uncover any visible planet similar and with the current capabilities of sustaining life with ideal conditions, only highlighting the uniqueness of our home planet we call Earth. We shouldn't take uncalculated measures and risks unnecessarily considering the drastic environment we would have to adapt to; preserving Earth should become a heightened priority.

THANKS



We appreciate your time and consideration

Ranbir and Vikas ~ Grade 9

Representatives of Fairview Junior High

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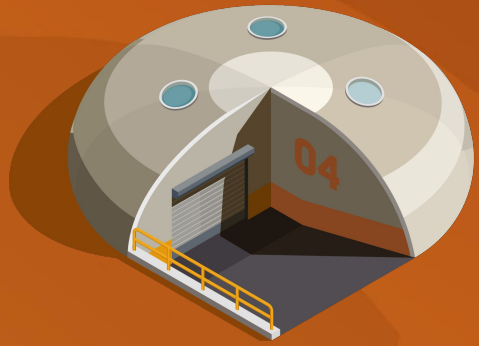

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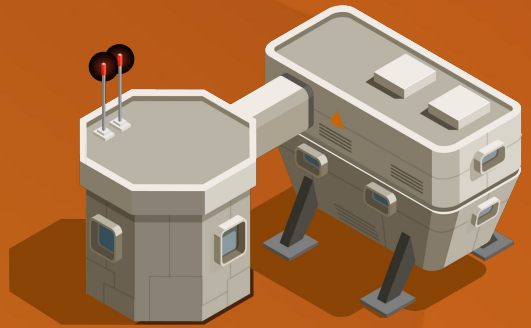

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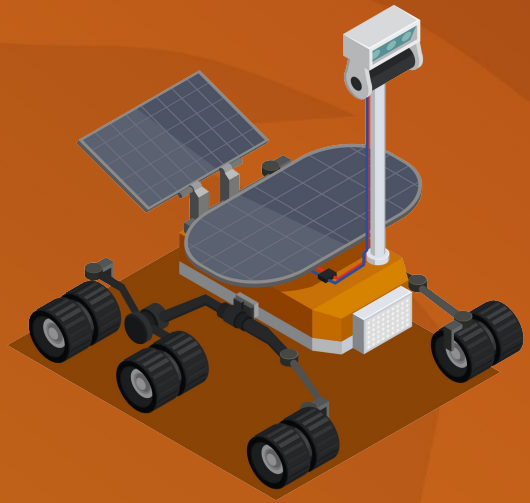

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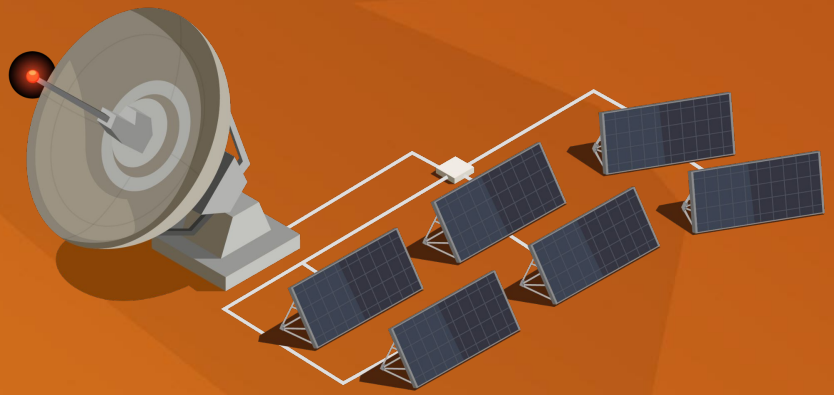

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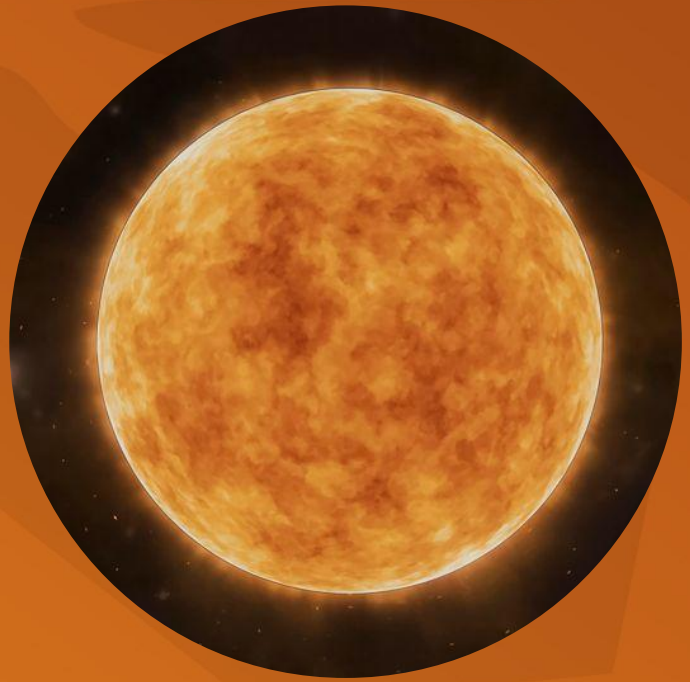

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