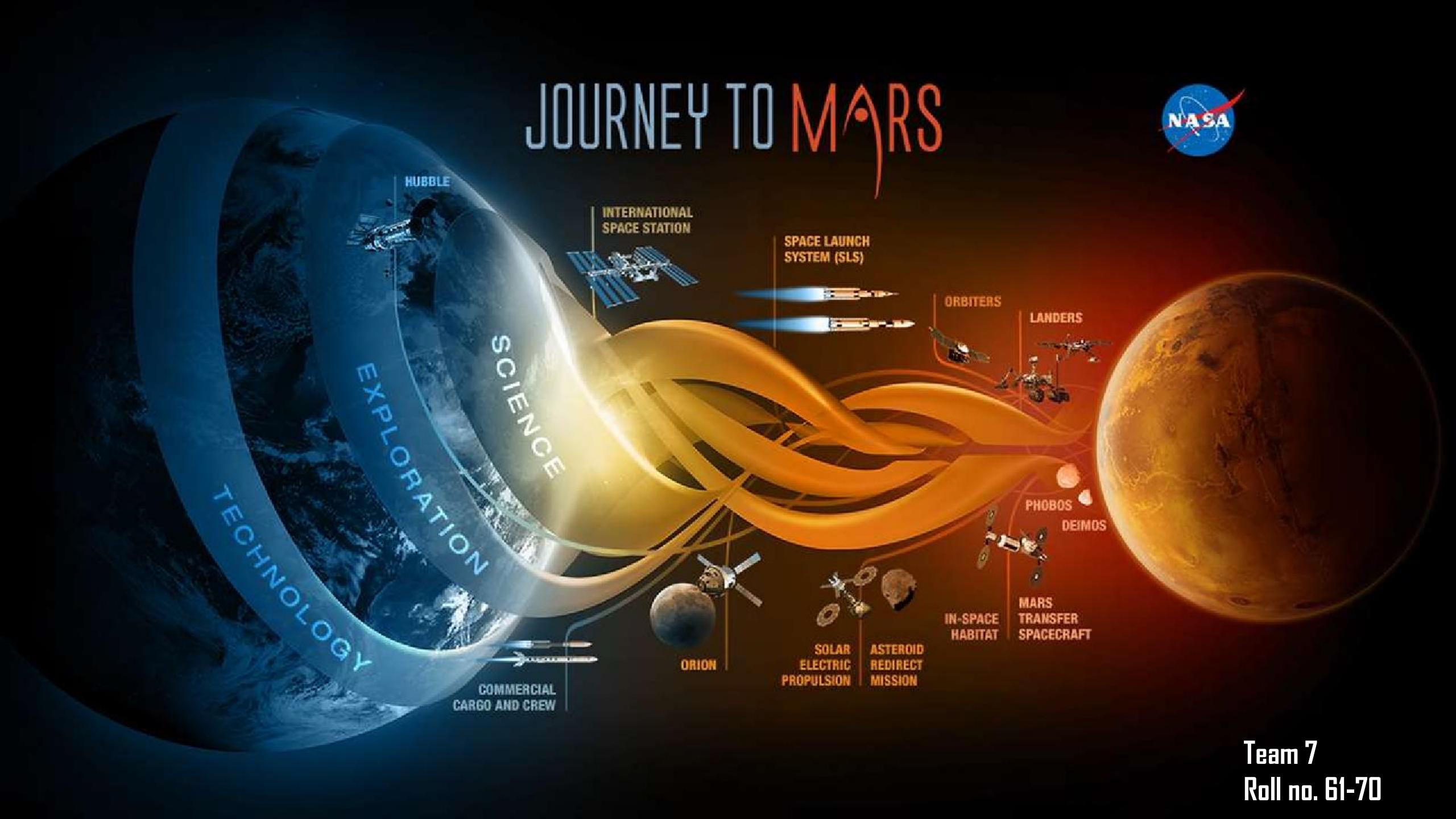




JOURNEY TO MARS



Team 7
Roll no. 61-70

TOPICS TO BE DISCUSSED

- ✓ Mythological stories and space
- ✓ Journey to the space
- ✓ Threats to humanity
- ✓ Leave the earth
- ✓ Exoplanets
- ✓ Why only MARS ?
- ✓ The challenge of living on MARS
- ✓ Mars missions

- ✓ Mangalyaan
- ✓ Human missions to Mars
- ✓ NASA's journey to the Mars
- ✓ Mars and beyond (SpaceX)
- ✓ Initial Life on Mars
- ✓ Terraforming Mars
- ✓ Ethical and social challenges
- ✓ Conclusion

MYTHOLOGICAL STORIES AND SPACE

- ✓ Human is curious about space and stars from the ancient time and trying to reach there.
- ✓ There are many stories and theories about ancient sites that they were built by aliens and we can't ignore them completely .

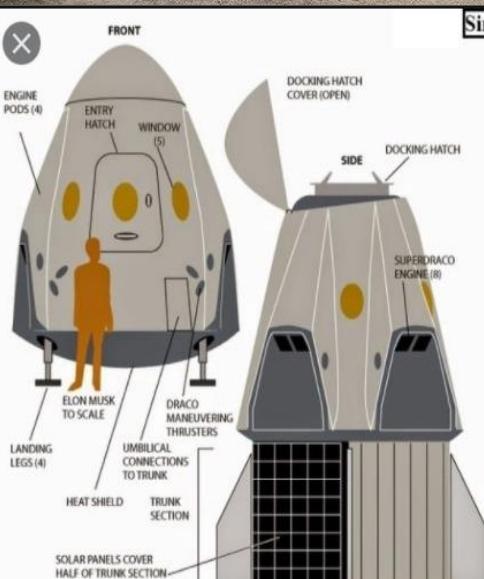
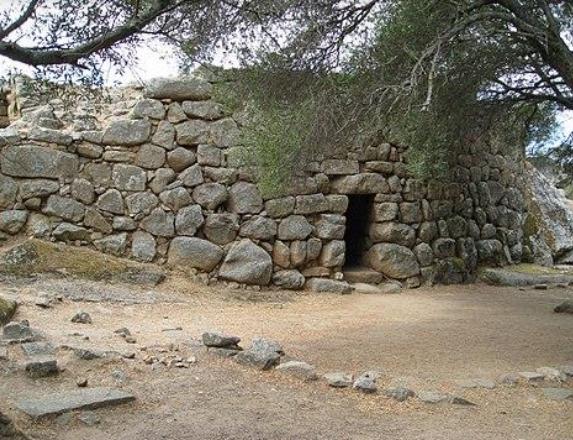
For example

- Orion correlation theory about **Pyramids of Egypt**
- Giants grave of **Sardinia** and many more like, **Easter Island**, **Teotihuacán**, **Sacsayhuamán** , **CHARAMA (Chhattisgarh)** etc.

