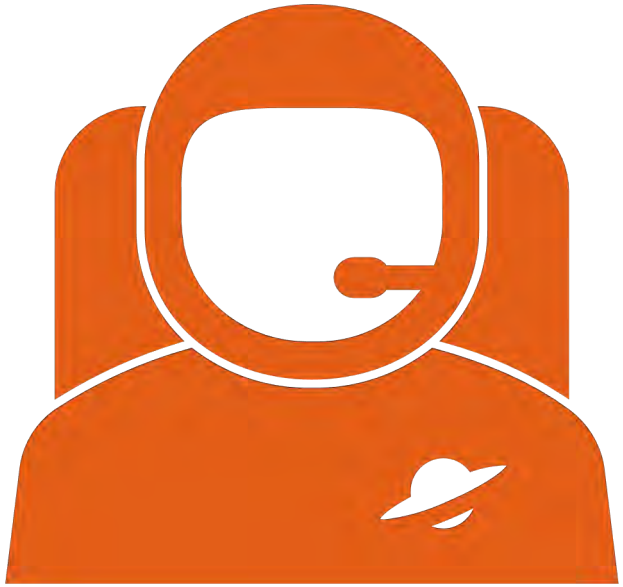


Humans to Mars

Lucinda Offer

Co-Chair Mars Scholar Project

Humans to Mars

- Observers of Mars
- Why Go to Mars
- How to Get to Mars
- What is Mars Direct
- Who will get us to Mars
- Terraforming Mars
- Mars will not be easy

1 > Observers of Mars

Wandering Stars

- Ancient Astronomers noticed some points of light moved
- They called those wandering stars, planets
- Mars has a special kind of movement
- Now understood as apparent retrograde motion it was a mystery for a long time and caused much confusion

