



a green concern  
**Greenenergy**

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# FROM EDITOR'S DESK



**You want to wake up in the morning and think the future is going to be great and that's what being space faring civilization is all about, It's about believing in the future and thinking that the future will be better than the past and I think of anything more exciting than going out there and being among the stars." ELON MUSK**

**This is what I too have it in mind when my son MOHIT mentioned then from BARCELONA that they had a presentation in the university "DWELLINGS on THE MARS" by FOSTERS, one of the best firms of the ARCHITECTURAL PROFFESION. Really seems to be the Great and Green idea. Need to give a strong thought on this unique idea.**

**NOW when this pandemic has showing its effects on the human beings in large way and everyone searching OXYGEN, I just thought that people will run away to the other planets. Received a mail stating that you could be one of the crew for the MARS mission by a Japanese industrialist. Lot many these rumors were there and once the second wave started, suddenly all of them stopped. All trying to tell and emphasis on the NATURE Conservation, TREE plantation and so on. Really strange but the fact of the life. When Nature tried explaining and trying to talk to you, you were happy to destroy it.**

**The human tendency to get more and more comfort seems to be increasing and thus finding every day a new solution. It needs to be nurtured or not, I really don't understand but as usual, GREENERGY wants to give it a BIG GREEN THOUGHT and the needed platform.**

**- Ar. Pramod Chaugule**

A vibrant space scene featuring a colorful nebula with shades of blue, purple, and green. Several planets are visible: a red and orange striped planet in the top left, a blue planet in the top right, a large blue and green planet in the middle right, and a blue planet in the bottom center. The background is filled with numerous stars of various colors and sizes.