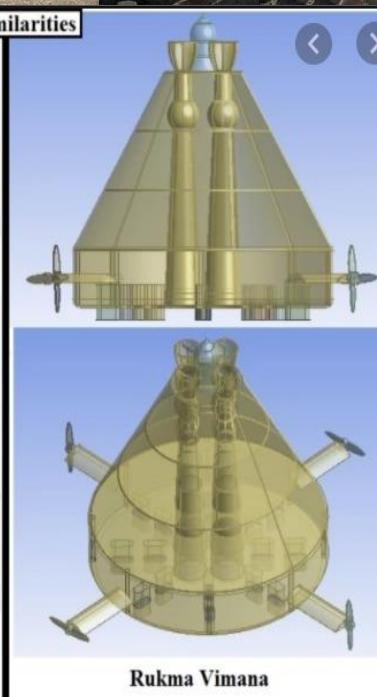
- ✓ There are many ancient holy texts in Hindu Cosmology Which conveys about Concepts of Space, Time, Multiverse, Consciousness and Astronomical calculations.

- ✓ For example The Vaimānika Shāstra conveys about aeroplanes and star ships in ancient India and describes their design and also describes many other important devices and alloys(using ancient alchemy).

[Download The Vaimānika Shāstra](#)



NASA's Space X Dragon



Rukma Vimana



JOURNEY TO THE SPACE

➤ Initial Steps :

Galileo Galilei (1564-1642)

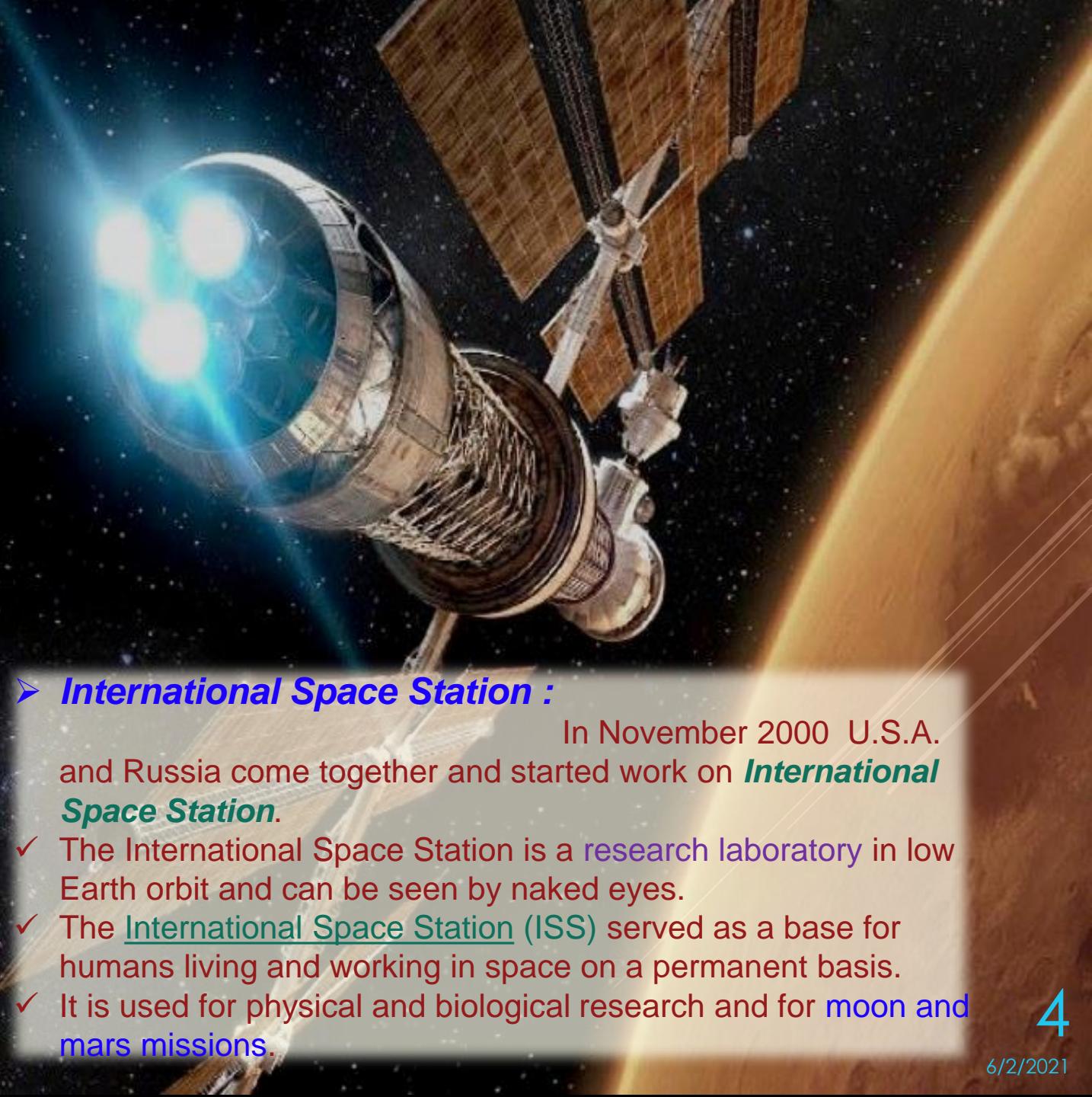
discovered telescope and put deep eyes in space.

