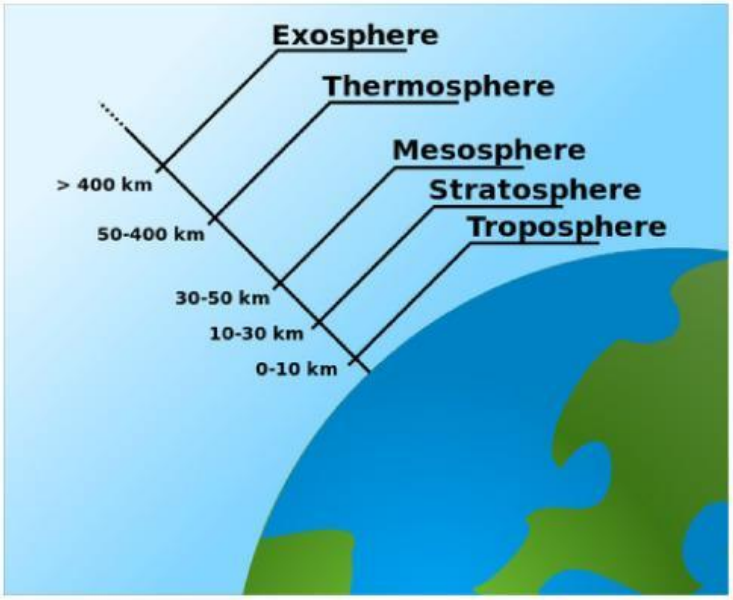
MISSION TO MARS – LIVING ON ANOTHER PLANET

As humanity ventures into the realm of interplanetary exploration, understanding the conditions on celestial bodies becomes paramount. In this chapter, we delve into the comparative analysis of living conditions on Mars, Earth, and Venus. Each planet presents a unique set of challenges and opportunities for potential habitation.

ATMOSPHERE

Earth

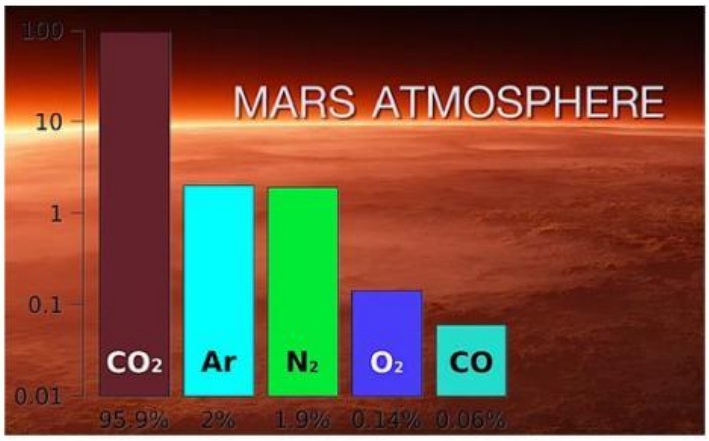
Earth's atmosphere predominantly consists of **nitrogen** (78%) and **oxygen** (21%). Trace amounts of other gases, including carbon dioxide, water vapor, and noble gases, are also present. This composition supports life as we know it, with the availability of breathable air for humans and other organisms.



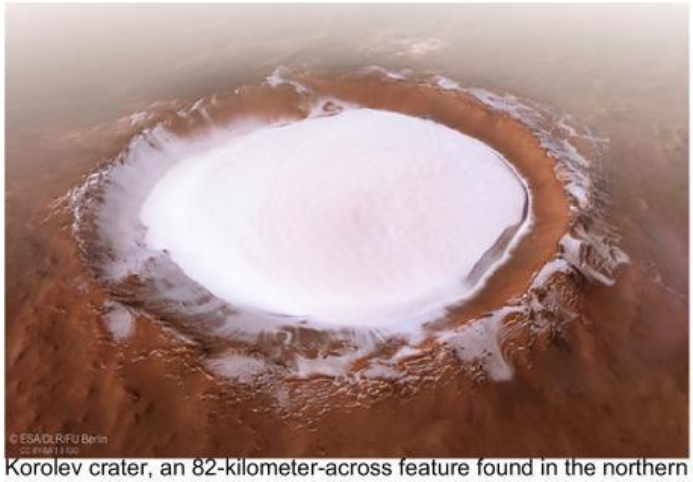
Mars

Mars has a **thin atmosphere** composed mostly of carbon dioxide (95.3%), with only traces of oxygen (0.13%). The low atmospheric pressure on Mars poses challenges for human habitation, as it requires artificial life support systems to provide breathable air.