Johannes Kepler
1571–1630

Giovanni Schiaparelli
1835–1910

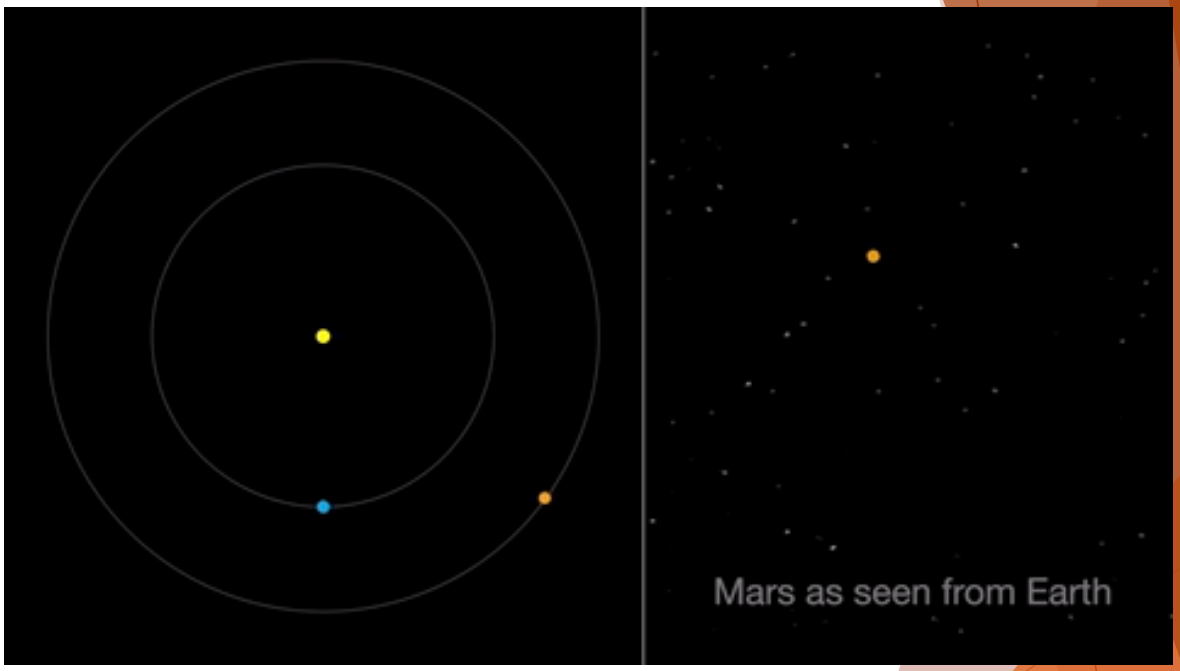
Percival Lowell
1855–1916

1600's

Kepler - Motions of the planets

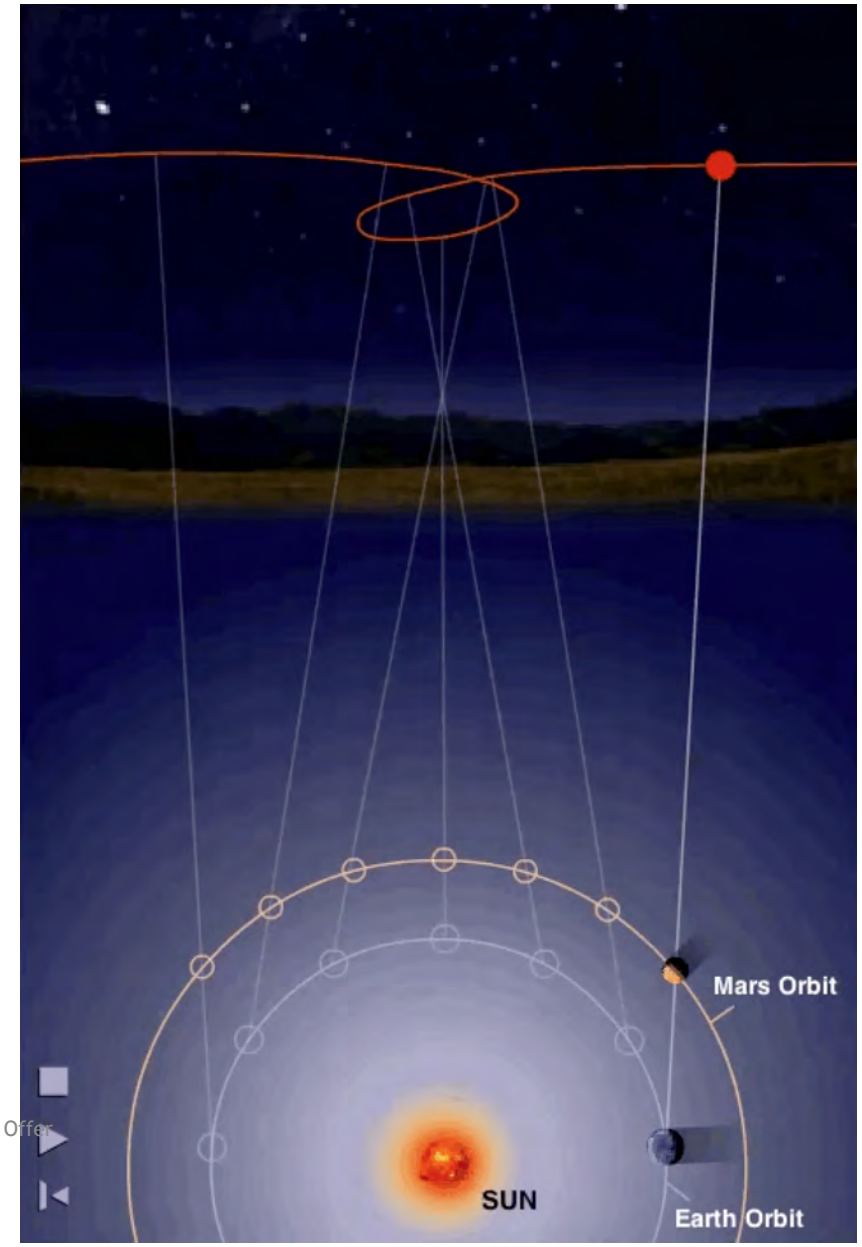
Cassini – 24-hour day

Huygens – Polar ice caps



Johannes Kepler

- Helped solve the problem that provided more evidence for the Copernicus' Heliocentric system
- A nearly blind mathematician, Kepler observed Mars and used trigonometry to notice that its orbit was elliptical and not circular. This was Kepler's first law.
- It solved the problem for Mars' apparent retrograde motion.



Mars only appears to go backwards.

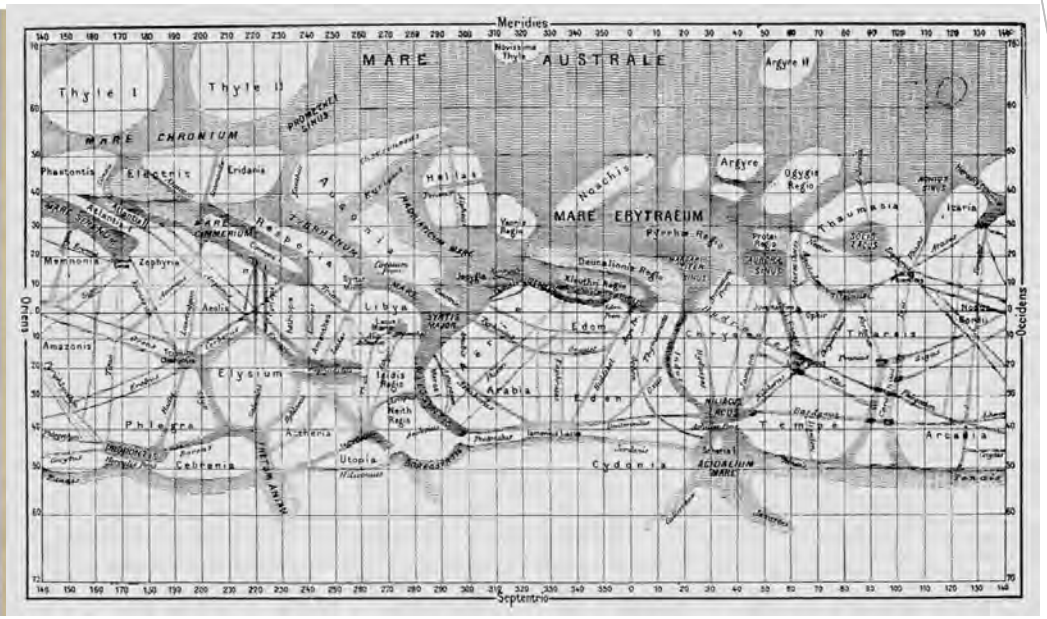
But it is just Earth "lapping" Mars in their orbits around the Sun.