- ✓ In upcoming centuries **Jacques Charles** Invented hydrogen balloon and after that **Wright Brothers** invented modern aircrafts.
- ✓ In early 20th century **Robert H. Goddard** invented rockets and established a milestone in journey to the space.

➤ Space Race :

In 1957 U.S.S.R. completed 1st space mission **Sputnik** and launched first artificial satellite and then send a dog "**Laika**" to the space.

- ✓ In 1961 U.S.S.R. send 1st human **Yuri Gagarin** to orbit the earth.
- ✓ In 1969 U.S.A. launched mission Apollo-11 and **Neil Armstrong** landed on moon.
- ✓ And modern space race starts from here.....



➤ International Space Station :

In November 2000 U.S.A. and Russia come together and started work on **International Space Station**.

- ✓ The International Space Station is a research laboratory in low Earth orbit and can be seen by naked eyes.
- ✓ The **International Space Station (ISS)** served as a base for humans living and working in space on a permanent basis.
- ✓ It is used for physical and biological research and for moon and mars missions.

THREATS TO HUMANITY :



Disasters and environmental issues

- ✓ Overpopulation and scarcity of resources
- ✓ Climate change
- ✓ Super Volcanos
- ✓ Movement in inner crust and tectonic plates of earth
- ✓ Epidemics

Man made problems

- ✓ Human violence
- ✓ Nuclear, Biological, and Chemical weapons
- ✓ Artificial Intelligence may takeover humans
- ✓ Genetically modified vaccines, and medicines will backfire on us



Threats from space

- ✓ Other intelligent species (Aliens) will invade us
- ✓ Gama ray burst and black holes
- ✓ Asteroids will destroy us
- ✓ Ice age or age of fire



LEAVE THE EARTH

□ Stephen Hawking Says Humanity Won't Survive Without Leaving Earth

"It will be difficult enough to avoid disaster in the next hundred years, let alone the next thousand or million," [Stephen Hawking](#) said. "Our only chance of long-term survival is not to remain inward-looking on planet Earth, but to spread out into space."



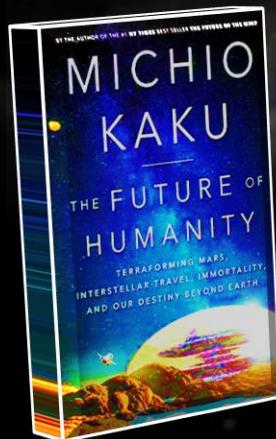
Not to leave planet Earth would be like castaways on a desert island not trying to escape... Sending humans to other planets... will shape the future of the human race in ways we don't yet understand, and may determine whether we have any future at all.

— Stephen Hawking —

AZ QUOTES

□ Michio Kaku Is It Time To Leave Earth?

Kaku discusses the future and survival of the human species and discusses topics such as terraforming Mars and interstellar travel. Given that it may take centuries to reach the closest suns and exoplanets, Kaku also explores alternative paths to ensure the survival of humanity, including the possibility of genetic engineering and transferring human consciousness into non-biological machines.



□ Elon Musk Said We Must Leave Earth For One Critical Reason

Colonizing other worlds is not a desire. It's a need.