*HUMANS – A MULTI-PLANETARY  
SPECIES?*

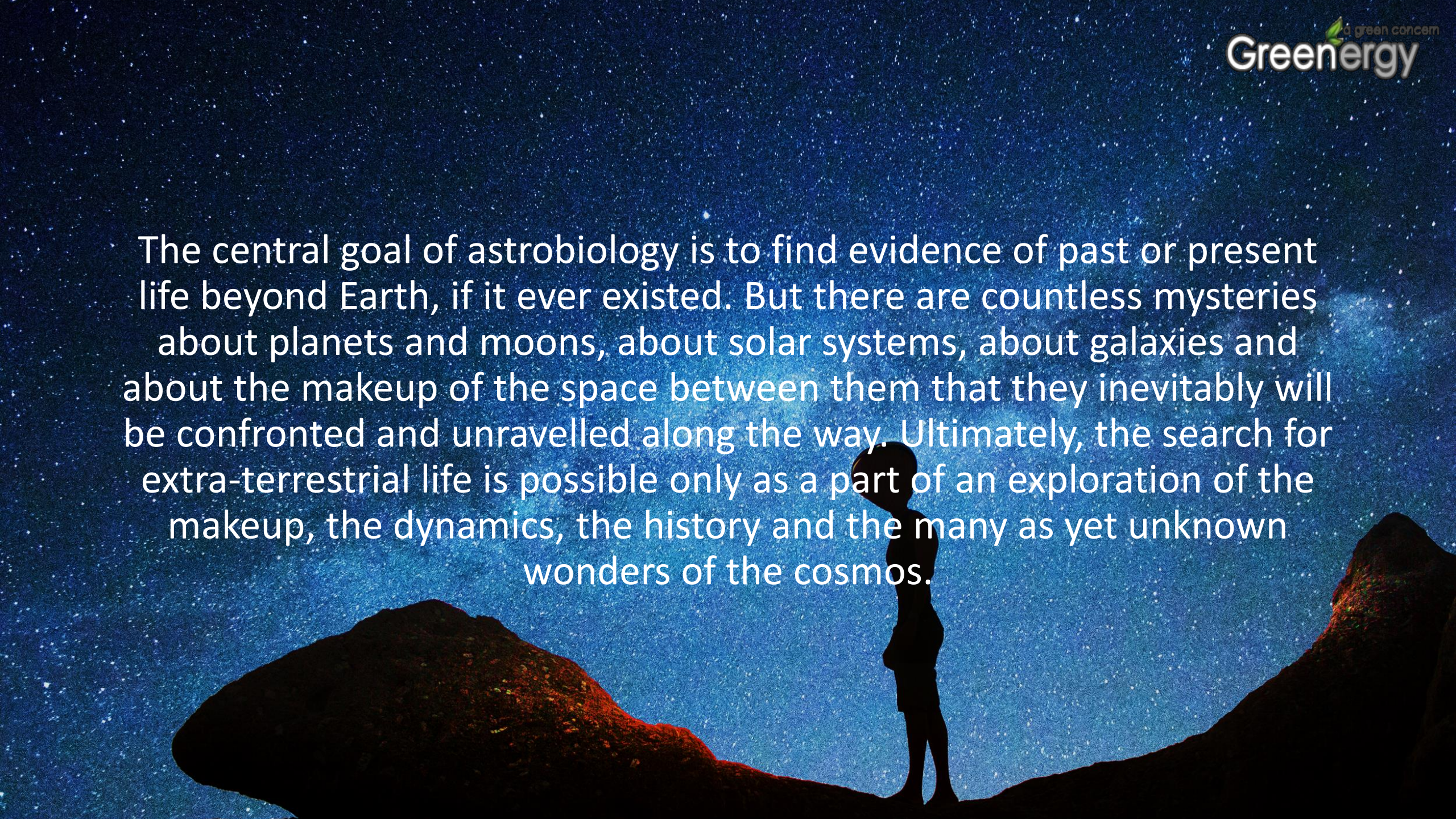
# LIFE BEYOND EARTH

If we ask people around us what they think about existence of life beyond Earth, we may get mixed responses. Some may totally deny their existence while some people might be so curious about it that they might be thinking of pursuing career in this field. But whatever is the case, each one of us has wondered about this exact thing at some or the other point in our life. We've all been there, we've all been curious.

Various movies too have represented extra-terrestrial life, well, either positively or negatively, as their plotline demands. But this has led to mixed reaction among people who believe in existence of life beyond Earth, though we've not yet found life on other planets and moons nor is there evidence of aliens visiting our planet. Its regular presence is just fictional. But it does not mean the universe is lifeless.

Astrobiology is a branch which studies the origin, evolution and distribution of life in the universe. Although no clear signs of extra-terrestrial life have ever been found, the scientific logic supporting presence of extra-terrestrial life has grown increasingly plausible. By understanding life on Earth, how it began here and more about chemical makeup of the cosmos and by checking for habitability on Mars, Titan (Saturn's Moon) through various missions, a body of science has been assembled to analyze the origins.

Astrobiology research is being done on such a scale now because the scientists think that the time has come. They are diving into origin-of-Earth and life-beyond-Earth issues. They are developing various exciting and cutting edge work in this field. We must also understand that identifying and finding extraterrestrial life and understanding origin of life on Earth are inseparable issues and research are done on some similar lines for both of these issues.



The central goal of astrobiology is to find evidence of past or present life beyond Earth, if it ever existed. But there are countless mysteries about planets and moons, about solar systems, about galaxies and about the makeup of the space between them that they inevitably will be confronted and unravelled along the way. Ultimately, the search for extra-terrestrial life is possible only as a part of an exploration of the makeup, the dynamics, the history and the many as yet unknown wonders of the cosmos.

# ASTROBIOLOGY AND NASA

Not long after NASA was established in 1958, the agency began a broad-based effort to learn how to look for the presence – both ancient and current – life beyond Earth.

The connection between space exploration and astrobiology (then called exobiology) was highlighted and given early legitimacy by molecular biologist-turned - exobiologist Joshua Lederberg. Even before NASA was formally established, he was reaching out to colleagues about the possibilities of finding life beyond Earth. He won the Nobel Prize (at age 33, for discoveries about the genetics of bacteria) the same year NASA was founded. By 1960 he was writing in the journal *Science* that: “Exobiology is no more fantastic than the realization of space travel itself, and we have a grave responsibility to explore its implications for science and for human welfare with our best scientific insights and knowledge.”

