



MISSION TO MARS

Susan Altounyan

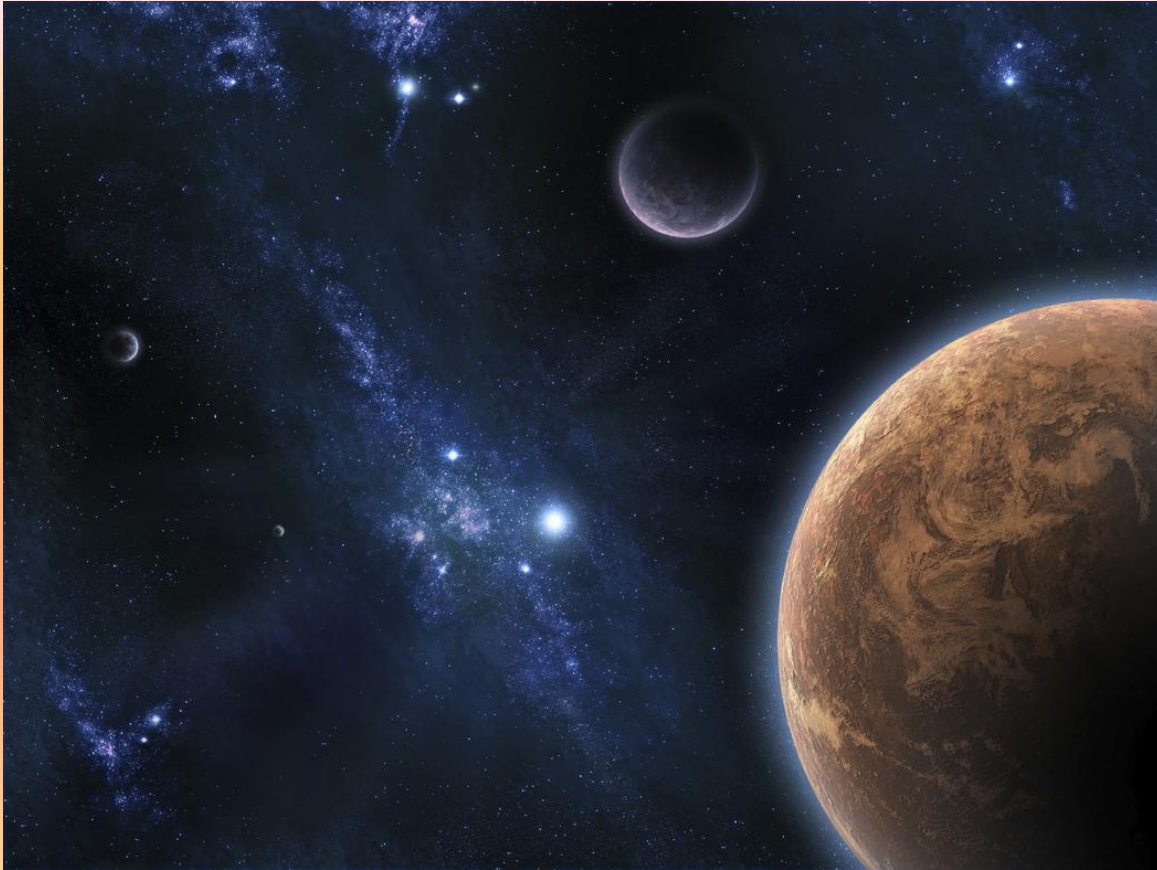
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DEATH OF A WATERY WORLD

- *With its next lander, NASA plans to discover why Mars changed*
- *What turned Mars from a warm, wet place to the cold, arid planet we see today.*
- *Long ago, the Red Planet was very different from the frozen, barren desert we have seen on our TV screens courtesy of Pathfinder.*





**Image of Mars
from Clipart**



HOW IT WAS

- The winding river valleys, shorelines and flood plains formed in those early times are clearly visible from space: proof that liquid water once flowed on Mars.
- It must have been warmer, too.
- The planet's atmosphere must have been thicker to trap heat from the Sun and create enough pressure to prevent water from boiling away.



SO WHAT WENT WRONG?

- *Why did the Martian atmosphere vanish and what happened to the water that once flowed across its surface?*
- *Did the planet die from natural causes, or was it a case of suicide, or even murder?*
- *Scientists hope to get some answers from the Mars Global Surveyor spacecraft, which entered orbit around Mars recently.*




MARS SURVEY

- *The Mars Volatiles and Climate Surveyor (MVACS)--will be launched in January.*
- *It will land at the edge of the southern polar cap of Mars and study the climate, the soil and atmosphere.*
- *There are three main theories and together they read like the plot of a detective novel.*



MURDER ON MARS

- *The first possibility is that Mars was murdered.*
 - *The surface of Mars is scarred with craters from collisions with comets and asteroids.*
 - *The blast from such impacts can blow away the atmosphere above the crater.*
 - *And with enough large impacts, a substantial fraction of the atmosphere could be eroded.*
 - *It would have been a slow, drawn-out death by suffocation.*
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SUCKED AWAY

- *Another possibility is suicide.*
- *Mars would have needed a thick atmosphere of a greenhouse gas like carbon dioxide to keep it warm enough for liquid water to flow over its surface*
- *Much of its CO₂ may have reacted with Martian silicate rocks to form chemicals called carbonates.*
- *So the atmosphere would gradually have been sucked into the surface of the planet.*



NATURAL CAUSES

- *The final possibility is that the Red Planet died of natural causes.*
- *Mars has an orbit that is more eccentric than the Earth's, and the axis of the planet may also have tilted sharply in the past so that winters were very severe.*
- *Mars may be in an ice age in which its CO₂ atmosphere has condensed to form permafrost at the poles or beneath the surface.*



WHAT HAPPENED TO THE AIR?

- *Martian ice ages may be self-perpetuating.*
- *A thinner atmosphere would be less effective at transporting heat from the equator to the poles.*
- *Because of this, the poles would stay cold, keeping the CO₂ locked up even when a change in the planet's eccentricity and tilt made the winters less severe.*
- *This may have locked Mars into a permanent ice age.*