□ Humans will leave Earth not to explore, but to exploit

~ Rakesh Sharma

EXOPLANETS

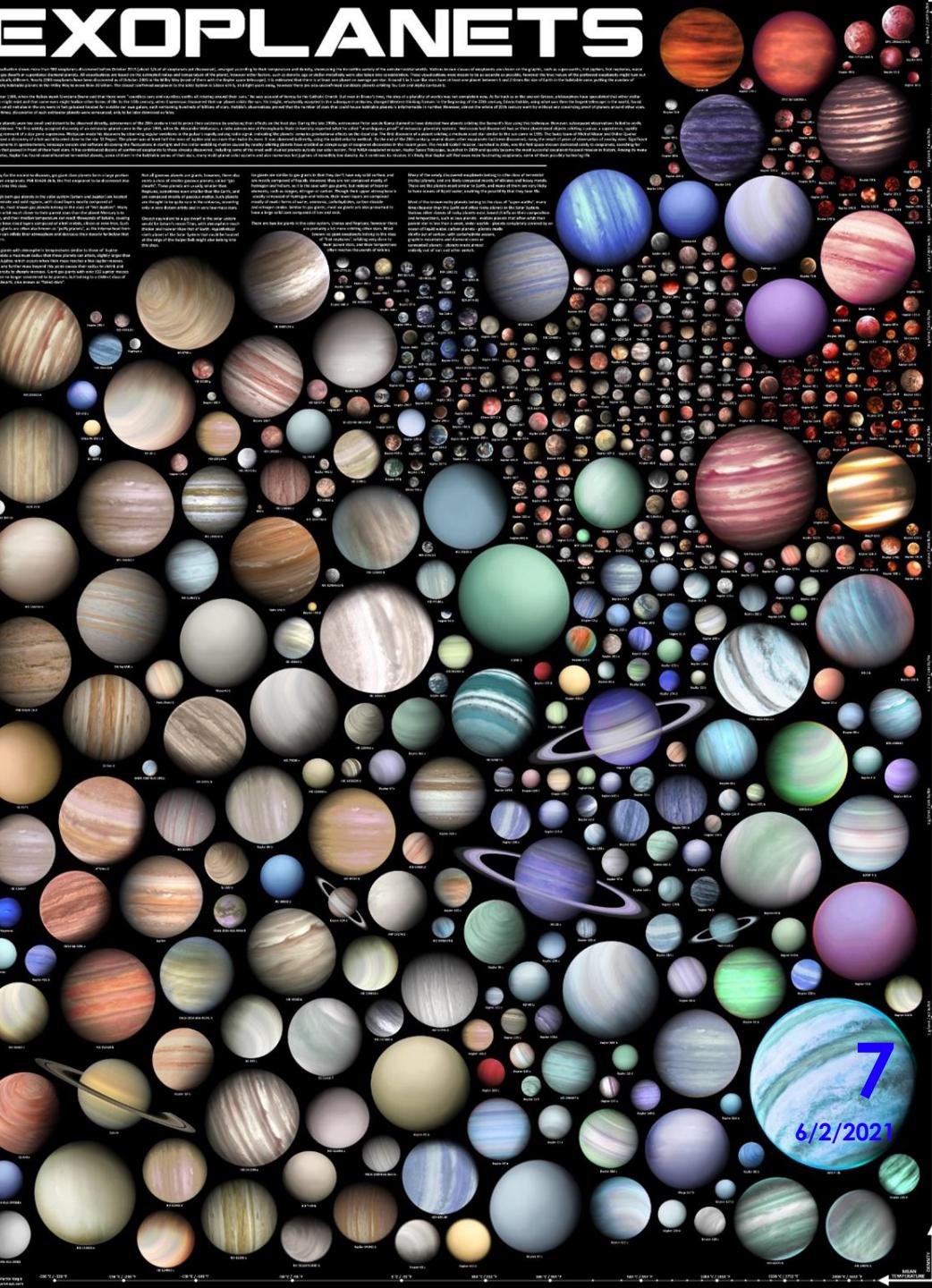


□ MORE THAN 2000 LIFE POTENTIAL PLANETS ARE DISCOVERED TILL NOW.

EXAMPLES :

- Mars
- Ceres
- Kepler 452-B
- Proxima-B
- Jupiter's moon Europa
- Venus
- Saturn's moon Titan, Enceladus

□ THEN WHY ONLY MARS ???



COMPARE TO EARTH

Mean Radius:	6,371 km	3,396 km
Mass:	59.7×10^{23} kg	6.42×10^{23} kg
Volume:	10.8×10^{11} km ³	1.63×10^{11} km ³
Gravity:	9.8 m/s ²	3.711 m/s ²
Avg. Temperature:	14°C (57.2 °F)	-46 °C (-51 °F)
Length of Day:	24 hours	24h 40m
Length of Year:	365.25 days	686.971 days
Water:	Plentiful	Intermittent (mostly frozen)
Polar Ice Caps:	Yep	Yep

BUT WHY MARS?

- ✓ Its soil contains water to extract
- ✓ It isn't too cold or too hot
- ✓ There is enough sunlight to use solar panels
- ✓ Gravity on Mars is 38% that of our Earth's, which is believed by many to be sufficient for the human body to adapt to
- ✓ It has an atmosphere (albeit a thin one) that offers protection from cosmic and the Sun's radiation
- ✓ Close to Earth (and asteroids)
- ✓ Has seasons like Earth
- ✓ The day/night rhythm is very similar to ours here on Earth
- ✓ Resources – atmosphere, water, metals
- ✓ Potential for terraforming