While the 1960s were defined within NASA primarily by the efforts to land humans on the Moon, all during that period the agency was also supporting a robust effort to prepare for a mission to Mars. Its core goal: To search for signatures of life beyond Earth.

While orbiters, landers, and rovers returned to Mars in the 1990s and 2000s, it wasn't until the 2012 landing of Curiosity that another astrobiology (though not life detection) mission began. Fortunately, a great deal had been learned in the intervening years. Previously unknown microbial communities were discovered on Earth that survive – thrive, even – in what were previously considered dead, uninhabitable environments.

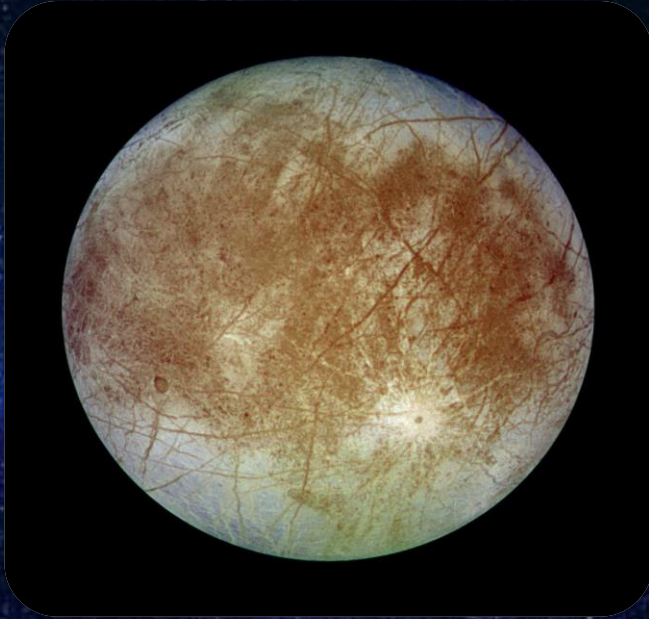
That discovery led researchers to extreme environments around the world, where they found microbes living in bitter cold, in highly acidic and salty water, in the rock of goldmines dug miles underground, in the atmosphere high above ground, and in surroundings with high levels of radioactivity. This explosion of often NASA-sponsored research told scientists a great deal about life on Earth, but it also quite clearly suggested that life can exist beyond Earth in conditions long deemed unsurvivable – such as the frozen-over oceans of Jupiter's moon Europa. Results from the field of “astrochemistry” have told scientists that the ingredients presumed to be needed for life are actually falling on planets, moons, and asteroids everywhere.



Guided by the mantra “follow the water,” NASA missions in our solar system have discovered a surprising variety of astrobiology targets. First came Jupiter’s moon Europa, with an ocean beneath its icy crust. On-going research suggests that the water is salty, a brine with apparent parallels to our oceans. And most recently plumes of that water may have been detected leaking from the moon – similar in some ways to those spurting out of Saturn’s moon Enceladus.

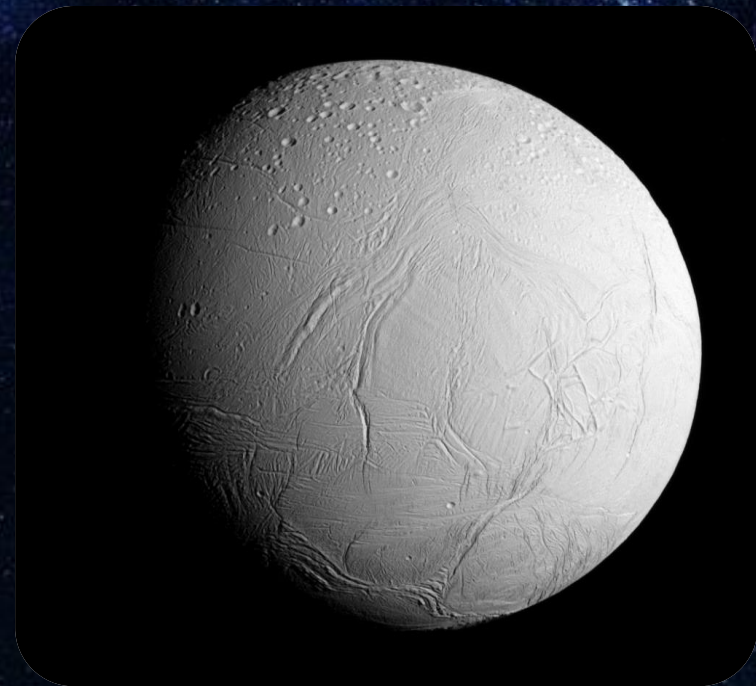
The water story on Mars has been especially promising, with the identification of deep river channels, valley systems, alluvial fans, and, more recently, lakes and suggestions of a once-grand northern ocean. The dwarf planet Ceres and Jupiter’s moon Ganymede now also appear to hold inner oceans, and the possibilities for finding more water worlds seem endless.