Late 1700-1800's

Herschel – Axis tilt and seasons

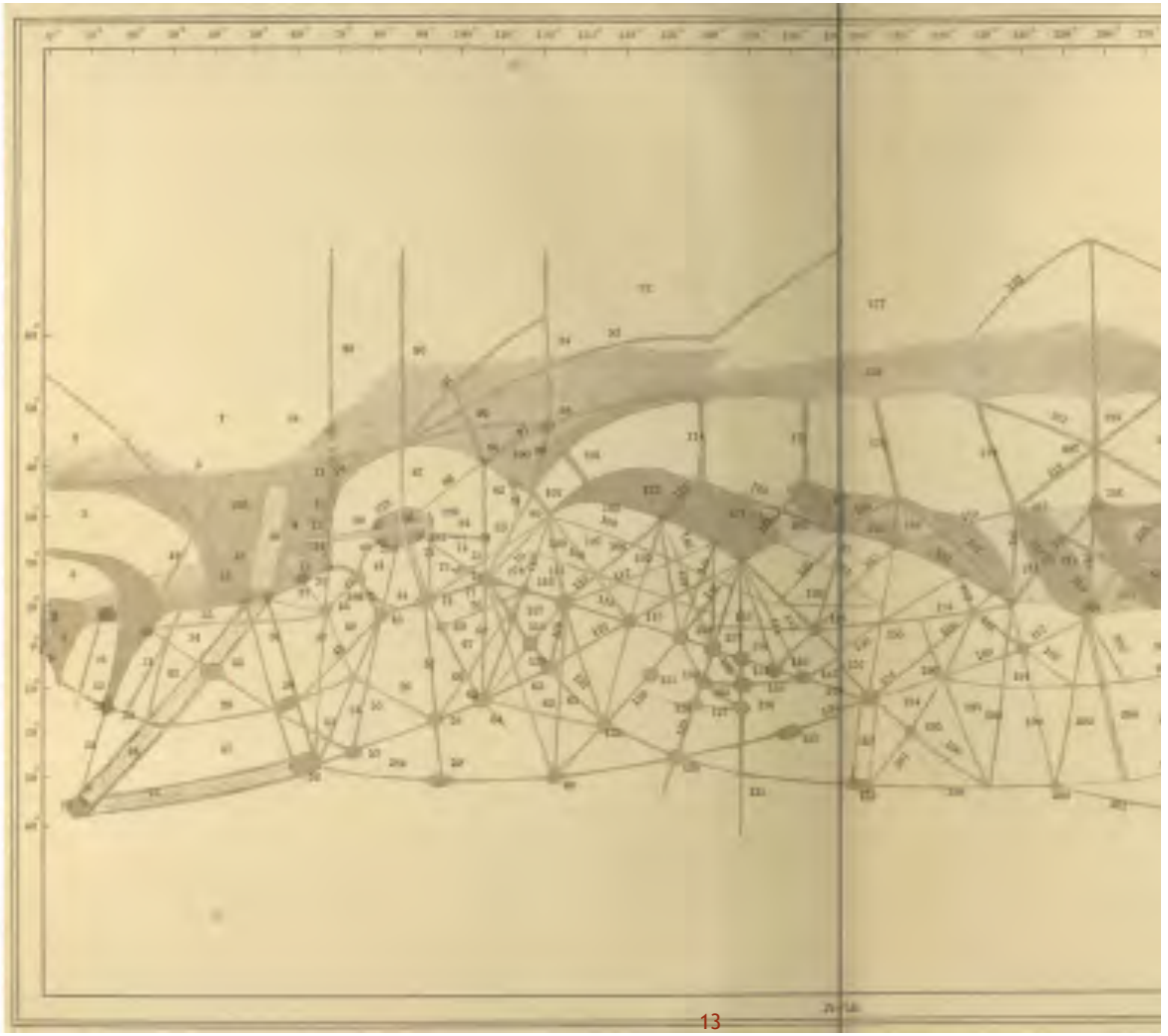
Schiaparelli – Mapping of Mars

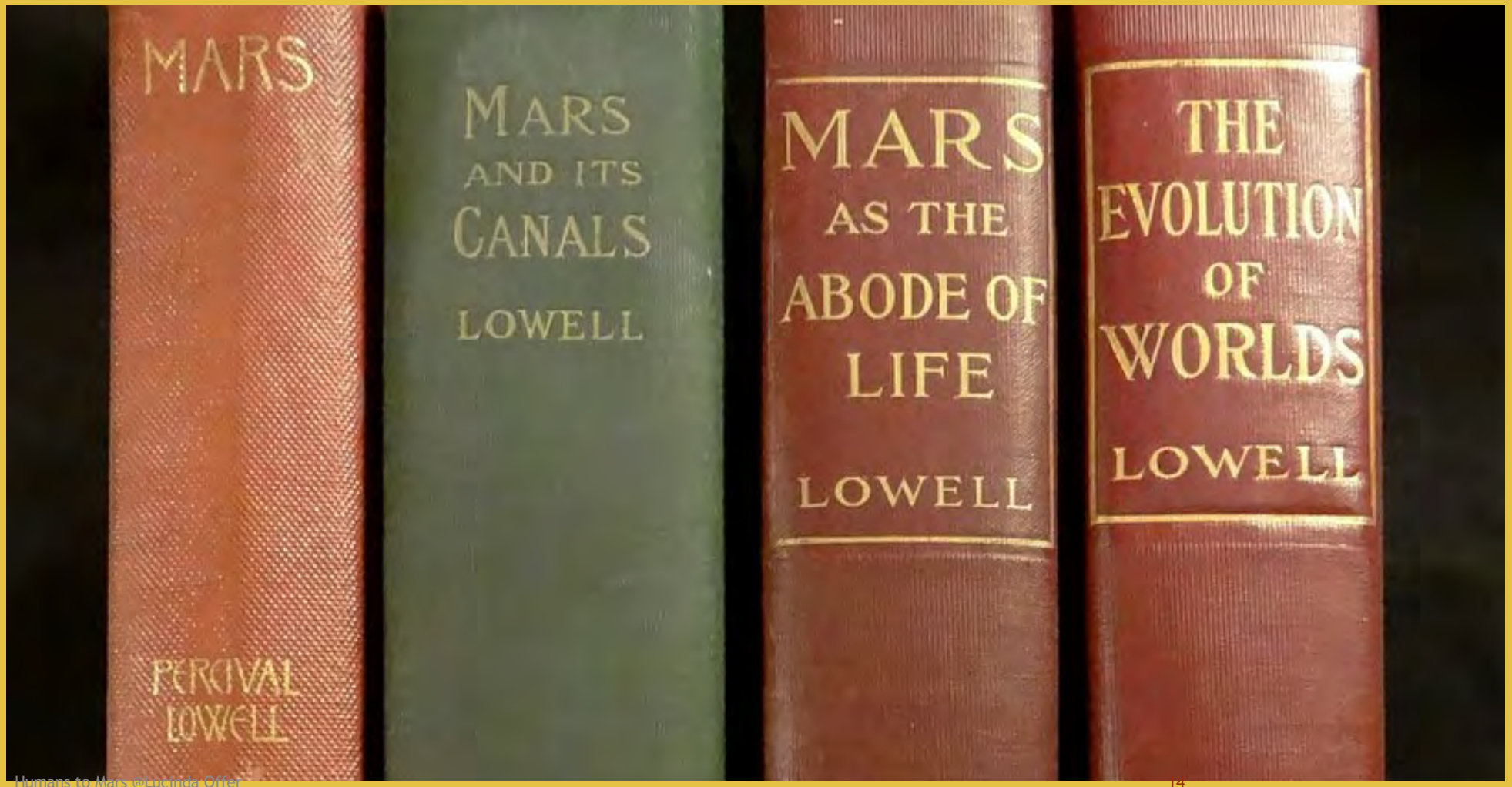
Lowell – Plurality of Worlds



Schiaparelli's map

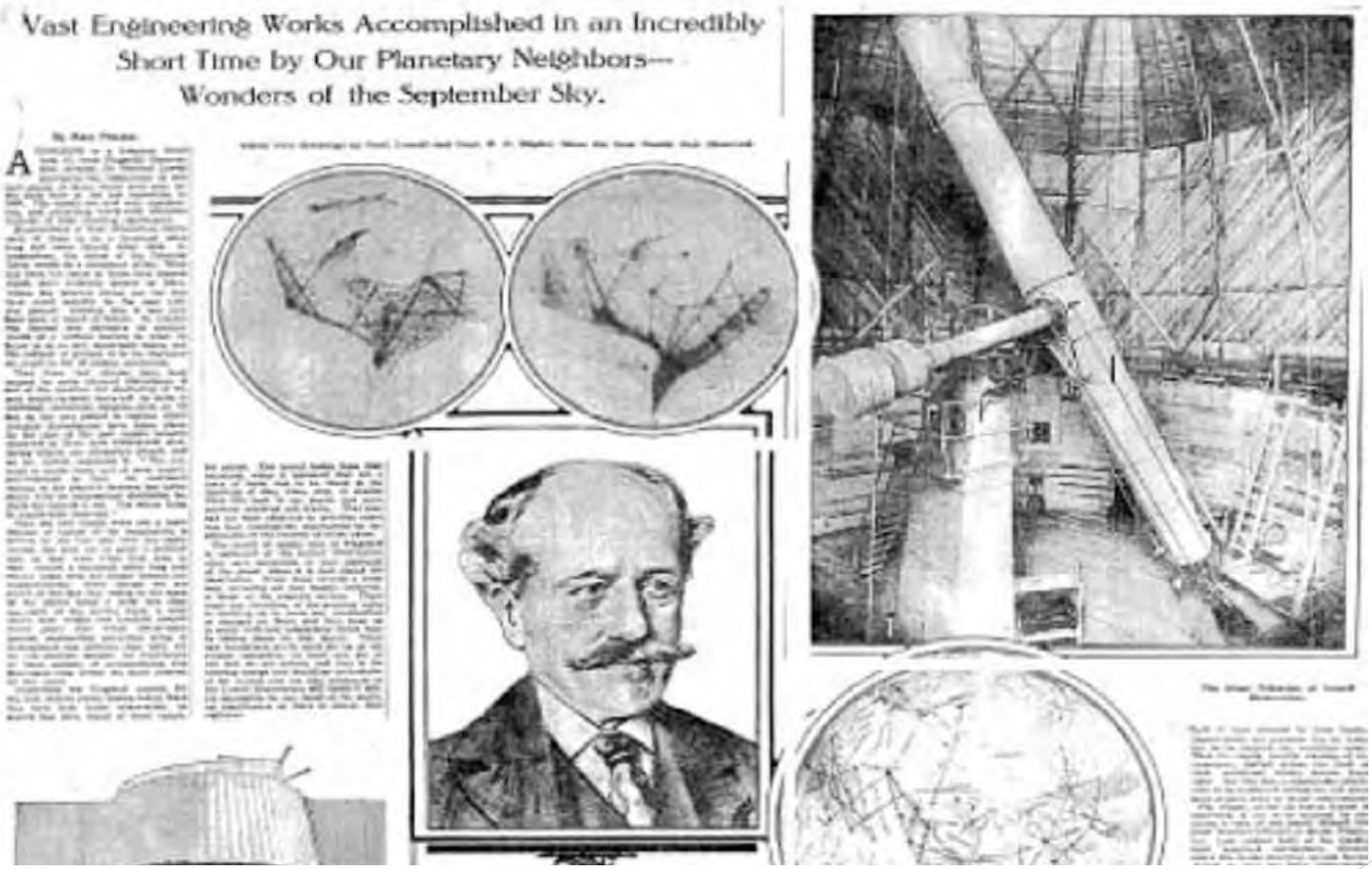
Showing Canali



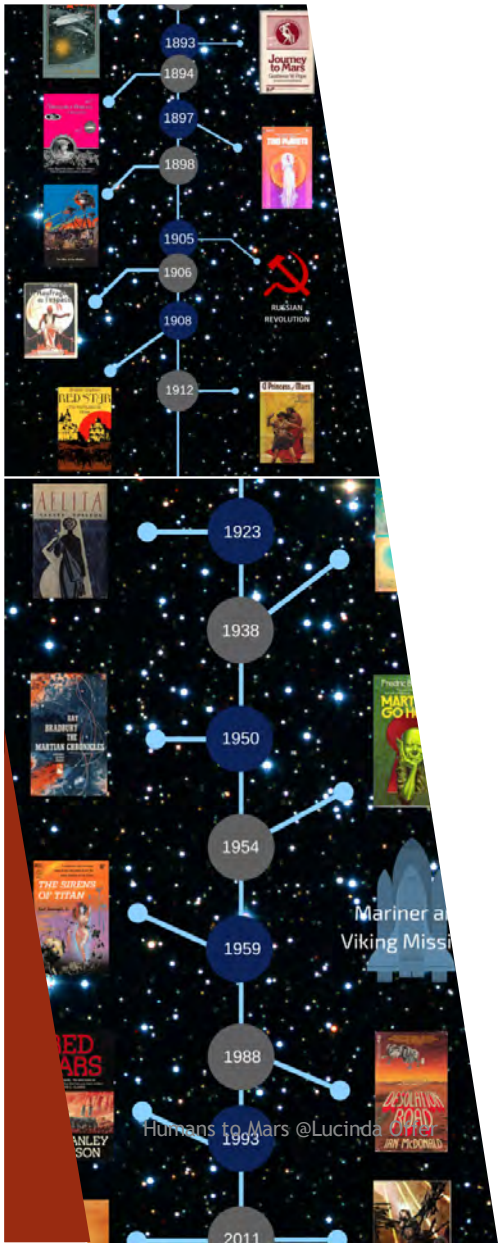

MARS
PERCIVAL LOWELL
MARS AND ITS CANALS
LOWELL
MARS AS THE ABODE OF LIFE
LOWELL
THE EVOLUTION OF WORLDS
LOWELL

MARTIANS BUILD TWO IMMENSE CANALS IN TWO YEARS

Vast Engineering Works Accomplished in an Incredibly Short Time by Our Planetary Neighbors— Wonders of the September Sky.