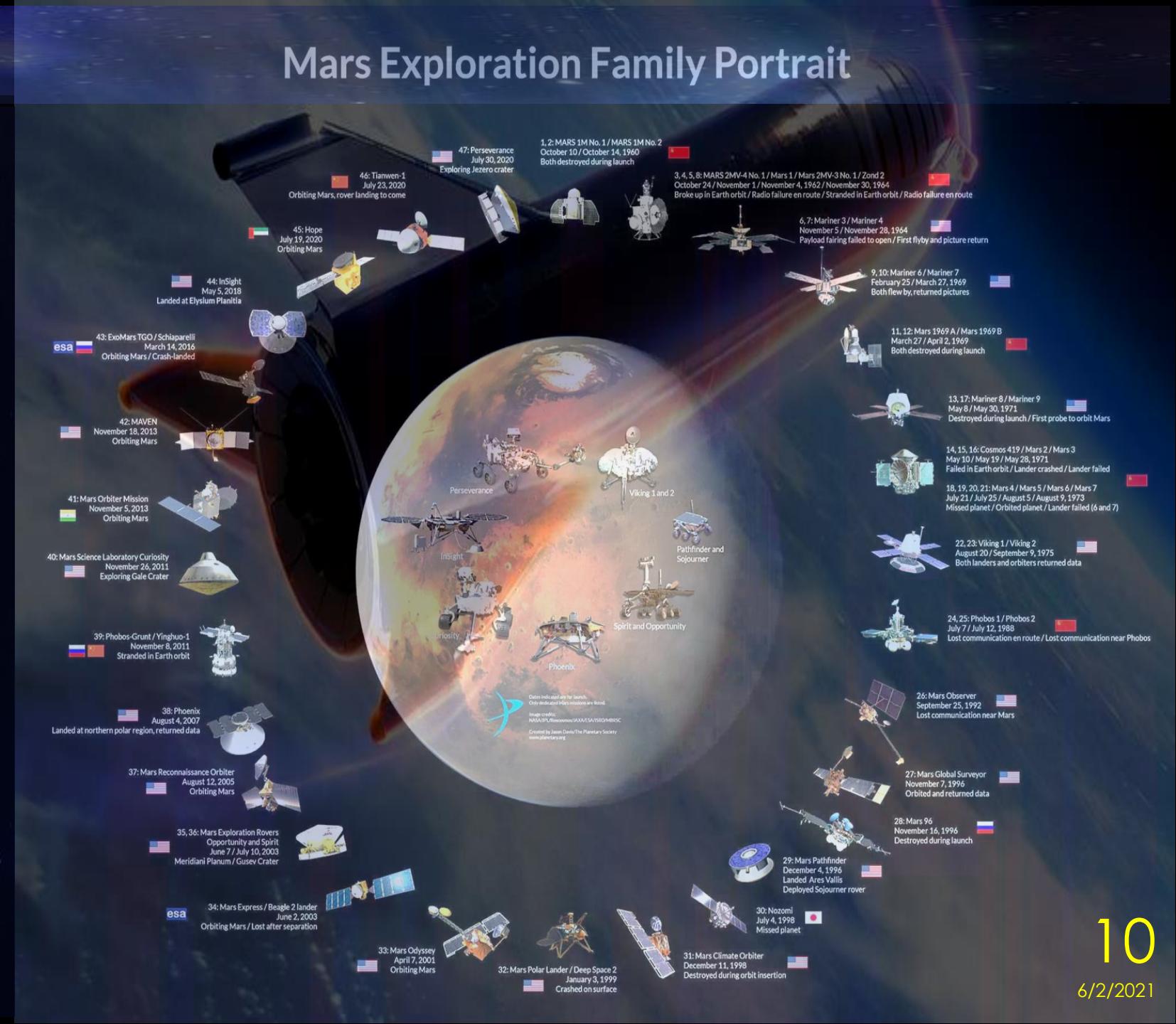


THE CHALLENGES OF LIVING ON MARS

- ❖ Very thin and toxic atmosphere.
 - ❖ Water Locked in Rocks and Sand
 - ❖ No magnetosphere or ozone layer to the block radiation.
 - ❖ Low gravity.
 - ❖ Long way from home.
 - ❖ Mars Colonization is much expensive
 - ❖ Absence of oxygen in air.
 - ❖ Cold, Sand Storm, Solar Flares etc.
- In short, compared to earth, mars is a pretty small, dry, cold, and dusty planet.
 - It has comparatively low gravity, very little atmosphere and no breathable air. And the years are also mighty long, almost twice that of earth, in fact.
 - However, the planet does have its fair share of water (albeit mostly in ice form), has seasonal cycles similar to earth, temperature variations that are similar, and a day that is almost as long.

MARS MISSIONS

- Mars is the most studied planet besides Earth by far over.
- Over the past 50 years humanity launched 54 mission to mars but only 26 of them were successful.
- Mars missions during 1960–2000 sent images of mars, take atmospheric, temperature, pressure measurements, Detected massive volcanos, riverbeds, traces of water on the surface, sent samples of soil and climate details of mars, and compiled global map of Martian surface.
- Missions during 2000–2020
 - ✓ revealed vast amount of water ice in polar regions
 - ✓ recorded radiation environment (Risk to future human explorers)
 - ✓ measured volume of water on Mars(821 km³)
 - ✓ detected sulphur, oxygen, nitrogen and other life forming chemical ingredients
 - ✓ recorded mineralogy maps
 - ✓ detected evidence that mars once had habitable, environment containing liquid water, warm temperature and thick atmosphere.
- Recent and future Mars missions are aimed to sent humans to Mars, and Mars colonization.



MANGAL YAAN

INDIA'S MISSION TO MARS



- On 5th November 2013 Indian space research organization (ISRO) launched India's first interplanetary mission Mars Orbiter Mission (MOM) And successfully inserted in the orbit of Mars on 24th September 2014. The MOM Probe lifted-off from the First Launchpad at Sriharikota near Chennai, using a Polar Satellite Launch Vehicle (PSLV) rocket C25.
- ISRO plans to develop and launch a follow-up mission called Mars Orbiter Mission 2 (MOM-2 or Mangalyaan-2) with a greater scientific payload to Mars in 2024. The orbiter will use aerobraking to reduce apoapsis of its initial orbit and reach an altitude more suitable for scientific observation

❖ Objectives :

- ✓ Develop the Technologies Required for Design, Planning, Management and operations of an Interplanetary missions.
- ✓ Design and realization of Mars orbiter
- ✓ Orbit around the Mars
- ✓ Deep space communication, Navigation, Mission planning and management
- ✓ Exploration of Mars surface features.
- ✓ Study of Morphology, Topography, Mineralogy and Martian atmosphere by Indigenous scientific instruments
- ✓ To see Mars had the environment in which life evolved.

❖ Achievements :

- ✓ With the success of MOM India became the first country in the entire world to have reached Mars in the very first attempt.
- ✓ ISRO become the 4th space agency after NASA, ROSCOSMOS, and ESA who achieved Mars orbit.
- ✓ MOM is the least-expensive Mars mission ever (Cost = 73 millions US\$).
- ✓ MOM developed and deployed in just 15 months while NASA took 5 years to complete MAVEN.
- ✓ In 2014, China referred to India's successful Mars Orbiter Mission as the "Pride of Asia".
- ✓ The Mars Orbiter Mission team won US-based National Space Society's 2015 Space Pioneer Award in the science and engineering category.
- ✓ Many woman scientists contributed in this mission including Dr. Ritu Karidhal Srivastava (Deputy Operations Director of MOM) (known as **Rocket Woman** of India).



2013-11-05 09:54 Mars Orbiter Mission



HUMAN MISSIONS TO MARS

The 2020's will be a "transition decade" that leads to Humans to Mars in the 2030's

- The human exploration of Mars has been an aspiration since the earliest days of modern rocketry.
- Robert H Goddard credits the idea of reaching Mars as his own inspiration to study the physics and engineering of space flight.
- Proposals for human exploration of Mars have been made throughout the history of space exploration.
- currently there are multiple active plans and programs to put humans on Mars within the next ten to thirty years, both governmental and private, some of which are:
 - ✓ Mars Society (analog studies, research, promoting manned Mars missions)
 - ✓ Mars to stay (The idea of a one-way trip to Mars)
 - ✓ Mars One (a Dutch entrepreneur group raising funds for a human Mars base establishment)
 - ✓ Red Society (open source plan for colonizing and terraforming Mars)
 - ✓ NASA'S "Journey to the Mars"
 - ✓ Plan of SpaceX for Mars colonization.
 - ✓ Low cost human mission proposal (Mars direct, and Mars to stay) by The founder of Mars Society "Robert Zubrin" etc.



□ On October 8, 2015, [NASA](#) published its official plan for human exploration and colonization of Mars. They called it "Journey to Mars".

□ The plan operates through three distinct phases leading up to fully sustained colonization.

❖ Phase 1

✓ **Earth reliant phase**

✓ **validating deep space technologies**

✓ **studying the effects of long duration space missions on the human body**

❖ Phase 2

✓ **capture an asteroid**

✓ **test deep space habitation facilities**

✓ **validate capabilities required for human exploration of Mars**

❖ Phase 3

✓ **Earth independent phase**

✓ **long term missions on the lunar surface which leverage surface habitats that only require routine maintenance, and the harvesting of Martian resources for fuel, water, and building materials**

✓ **NASA is still aiming for human missions to Mars in the 2030s, though Earth independence could take decades longer.**



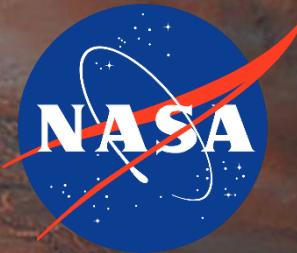
➤ On August 28, 2015, NASA funded a year long simulation to study the effects of a year long Mars mission on six scientists.