As the estimated number of exoplanets has grown into the many billions, the possibility that some are home to living organisms has become more plausible and the subject of substantial research. Scientists have determined that some of the planets are rocky and “Earth-like,” and orbiting their sun well within a “habitable zone” – at a distance where water can remain liquid on the surface of the planet for at least some of the time. Far more than a rocky surface and occasionally liquid water is needed to make a planet truly habitable, but it’s an important start.



EUROPA – JUPITER'S MOON

ENCELADUS – SATURN'S MOON





CERES – A DWARF PLANET



GANYMEDE – JUPITER'S MOON



EVIDENCE OF FLOWING WATER ON MARS

Earth-based research has been essential to astrobiology and has significantly changed our understanding of Earth and what might be possible on other worlds. But NASA and European robotic missions and space telescopes have most often been the engines that drive the field.

As technologies and scientific understandings have progressed, astrobiology has entered ever more fields. Moving beyond the astronomical detections of a cosmic menagerie of exoplanets, efforts are now underway to analyze the atmospheres, and ultimately the surfaces, of those bodies.

Carbon dioxide, water, and other compounds have already been detected in exoplanet atmospheres, but the ultimate goal is to find concentrations of oxygen, ozone and perhaps methane – gases which are associated with biology. Because oxygen and ozone quickly bond with other elements, the presence of large reservoirs of elemental oxygen, for instance, would tell scientists that it is constantly being produced. On Earth, the production of oxygen is largely a function of life.

With so many lines of research underway, NASA leaders are optimistic about finding life beyond Earth in the not too distant future.