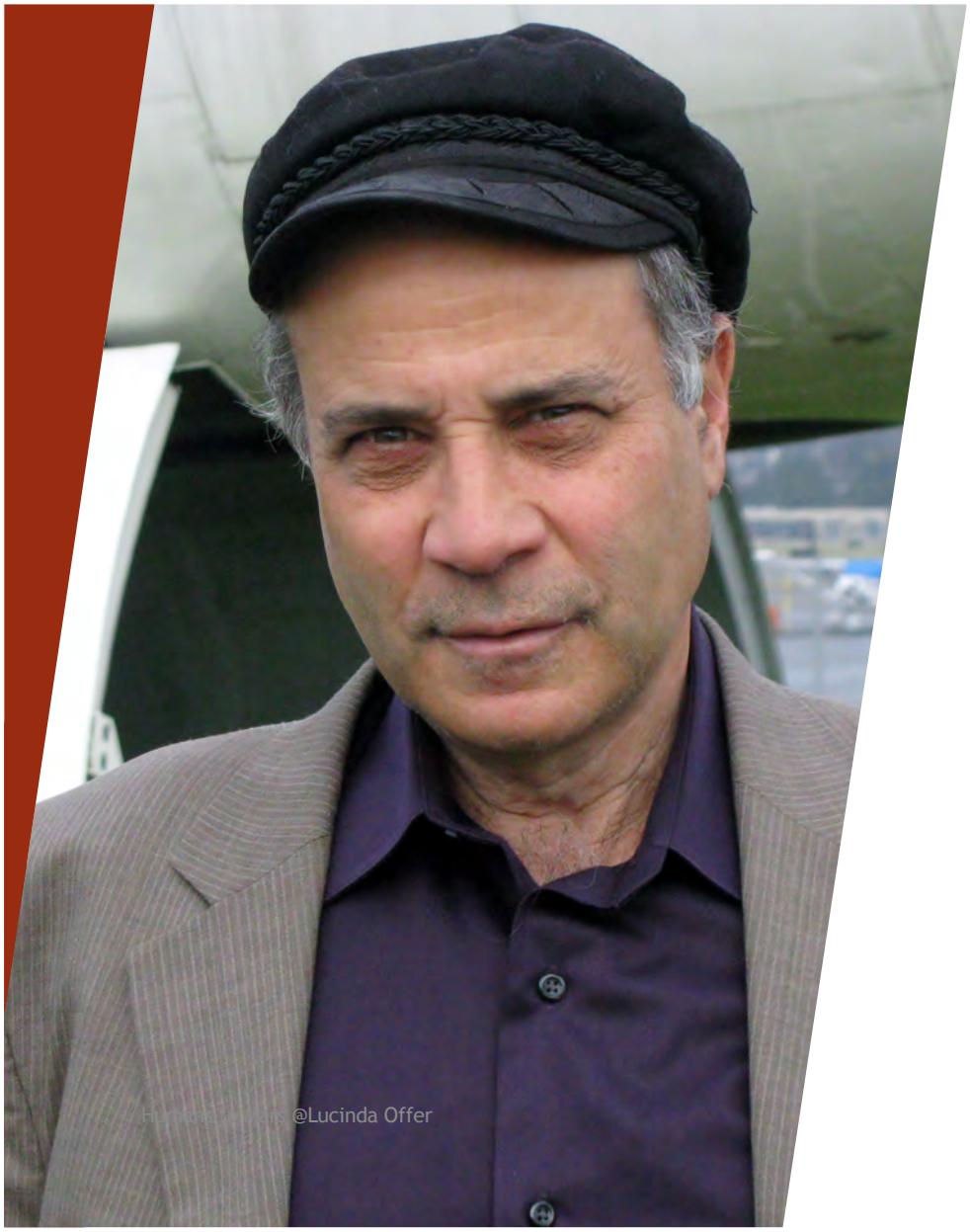


1911



Mars Science Fiction since 1877

- 1877 - Schiaparelli's 'Canali'
- 1880 – Across the Zodiac
- 1893 – Journey to Mars
- 1894 – Unveiling a Parallel
- 1897 – Two Planets
- 1898 – The War of the Worlds
- 1908 – Vampires of Mars
- 1912 – Princess of Mars
- 1923 – Aelita
- 1938 – Out of the Silent Planets
- 1949 – Red Planets
- 1950 – The Martian Chronicles
- 1951 – The Sands of Mars
- 1952 – The Martian Way
- 1954 – Martians Go Home
- 1959 – The Sirens of Titan
- 1988 – Desolation Road
- 1993 – Red Mars
- 2011 – Quantum Thief
- 2011 – The Martian



Scientists, engineers and supporters of Mars

- Johannes Kepler 1571-1630
- Giovanni Schiaparelli 1835-1910
- Percival Lowell 1855-1916
- Werner von Braun 1912-1977
- Carl Sagan 1934-1966
- Chris McKay 1950's -
- Robert Zubrin 1952-
- Elon Musk 1971 -

Break on Through

- Marco Melgrati's 21st Century version of the Flammarion's engraving from 1888
- A metaphorical illustration of man's quest for knowledge. For what lies beyond…

3 > How to Get to Mars

3, 2, 1 Launch!

Leadership

Heavy-lift

In-Situ Resource Utilization (ISRU)

Leadership

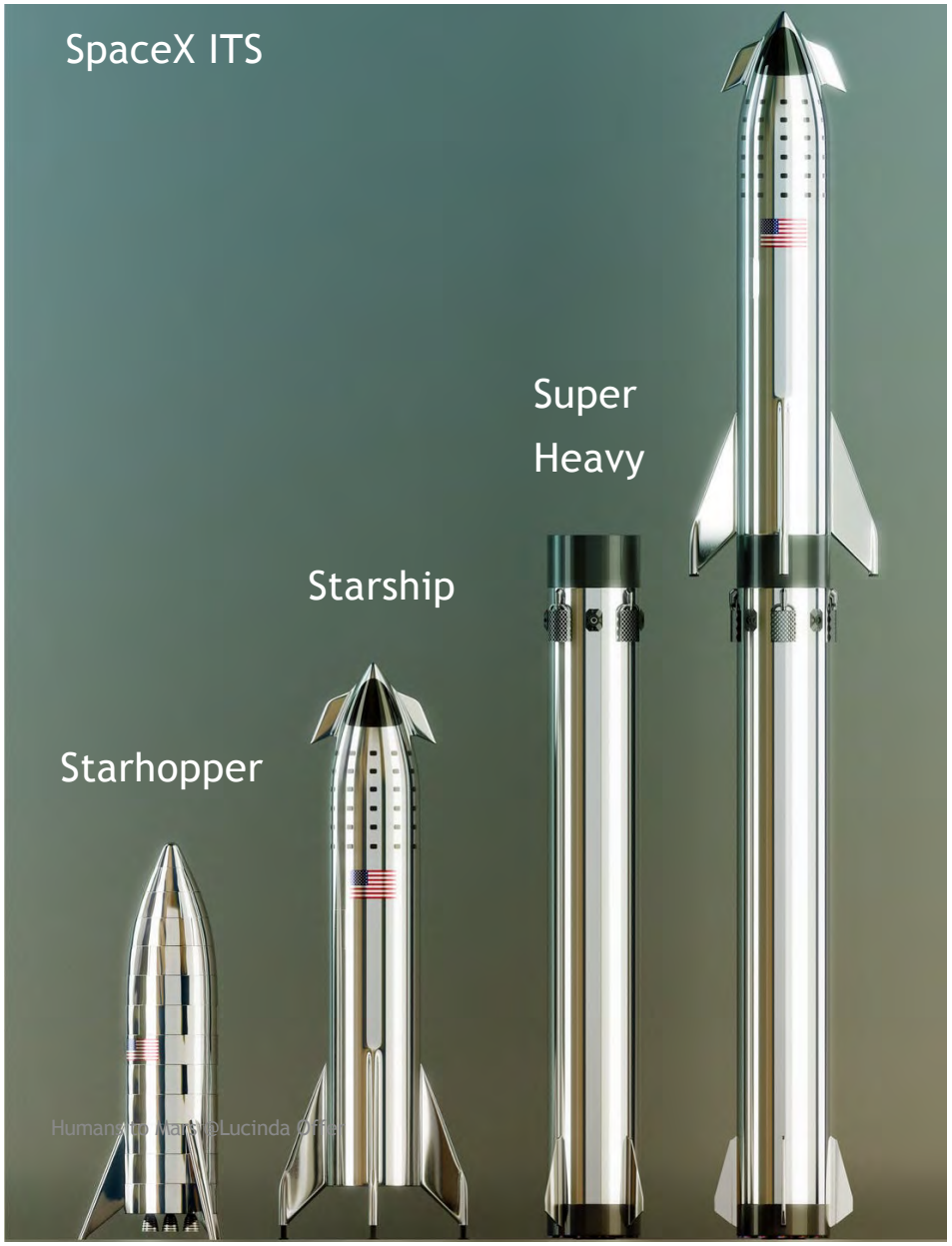
- Historically – a President of a nation announces a space plan and then follows through within his term or their successor continues it.
- The owner of a private company with direct income or from other sources to fund a space program.


PRESIDENT OF THE UNITED
BLUE ORIGIN

Super-heavy lift launcher

- In the 60's and through to the 80's we had Werner von Braun's Saturn V rocket which could lift 140 tons to orbit. No other technology in the world currently exists comparable to the Saturn V.