➤ The scientists lived in a bio dome on a Mauna Loa mountain in Hawaii with limited connection to the outside world and were only allowed outside if they were wearing spacesuits.

NASA'S JOURNEY TO MARS

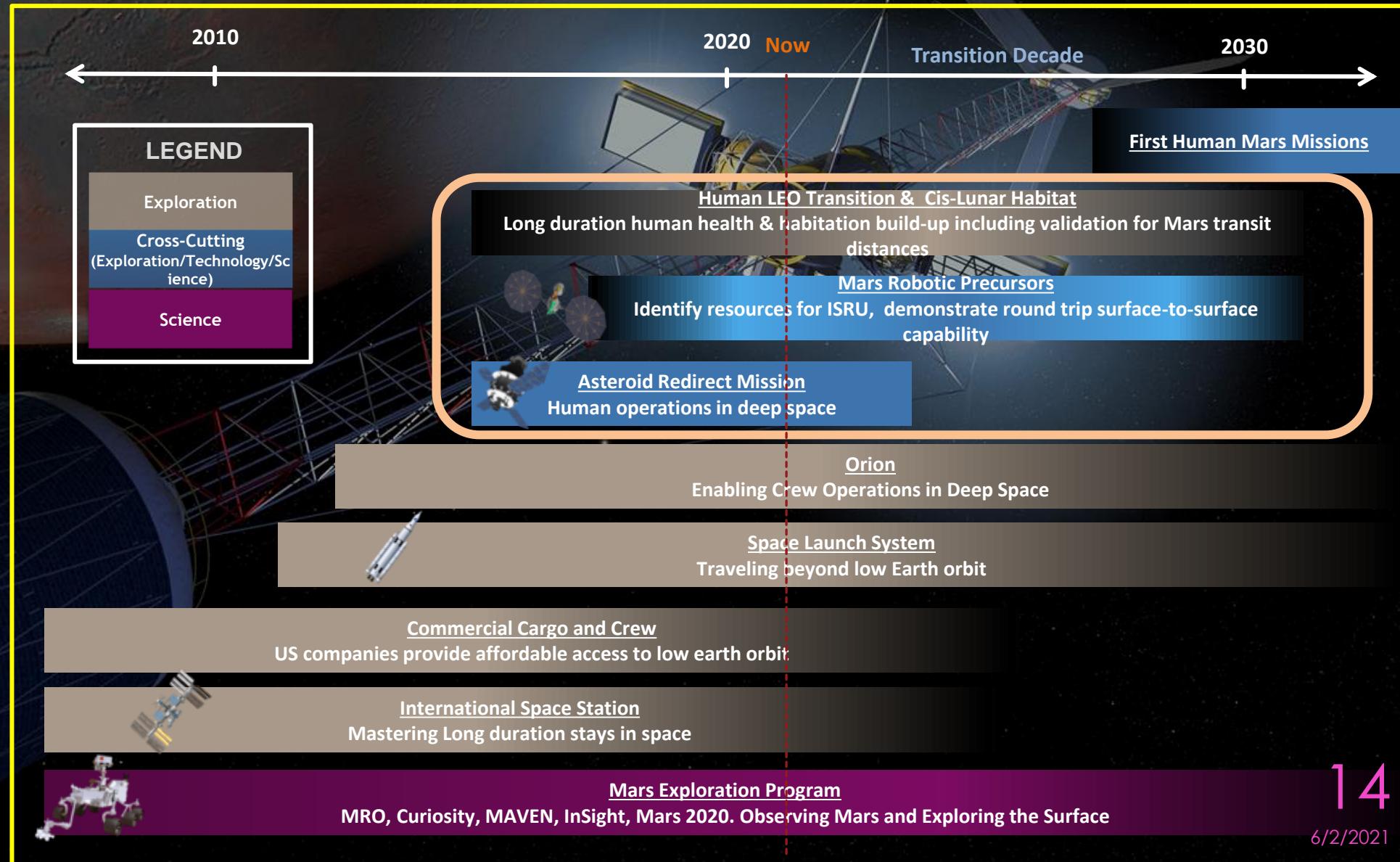
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ELEMENTS OF THE JOURNEY TO MARS

NASA's human Mars exploration plans have evolved through the NASA Mars Design Reference Missions, a series of design studies for human exploration of Mars.



MARS & BEYOND

THE ROAD TO MAKING HUMANITY MULTIPLANETARY

SPACEX

- ❑ SpaceX CEO Elon Musk is planning to colonize a self-sustainable city of 1 million people on mars till 2050.
- ❑ Considering the technological advancement SpaceX achieved over the period of time this goal is achievable because Elon's technology is reusable, advance, and cost efficient.
- ❑ Steps :

- ✓ 1st uncrewed rocket in 2024 and crewed in 2026.
- ✓ Mass production and launching of starship.
- ✓ Send 1 million people and cargo to Mars.
- ✓ Creating infrastructure on Mars with the help of 3-D printing.
- ✓ A self-sustainable civilization in domes.
- ✓ Convert Red Planet into Blue Planet (Terraforming).

- ✓ The only home humans have ever known is Earth. But history shows that surviving as a species on this tiny blue dot in the vacuum of space is tough and by no means guaranteed.
- ✓ The dinosaurs are a classic example: They roamed the planet for 165 million years, but the only trace of them today are their fossilized remains. A colossal asteroid wiped them out. So it can wipe us out too.
- ✓ Putting humans on more than one planet would better ensure our existence thousands if not millions of years from now.

~ Elon Musk

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TECHNOLOGY BEHIND SPACEX

Musk emphasize on reusable and cost-efficient space transportation.