*(courtesy: [astrobiology.nasa.gov](http://astrobiology.nasa.gov))*

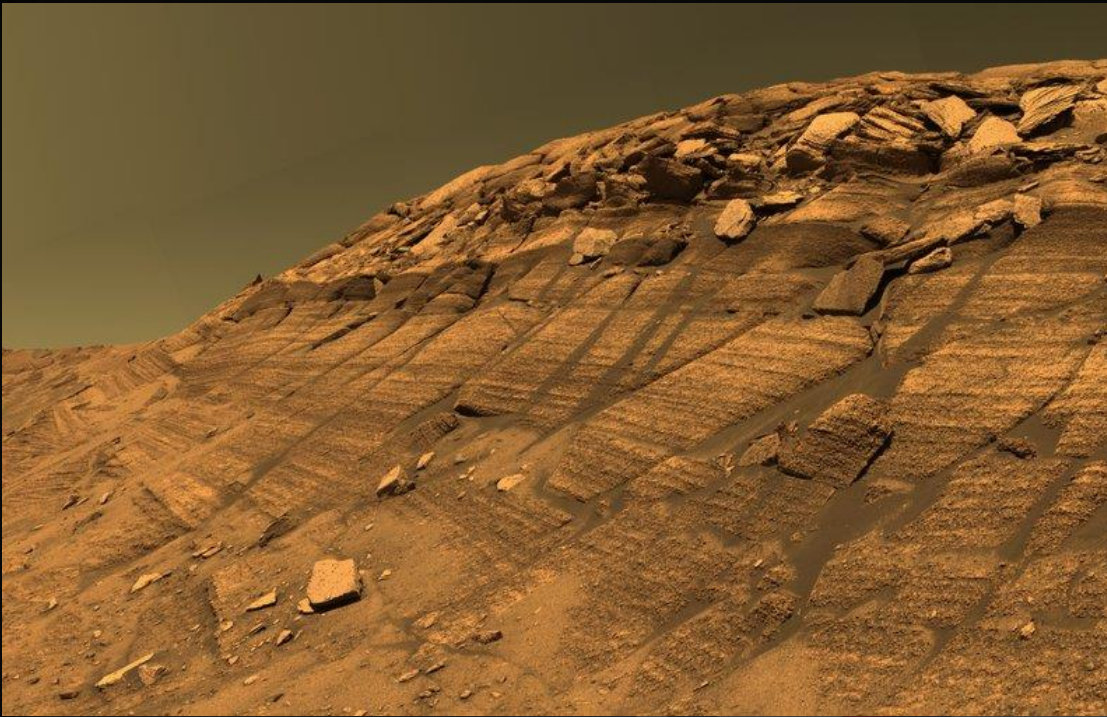
# NASA AND MARS

We can see that a broad range of advances in astrobiology set the stage for what immediately became the biggest news of all — the possible detection of signs of ancient martian life.

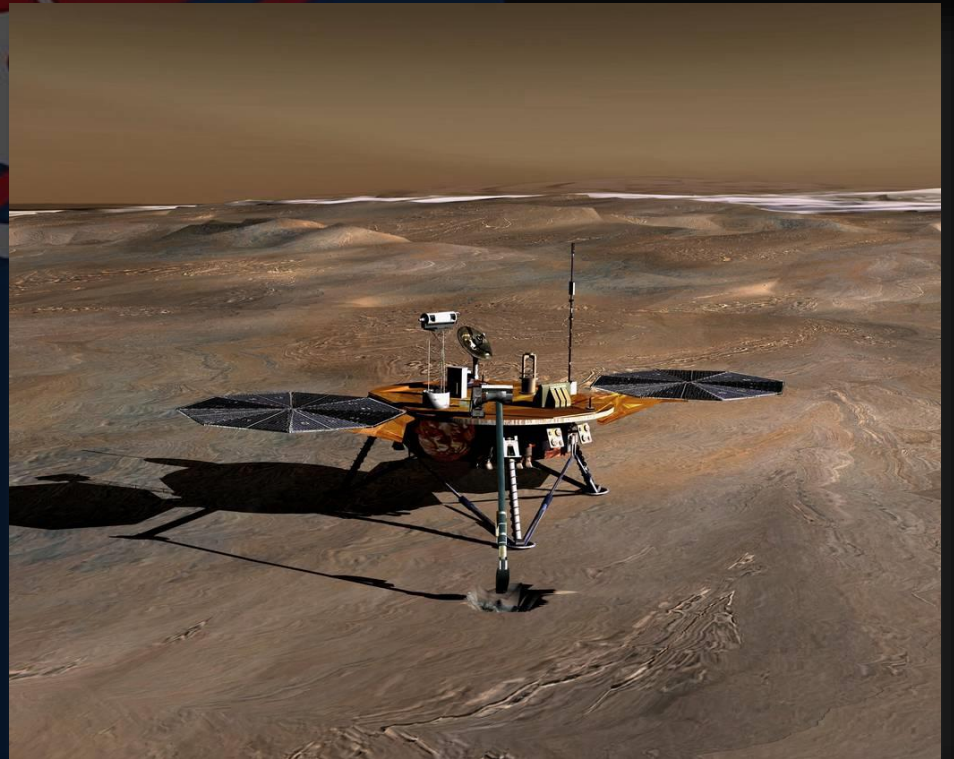
The 2000s saw a renewed interest in exploring Mars with NASA orbiters, landers, and rovers. None had specifically astrobiological missions, but all contributed to better understanding pathways into the discipline's goals. The *Phoenix* lander, for instance, found water ice in the north of Mars, ground-truthing the theory that Mars had substantial ice deposits just under its surface. The *MER* rovers, *Opportunity* and *Spirit*, detected carbonates and other minerals important to understanding the potential for biology in the martian past.

