Chapter -17

Search of Life Outside the Earth

17.1 Position of the earth in space

New scientific research tells us that there are a billion worlds like earth in our galaxy. Most of these are rocky like earth. There are about 100 billion galaxies in the universe which have been seen till now. NASA's senior scientist Alen Stophen says that today the people of earth have very strong evidence that they will find life outside the earth in the coming decade. Strong evidences will be collected about Aliens in the next 20 to 30 years. There is no reason to doubt Alen Stophen as the virtual solar laboratories and remote sensing devices present in space have greatly increased human understanding as compared to the earlier times. Man is trying to find whether if life is present on any other planet just like on earth and on their, snow covered satellites. In our solar system we are trying to find if life is there on the Jupiter's satellite, Europa. It is not necessary that the life outside the earth will be the same as ours. There is a possibility of life in the ocean of liquid methane found on the satellite, 'Titan' of the planet Saturn.

It is also believed in the scientific world that in space life is present in abundance. In the form of micro-organisms it continuously comes on the earth. It is also believed that life did not originate on earth. Life on Earth came from outer space in a subtle form. The claims of life coming from space have been claimed but have not been fully certified till now.

The second group of scientist thinks life can be found outside the earth, but the possibility of it in a developed form as on earth is negligible. They believe that it is just not enough to be a watery, rocky planet like Earth, for the development of life. For the origin of life on an object like Earth, there is no need for the environment to be worthy of life. After being originated, for the continuity and development of life, it is necessary to have an environment which supports life. After the origin of life, to make the environment of the object life sustaining and to keep the environment continuously in that form is very difficult.

Scientists believe that when a planet like Earth is formed it is excessively hot and explosive. It takes about 50 million to one billion years to cool down the body so that the life can be originaed by the combination of non living chemical compounds. It is not necessary for the planet to have a life sustaining atmosphere for the origin of life. The real test begins after one or one and half billion years after the formation of a planet. After the origin of life it becomes necessary to keep the planet's atmosphere permanently life sustainable. Some scientists have compared the work of changing the planets dangerous environment to be life worthy, to riding a wild bull. Research suggests that most of the planets like earth do not make their environment worth living for during the first one billion years of their life, and the life that arose on that planet was destroyed in the astral state.

You are familiar with the word aliens. In the movie "Koi mil gaya" it was imagined that a child was left on the earth, who came with his family in a UFO. A group of children kept its name "Jaadu" and keep it safely with them. The organism outside the earth are called Aliens. You knows that there are many galaxies in the universe. One of these galaxy is named the milky way of which our sun is a star and we live on one of its planets the earth.

Fig. 17.1 A creative picture depicting an Alien.

Based on the information gathered till now, it is only the Earth that has a life full of biodiversity. Among all the organisms existing on the Earth, humans are the most developed ones. Humans have the power of thinking and understanding. Since the humans started to understand the environment, a question arose in his mind that are we alone in the universe? Is there life on any other planet other than the Earth?

Initially, humans had limited knowledge. Humans tried to answer the above questions by their creativity and imagination, which lacked any physical evidence and created many stories about the celestial bodies having a variety of life. Much literature has been written on it. Many popular movies have been made, one of which is mentioned above.

17.2 Possibilities of life in space

After the development of science, humans tried to answer the questions how and when life originated on the earth. It was clear from the various theories that the Earth originated as a hot solid ball and cooled down slowly, then gradually its environment was formed. Simple compounds were formed by the association of the elements present in the atmosphere and then more complex compounds were formed from them. These compounds had life based atoms such as water, amino acids, nucleic acids etc. The condensation of these atoms accidentally originated the first organism. The first organism through the bio-evolution gave birth to all the animals and humans. Life on Earth is possible because of the Earth's respective distance from the sun. The earth is that far away from the sun that water can stay in liquid form on it.

With the enhancement of information, it was clear that our galaxy had billions of stars like sun. Many of which have their own solar system and families. These various solar systems have planets similar to the earth, where life can be possible. With the development of Radio astronomy, we came to know that the chemical atoms which led to the origin of life on the Earth are present in the universe in abundance. This gave support to the thought that out of many planets similar to the Earth present in the universe, some may have life. It is also believed that many planets may have life much more developed one than that of the Earth. From this, originated the thinking that aliens came to the Earth in their spaceships.