Water exists on Mars but the atmosphere is too thin for it to last long on the surface in a liquid state. Instead, water on Mars is found below the surface of the polar regions as water-ice and also as seasonal briny water flows down hillsides and crater walls.



Key to gases	
CO_2	Carbon Dioxide
Ar	Argon
N_2	Nitrogen
O_2	Oxygen
CO	Carbon Monoxide



Korolev crater, an 82-kilometer-across feature found in the northern lowlands of Mars. (ESA/DLR/FU Berlin, CC BY-SA 3.0 IGO.)

LIVING ON ANOTHER PLANET

Venus

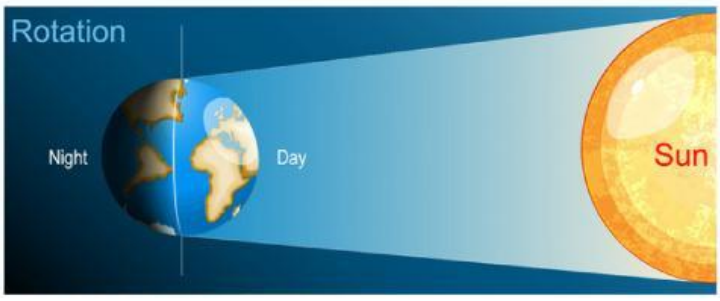
Venus has a **dense atmosphere** consisting mainly of **carbon dioxide** (96.5%) and **nitrogen** (3.5%), with trace amounts of other gases. The **atmospheric pressure** on Venus is approximately 92 times that of Earth, creating an inhospitable environment for human life. Additionally, Venus's atmosphere traps heat, leading to extreme surface temperatures.

A look at a planet where the skies boil and the clouds rain acid

DAY/NIGHT CYCLE

Earth

Earth experiences a roughly 24-hour day-night cycle due to its rotation on its axis. This cycle influences various biological and environmental processes, including temperature regulation and the sleep-wake cycle of organisms.



Mars

Mars has a day-night cycle similar to Earth, with a slightly longer day duration of approximately 24 hours and 39 minutes. Martian rovers and landers have observed sunrise and sunset phenomena similar to those on Earth, albeit with distinct variations in color and intensity due to atmospheric differences.

Venus

Venus rotates very slowly on its axis, taking about 243 Earth days to complete one rotation. Moreover, Venus's rotation is retrograde, meaning it spins in the opposite direction to most other planets. As a result, a day on Venus lasts longer than a year, complicating potential habitation efforts.

CLIMATE AND WEATHER

Earth

Earth exhibits diverse climates and weather patterns due to factors such as latitude, elevation, proximity to water bodies, and atmospheric circulation patterns. Average temperatures vary widely across different regions, ranging from polar cold to tropical heat.

Mars

Mars has a **cold** and **arid climate**, with average surface temperatures around -80 degrees Fahrenheit (-62 degrees Celsius). Temperature fluctuations between day and night can be significant, with daytime temperatures reaching around 70 degrees Fahrenheit (20 degrees Celsius) near the equator and plummeting to -100 degrees Fahrenheit (-73 degrees Celsius) at night.