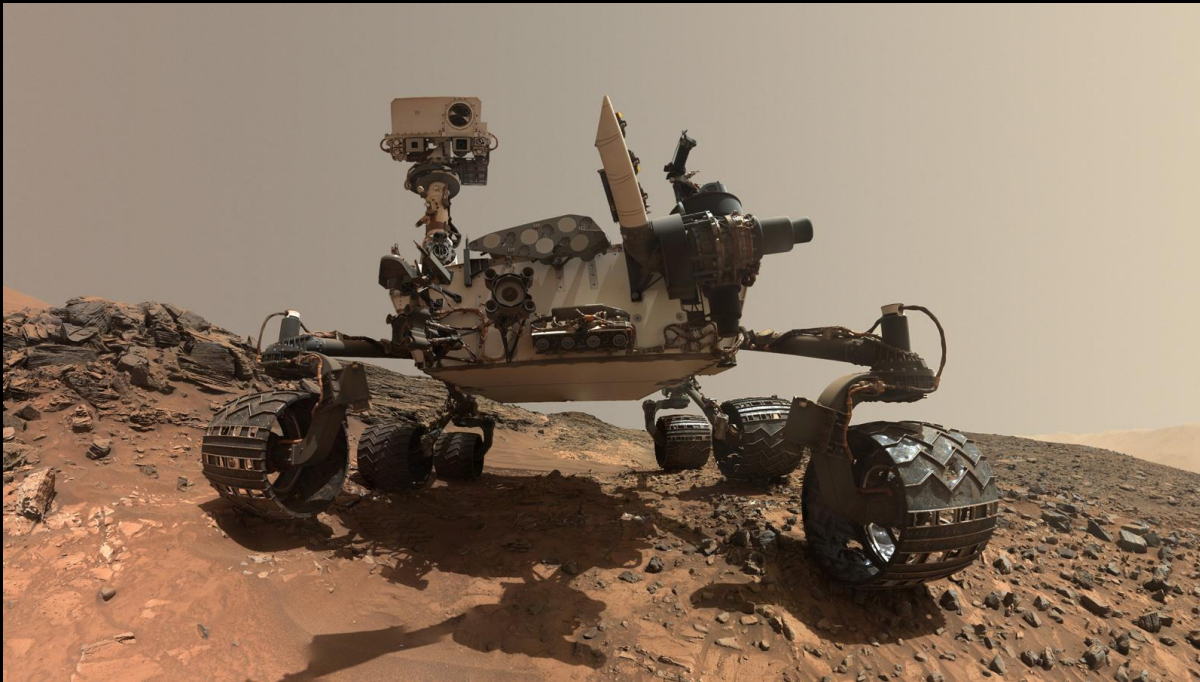
And then came *Curiosity*, which has had an explicitly astrobiological mission — to determine whether ancient Mars was habitable. The rover does not have the capacity to assess whether the planet was actually once inhabited by microbial life, but the results it has collected have convinced its science team that portions of the Gale Crater landing site were once perfectly capable of supporting life. It was the first formal identification of a habitable environment beyond Earth.

IMAGE BY  
MER OPPORTUNITY



PHEONIX MARS LANDER





## CURIOSITY ROVER

PICTURE TAKEN BY CURIOSITY ROVER





As is always the case with astrobiology, it was a combination of results — gathered by way of geology, geochemistry, mineralogy, sedimentology, super-high temperature chemistry and precision photography — that led to the conclusion. These findings support the theory that Mars was warmer and much wetter during its earliest days, even though climate modelers can't figure out how an ancient Mars could have been warm enough, and had an atmosphere thick enough, to keep that water liquid for potentially tens of millions of years.

Many more such studies were conducted and are still being conducted, and that is the reason why the organizations promoting the idea of colonization on other planets have chosen Mars for the same.