Falcon Heavy

- ✓ Most powerful Rocket by a factor of two
- ✓ 64 metric ton payload
- ✓ Generates more than 5 million pound thrust with 3 falcon-9 engine cores (27 merlin engine)

Starship

- ✓ Can carry both cargo and crew
- ✓ World's most powerful launch vehicle ever developed.
- ✓ Payload more than 100 metric tons
- ✓ Raptor Engine (Reusable and first full-flow staged combustion rocket engine)
- ✓ Musical Concert on ship

Process

- ✓ Launch Starship and returning the booster
- ✓ Ship orbit the Earth
- ✓ Tankers refill the Ship and return to earth
- ✓ Travel to Mars
- ✓ Landing on Mars
- ✓ Ship refilling on Mars
- ✓ Return journey



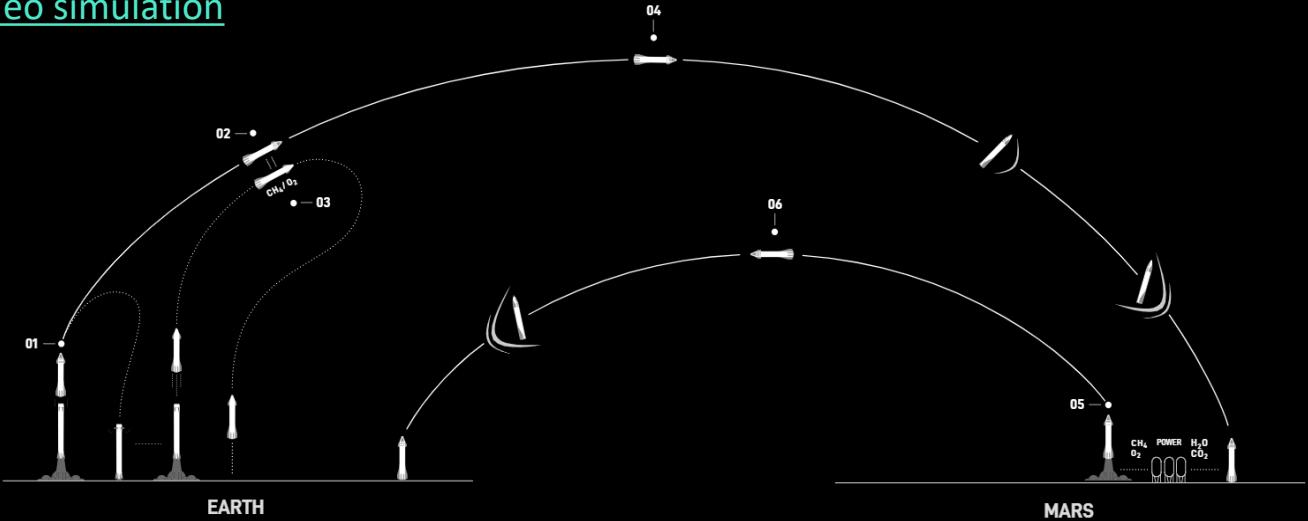
Falcon Heavy



Starship

Process

[Watch video simulation](#)



Music concert in Starship





CIVILIZATION PROCESS

- Fleet of rovers, helicopters and robots
- Cargo Ship
- Base setup
 - (Rovers, Drones, Robots, Mining machinery, Solar & Nuclear plants, 3-D printers, Moxie etc)
- 1st Crew on Mars
- Colony establishment
 - (With the help of local resources)
- Construction
 - (Labs, Green house etc.)
- Fuel production
 - (CO₂ + Ice = CH₄ + O₂)
- Mass Migration to Mars
- Big infrastructure establishment
 - (Factories, Markets, Parks etc)
- Terraforming
- Fully self-sustainable civilization

Life inside the domes

- ✓ Grow plants and food in Green Houses
- ✓ Normal cloths inside the dome but spacesuit in outer environment
- ✓ Melted ice for water supply
- ✓ Fully recycling of resources.
- ✓ Digging, mining, manufacturing, construction, exploration and transportation with the help of robots, 3-D printers and other machines for become self-sustainable.
- ✓ Import some important material from earth.
- ✓ Underground base for radiation protection during solar flare
- ✓ Research labs to make mars habitable

INITIAL LIFE

LIFE IN DOMES

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BASE BUILDUP

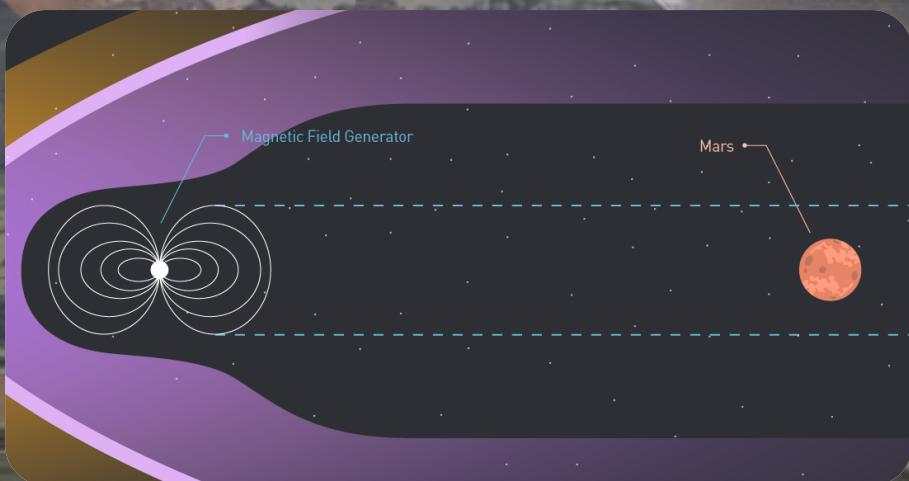


TERRAFORMING MARS

Terraforming is the hypothetical process of deliberately modifying the atmosphere, temperature surface topography or ecology of a planet to be similar to the environment of Earth to make it habitable by Earth-like life

Magnetic field

- ✓ Put a giant magnet at Lagrange point.
- ✓ It will protect Mars from solar radiation and storms.
- ✓ Protect its atmosphere from being blown away.