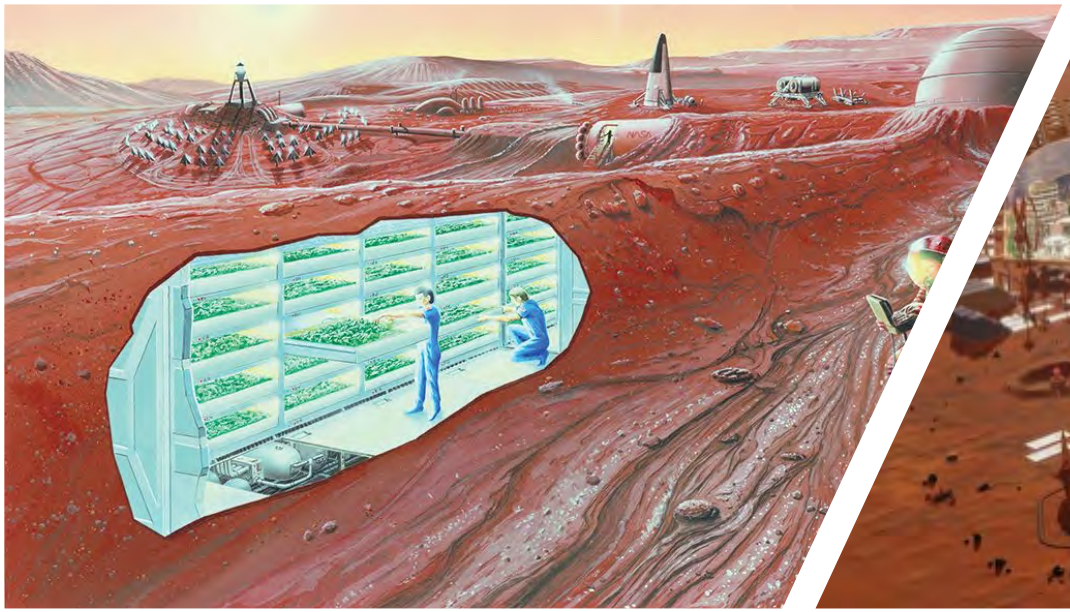
- SpaceX is the only private company to have current plans for a launcher that when built will surpass the current lift ability of the Saturn V two times over. It will be considered a Super-heavy lift launcher – the Interplanetary Transport System (ITS), Starship - and will lift 300 tons to orbit.