*(courtesy: [astrobiology.nasa.gov](http://astrobiology.nasa.gov))*

# SPACE X MARS EXPLORATION

“You want to wake up in the morning and think the future is going to be great - and that’s what being a spacefaring civilization is all about. It’s about believing in the future and thinking that the future will be better than the past. And I can’t think of anything more exciting than going out there and being among the stars.”

SPACE X -Elon Musk

Now we’ve got acquainted with various researches done and efforts taken to make humans a multiplanetary species. One of the organizations playing an active role in this task is SpaceX. The company founded by Elon Musk in 2002 aims to reduce space transportation costs to enable colonization of Mars. Now the question arises why Mars? Why is it that every organization is thinking Mars can be a substitute for Earth?

Well, Mars is one of the closest habitable neighbour at an average distance of 140 million miles. Its distance from Sun ensures it has decent sunlight. It is a bit cold but can still be warmed up. Its atmosphere is primarily CO<sub>2</sub> with some nitrogen and argon and a few other trace elements, which means that we can grow plants on Mars just by compressing the atmosphere. Gravity on Mars is about 38% of that of Earth, so you would be able to lift heavy things and bound around. Furthermore, the day is remarkably close to that of Earth i.e. the day length of Mars is 24 hrs. 37 min.

SPACE

STARSHIP



According to them we'll need 6 months to travel to Mars. They've designed a vehicle for this purpose called 'Starship'. SpaceX's Starship spacecraft and Super Heavy rocket (collectively referred to as Starship) represent a fully reusable transportation system designed to carry both crew and cargo to Earth orbit, the Moon, Mars and beyond. Starship will be the world's most powerful launch vehicle ever developed, with the ability to carry in excess of 100 metric tonnes to Earth orbit. Together the Starship spacecraft and Super Heavy rocket create a reusable transportation system capable of on orbit refueling and leveraging Mars' natural H<sub>2</sub>O and CO<sub>2</sub> resources to refuel on the surface of Mars. Starship leverages tanker vehicles (essentially the Starship spacecraft minus the windows) to refill the Starship spacecraft in low-Earth orbit prior to departing for Mars. Refilling on-orbit enables the transport of up to 100 tons all the way to Mars. And if the tanker ship has high reuse capability, the primary cost is that of the propellant, and the cost of oxygen and methane is extremely low. Starship will enter Mars' atmosphere at 7.5 kilometers per second and decelerate aerodynamically. The vehicle's heat shield is designed to withstand multiple entries, but given that the vehicle is coming into Mars' atmosphere so hot, we still expect to see some ablation of the heat shield (similar to wear and tear on a brake pad). The engineering video below simulates the physics of Mars entry for Starship.

With all of this information we can be sure that SpaceX are aiming to have full-proof plan for their Mars mission. They are really taking efforts in that direction. But after knowing all of this....the question now is....Is it really WORTH IT?