Gravity and Atmospheric Pressure

- ✓ Centrifugal gravity based sleeping cabin with 1 bar Pressure.
- ✓ Essential even after terraforming
- ✓ Protect from body mutation



Energy

- ✓ Solar and Nuclear
- ✓ From methene and Oxygen
- ✓ Geothermal energy

TERRAFORMING MARS

□ Heating Mars

- ✓ It will help in many ways.
- ✓ Increase temperature and become bearable.
- ✓ Melt ice and release liquid water and caged CO₂.
- ✓ Help in greenhouse effect and thickening atmosphere .
- ✓ Ocean, ponds, lakes and rivers will be created and water cycle will start.
- ✓ With water cycle seasons also will start.
- ✓ Martian Core will melt and it's Natural magnetic field will be restored.
- ✓ Liquid water will reduce dust giants and storms.

□ How to heat

- ✓ Nuke Mars
- ✓ Greenhouse Gases production by establishing nuclear and methane powered factories at large scale.
- ✓ Big solar mirrors in orbit
- ✓ Deviate and collide comets to Mars



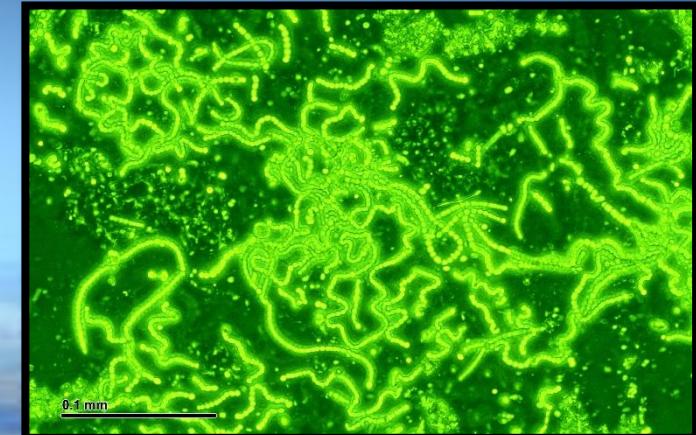
TERRAFORMING MARS

❑ Nitrogen

- ✓ Nitrogen is essential for creating bio-sphere on Mars
- ✓ 3% in Martian environment
- ✓ Nitrogen content in ancient Martian rocks and sediments will release on heating Mars
- ✓ Nitrogen caged in frozen ice on Mars will also release on heating
- ✓ Import solid ammonia from Venus and Titan

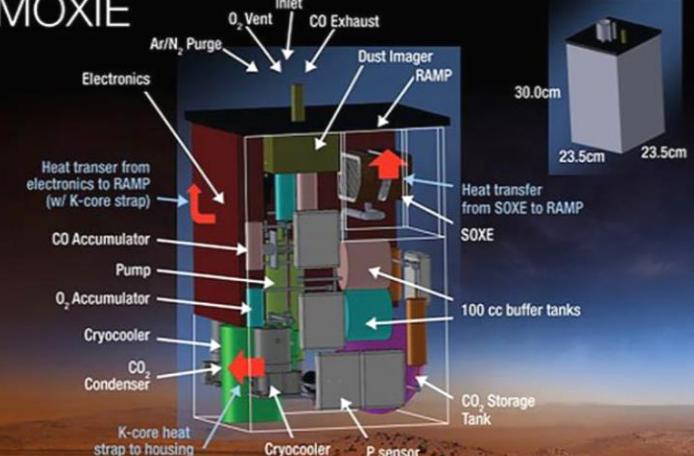
❑ Oxygen

- ✓ Our primary requirement
- ✓ $\text{CO}_2 + \text{Ice} = \text{CH}_4 + \text{O}_2$
(CO_2 95% in Martian environment)
- ✓ Oxygen from Martian environment by converting CO_2 in O_2 with MOXIE
- ✓ Plants in Green house
- ✓ Photosynthetic bacteria like Cyanobacteria
- ✓ Ozone layer creation by reaction of O_2 with sunlight



Blue-Green algae (cyanobacteria)

MOXIE



TERRAFORMING MARS

□ Adding biosphere

- ✓ Initial Plants and aquatic life in domes
- ✓ Adding mosses and microbes in soil
- ✓ Add fertilizers in soil
- ✓ Genetic engineered species
- ✓ Aquatic life
- ✓ Import other species from earth.
- ✓ Food chain and web establishment.

You need to live in a dome initially but over time you could terraform Mars to look like Earth and eventually walk around outside without anything on. ... So it's a fixer-upper of a planet.

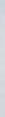
~ Elon Musk



❖ ETHICAL AND SOCIAL CHALLENGES

- ✓ Laws and constitution of Mars
- ✓ Social order and Public relationship on Mars
- ✓ Drawbacks of "Outer Space Treaty"
- ✓ Resources allotment
- ✓ Human rights of Martians
- ✓ What if we found any form of life under Martian surface
- ✓ Conflicts between Martian colonies
- ✓ Conflicts in Crew members
- ✓ Martians may mutate
- ✓ Politics on Earth may create problems for Martians
- ✓ Some giant corporations or greedy countries may go to mars just for rob recourses
- ✓ Will we spoil also Mars like Earth?





CONCLUSION

- Mars Colonization is our need but Earth is our primary home and we have to conserve it.
- It's not too late .
- Other alternatives like Terraforming Antarctica, Underwater or Underground human civilization, genetic engineered humans, but not much effective
- Humans cant survive on Earth, Mars or elsewhere in universe unless they understand that
 - ✓ Work on sustainable development
 - ✓ Respect and conserve mother nature
 - ✓ Growing plants and forests on Earth is much easier then Mars.
 - ✓ Don't behave with Mars as we behaved with our Mother Earth.
- Mars is only our backup plan.
- Human is most conscious and optimistic creature , consciousness is rare and we have to preserve it .
- Hopefully we will colonize Mars and also colonize and explore interstellar world, may be it take time more then our expectations.



A futuristic landscape featuring a massive floating space station above a waterfall and rocky terrain. The space station is a complex structure with multiple levels, solar panels, and a large circular opening at the top. A bright blue energy beam or beam weapon is being projected from the side of the station towards the right. In the foreground, a waterfall cascades down a rocky cliff into a river flowing through a valley. The surrounding environment is a mix of rugged mountains and lush green fields under a dark, cloudy sky.

THANK YOU