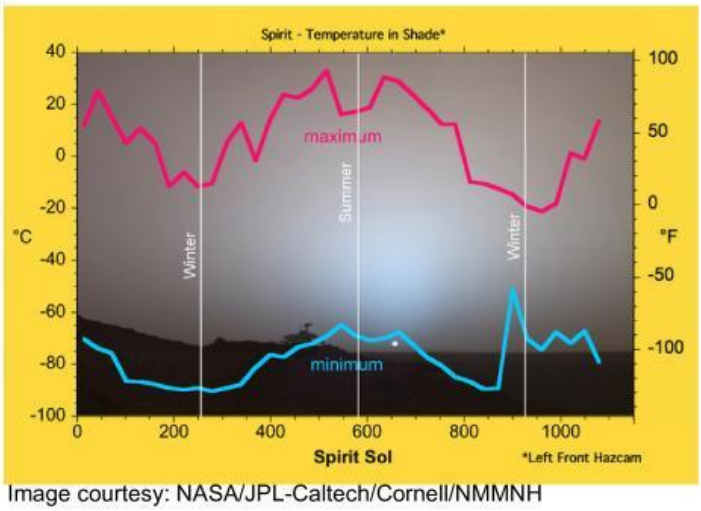


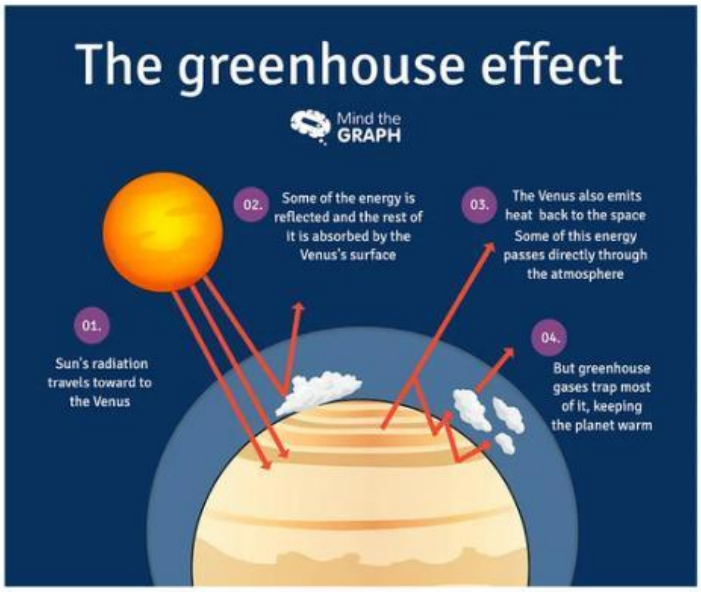
Image courtesy: NASA/JPL-Caltech/Cornell/NMMNH

LIVING ON ANOTHER PLANET

CLIMATE AND WEATHER

Venus

Venus experiences an extreme greenhouse effect, resulting in surface temperatures averaging around 870 degrees Fahrenheit (465 degrees Celsius), making it the hottest planet in the solar system. The thick clouds of sulfuric acid in Venus's atmosphere contribute to its scorching surface temperatures.



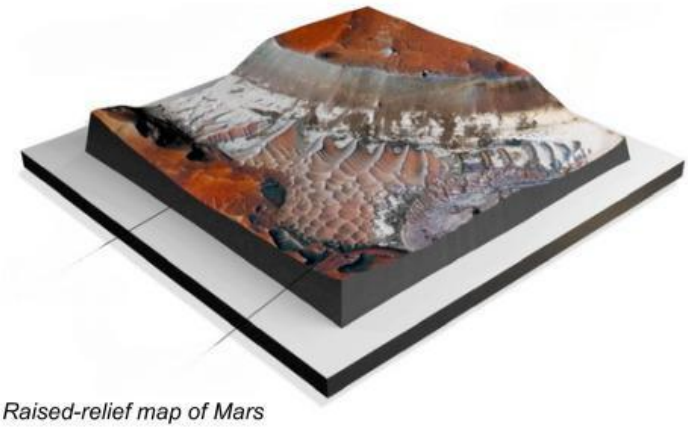
The **greenhouse effect** is a natural process that occurs when certain gases in a planet's atmosphere trap heat from the sun, preventing it from escaping back into space.

DID YOU KNOW?

California State Three Dimensional 3D Raised Relief Map

Mars

Mars's surface is characterized by **rugged** terrain, including **mountains**, **valleys**, and vast **plains**. Surface exploration missions have identified potential landing sites with relatively **flat** terrain for spacecraft and rovers. Challenges such as dust storms, rocky terrain, and steep slopes must be considered for mobility and habitat construction.



Raised-relief map of Mars

THE SURFACE

Eearth

Earth's surface features **diverse geology**, including **mountains**, **plains**, **deserts**, **oceans**, and **polar ice caps**. Accessibility and habitability vary across different regions, but the planet's diverse **ecosystems** support a wide range of life forms.

Venus

Venus's surface is predominantly composed of **volcanic plains**, with vast stretches of basaltic rock and numerous impact **craters**. The **extreme temperature and pressure conditions**, along with corrosive atmospheric gases, pose significant challenges for landing and surface operations.