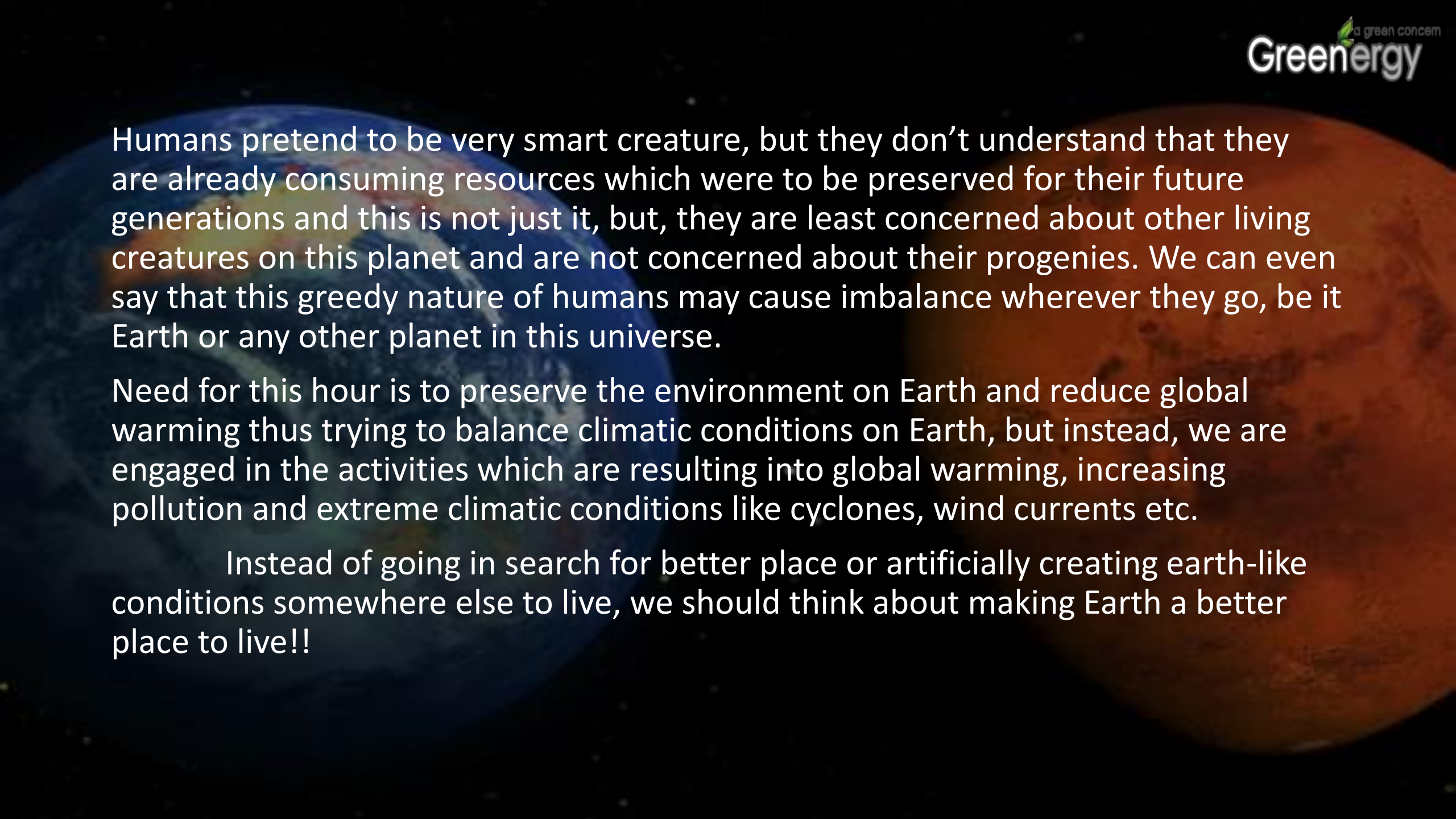
# IS IT REALLY WORTH IT?

- by *Udaysinh Patil*

Now after knowing about all the research done, all the efforts taken to make humans a multi-planetary species, now the question which arises is whether all of this is really worth it? At what cost are we doing this 'development' and trying to fulfil this dream? Will we be ever able to pay it back?

Well, all of this is certainly not worth it. The way the multi-talented human beings are creating mess out of the beautiful Earth gifted by God almighty, why should one allow them to create heap of mess on other planets too under the name of so-called 'development'?

Whatever efforts are being put into checking the possibilities of colonizing on other planets, using the limited resources available on Earth as input to manufacture space vehicles or satellites or space stations or expeditions is not ethical at present condition when Earth is in danger.



Humans pretend to be very smart creature, but they don't understand that they are already consuming resources which were to be preserved for their future generations and this is not just it, but, they are least concerned about other living creatures on this planet and are not concerned about their progenies. We can even say that this greedy nature of humans may cause imbalance wherever they go, be it Earth or any other planet in this universe.

Need for this hour is to preserve the environment on Earth and reduce global warming thus trying to balance climatic conditions on Earth, but instead, we are engaged in the activities which are resulting into global warming, increasing pollution and extreme climatic conditions like cyclones, wind currents etc.

Instead of going in search for better place or artificially creating earth-like conditions somewhere else to live, we should think about making Earth a better place to live!!

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