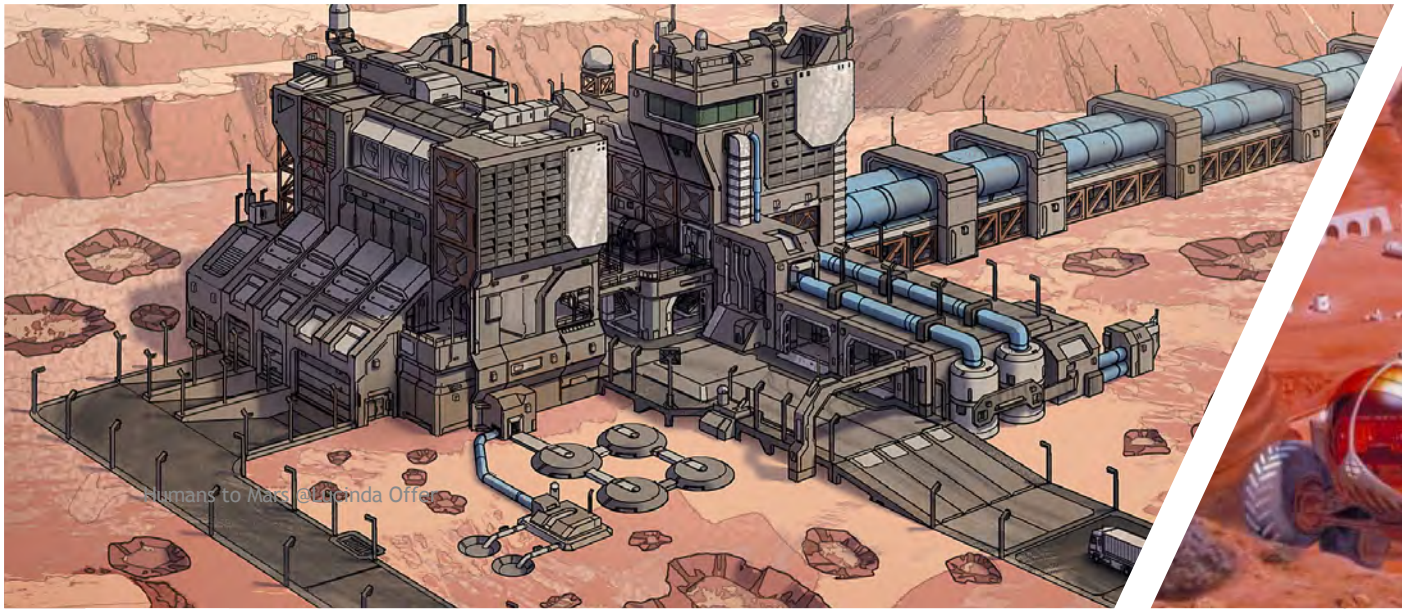

SpaceX ITS
Super
Heavy
Starship
Starhopper

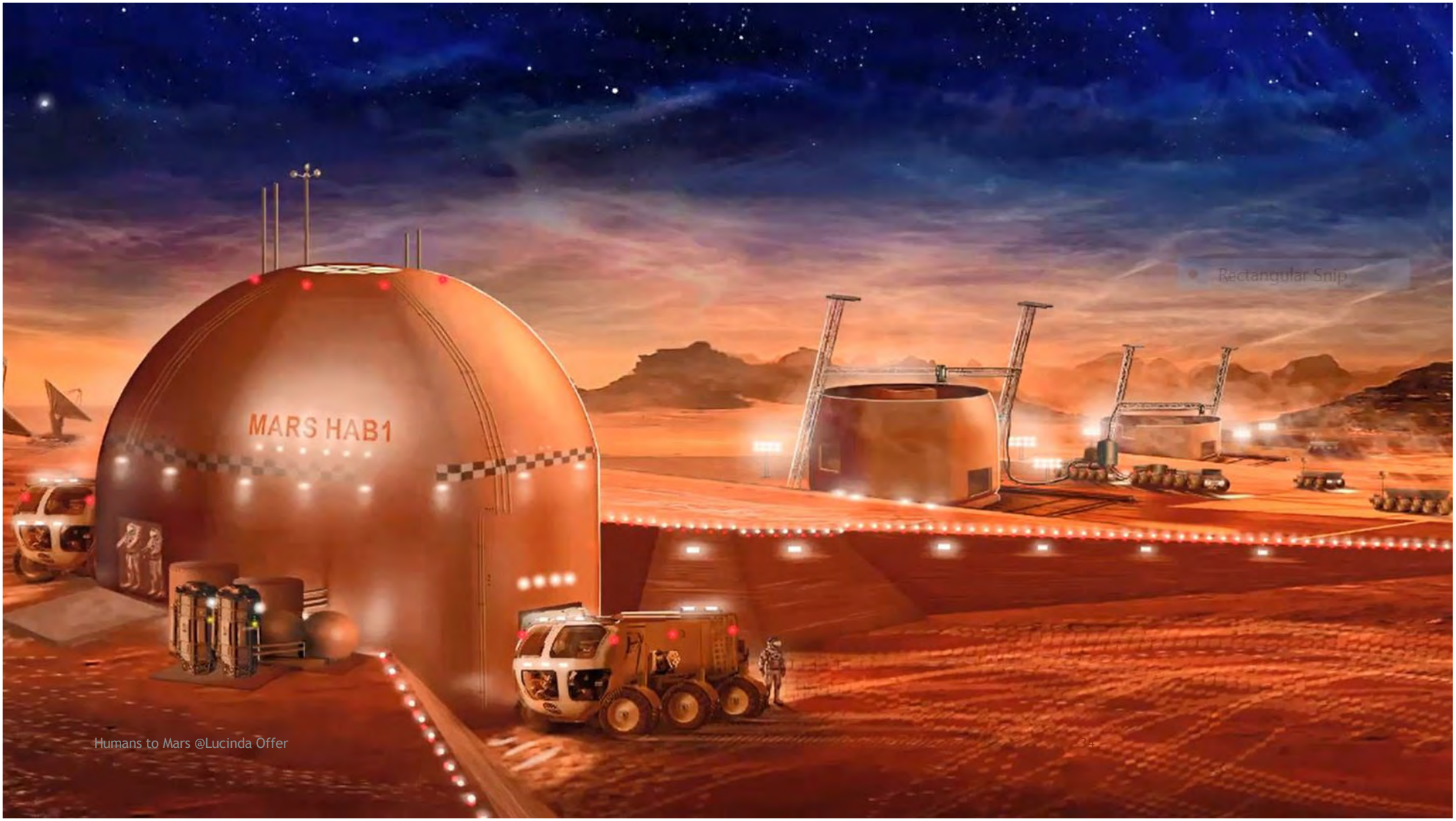
In-Situ Resource Utilization (ISRU)

- In simple terms, ISRU is basically living off the land. Using materials locally to make what you need whether it be hydrogen, oxygen, water, methane, bricks and cement.

- ISRU is what humans have been doing on Earth. How do you think the glass is made or the polymers that make up plastic products like furniture or shopping bags? Everything we have created comes from materials on Earth that we have processed to make a variety of products. Whether it be from mines, quarries, plants, springs or oil and gas.






MARS HAB1
Humans to Mars @Lucinda Offer


BRICK & MORTAR

5> Who Will Get Us to Mars

The First Martians

- Engineers and scientists to lay a good foundation
  - Engineers such as electrical and mechanical
  - Material scientists, chemists, geologists, biologists
- Group dynamics – TEAMS “Teamwork makes the dream work” (Astronaut Scott Kelly)
  - People who can work together and get along
  - People who love exploring
  - Problem solvers
  - Psychologically robust
- Humans follow the rovers
  - Humans will be working with automation
  - Humans will be working with robots

Martians will be able to

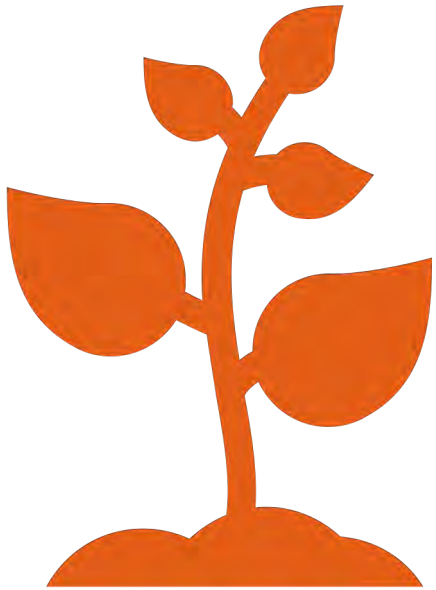
Arrive

Survive

Thrive

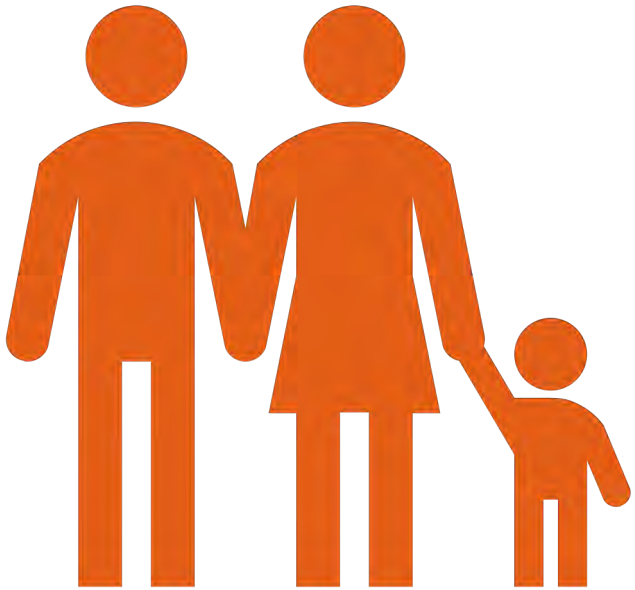
Arrive

- Getting there – how long will it take?
- What will they undergo, be exposed to?
- What will they have with them?
- What will they do when they get there?
- What will be there when they get there?



Survive

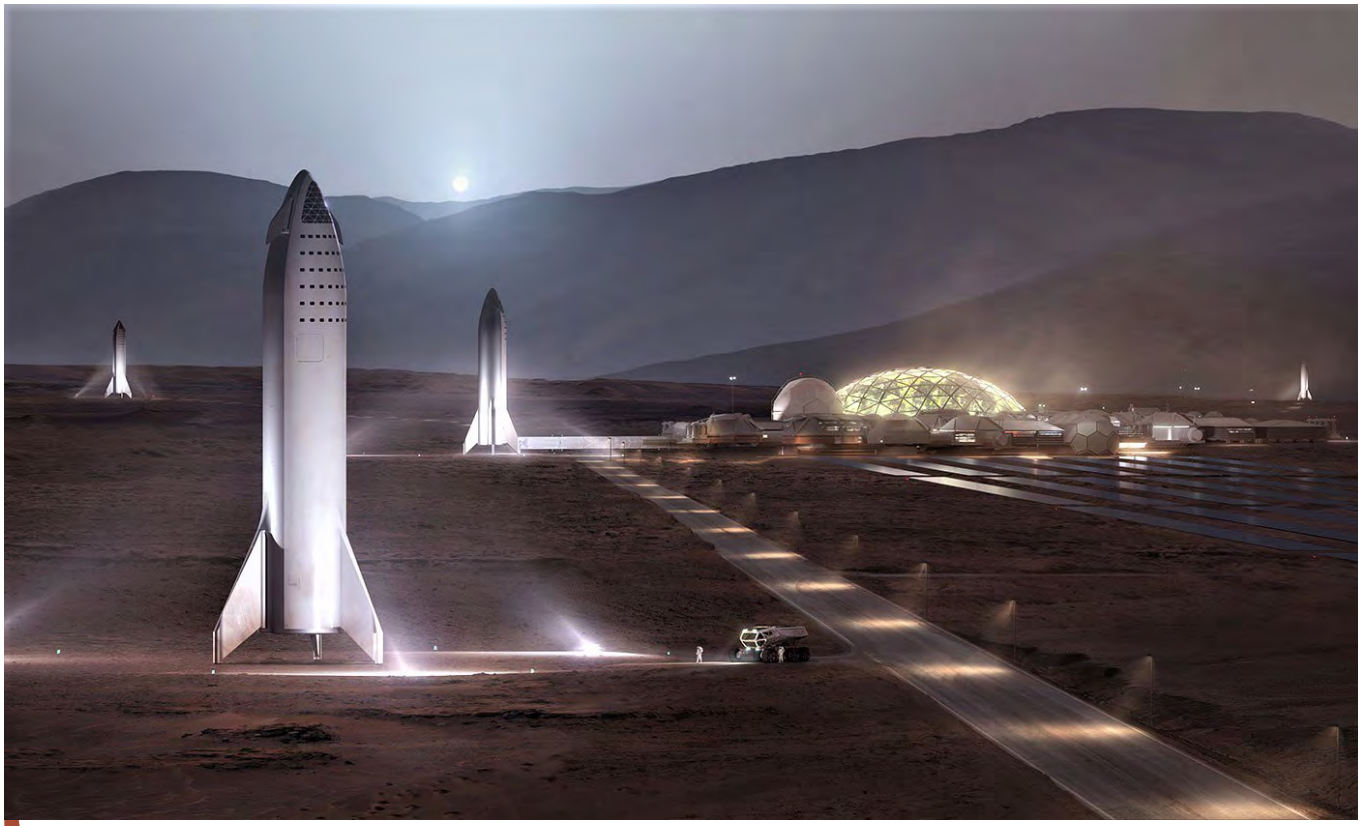
- What are the important things that humans need to survive on an inhospitable planet?
- Become familiar with Maslow's hierarchy of needs?
- Survival Rule of Threes:
  - You can survive three *minutes* without breathable air (unconsciousness generally occurs), or in icy water.
  - You can survive three *hours* in a harsh environment (extreme heat or cold).
  - You can survive three *days* without drinkable water.
  - You can survive three *weeks* without food.



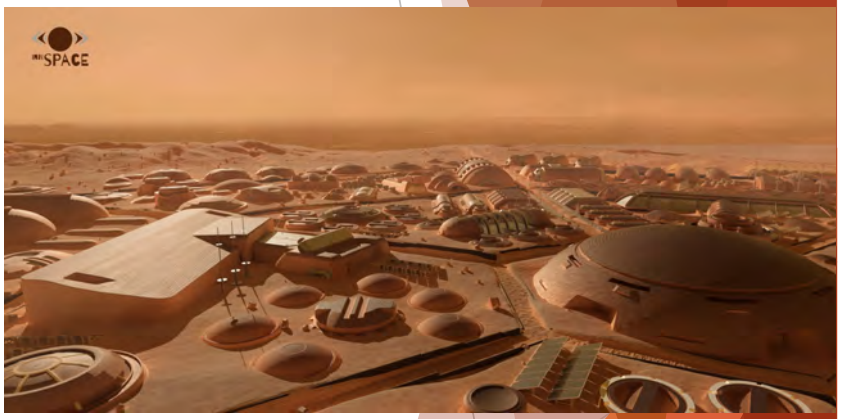
Thrive

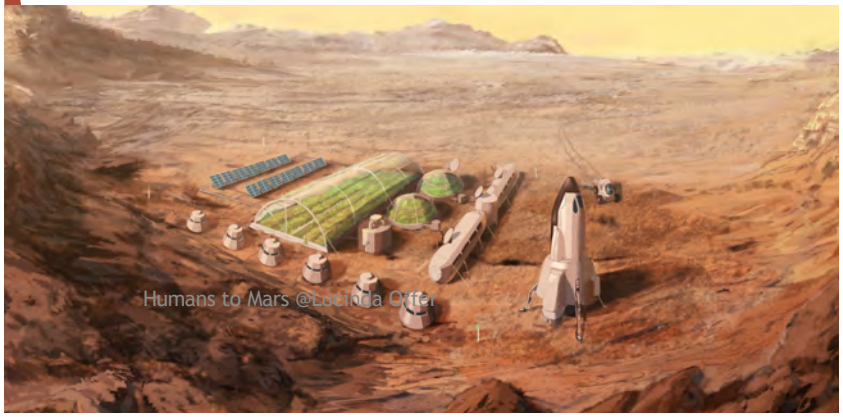
- What will this mean?
  - Reproduction – materials and people
  - Sustainability – quality of life
  - Maintenance – keeping systems going
  - Autonomy – being able to do this without help from Earth

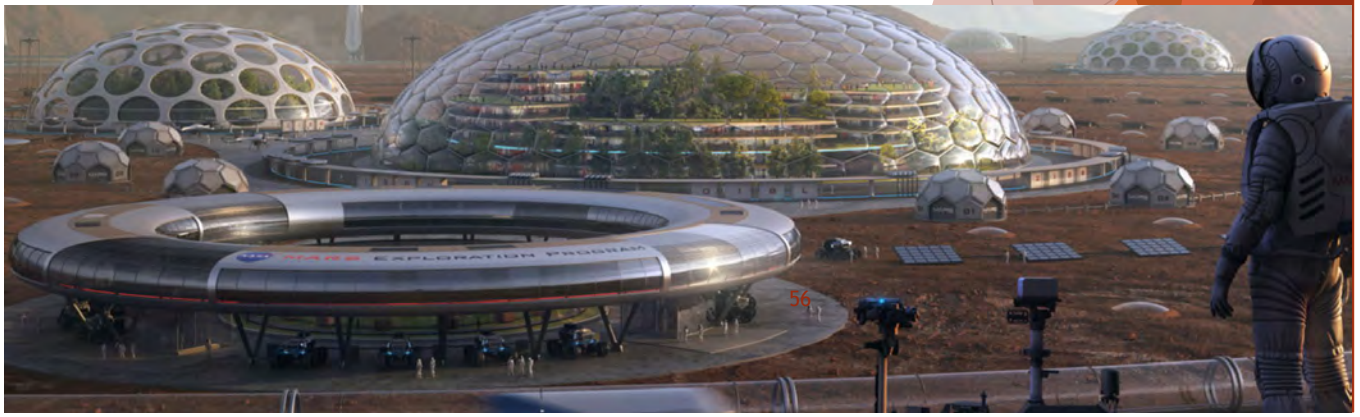
Humans to Mars ©Lucinda Offer




SPACE


SPACE




EXPLORATION PROGRAM