In the year 1972 when pioneer-10 was launched, it was very much believed that highly developed life existed out of the earth. At that time, scientists were scared that due to any wrong notion, the life outside earth would attack people on the Earth. Pioneer -10 spacecraft was to pass by Jupiter and then go out of our solar system. The fear was that during its infinite journey, pioneer-10 would come in contact with some developed civilizations. The developed civilization could consider pioneer-10 as an attack over them from the people of the Earth and would retalita us. To remove this misconception, a plate was placed on pioneer-10 depicting male and female in a friendly posture and in sign language, a message was written about pioneer- 10 being sent from the earth. As planned pioneer-10 completed its mission successfully and no traces of life elsewhere were found.

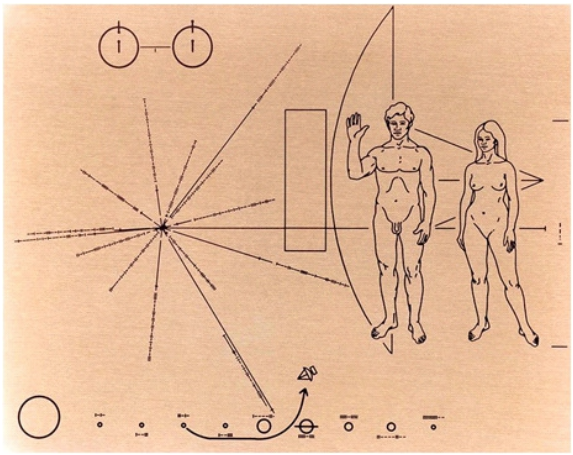

Fig. 17.2 A plate placed on Pioneer-10 to give message of peace to the Aliens.

With the advancement of scientific methods humans made rigorous efforts for finding life outside the earth. Search for extra terrestrial intelligence started in the year 1999, as a part of this effort. Efforts have been made to hear the murmuring in the universe by

radio telescopes. Huge radio telescopes have been setup in the space to find traces of life in space. The results of all these efforts is nil till now. Finding a civilization more developed than ours is a far fetched, one. The scientific cummunity has still not been able to gather any evidence of micro-organism outside the earth. In order to find life outside the earth and to reach some results NASA has started an ambitious program.

17.3 Main space campaign

Looking at the eternal sky, the human mind has been inquisitive since ancient times. When there were no means in the ancient times people just gathered information about the motion of planets-constellations with their naked eyes and co-related that with the occurence of weather, eclipse etc. After the invention of telescope the human vision began to cover more distance, the scope of information grew. Exploring space while living on earth is called astronomy, but sending automated machines or humans to space is part of space research technology.

Sending devices physically in space was possible after the development of powerful rockets in the twentieth century. Prior to the development of the rocket, it was possible to send an object up to 40 kilometers in the sky, during the First World War with a device called Paris-gun. During the Second World War German scientists sent the first man made device into space in 1942 by the invention of rocket. After the Second World War The United States of America started using German scientists and German equipments in military and non- military research. The first image of the Earth from the space was drawn in 1946. With the help of German scientists, Russia too came in the field of space research in 1947.

Due to the desire to outstrip one another the Soviet Union and the United States, the development of space science was some what faster. Soviet Union initiated by sending the first man made satellite named Sputnik-1 into the space in October 1957. Sputnik-I revolve around the earth by keeping a distance of 939 to 215 Km. The radio transmitter fitted on it sent the information about the upper atmosphere in form of beeps. While returning to the earth this satellite burnt out in the sky. Russia was the first to send first organism into the space, Euri Gagarin was the first man to go into space, establishment of space station Salute-I etc. In July 1969 America landed the first human on moon and pretended to show that it had left Russia behind.

Today space research centres of 22 governments are working in the world. Among these Russia's Roscososmos, America's NASA, China's National Space Authority, India's ISRO, European space agency of Europe are the main ones. America's and Russia's competition has now changed into coperation. In the beginning space research, was a question of prestige but today it has became a military and non-military requirement of every country.

The main reason for man's interest in space is the benefits that come through artificial satellites. Artificial satellites provide information about the earth surface and about the atmosphere of the earth, these information can not be obtained on the surface of the earth. Today the communication system of the world is based on the artificial satellite system. If the internet does not work properly, business activities along with television will also stoped. By the spying of other countries and destroying the artificial satellites of another country economic crisis can be can be caused. Therefore the military importance of artificial satellites has increased.

The second goal far space research after Earth is the moon. Moon has been attracting the humans since ancient times. Human beings have been successful in landing automated machine and human on its surface to study it. To encourage the tourism outside the earth, mining of helium 3 on moon and bringing it back to earth and to use moon as a station for the journey of deep space are matters of human interest.

The third subject of human interest in space is the planet Mars. Information is being collected about Mars by sending vehicles in its orbit. The surface of Mars is also being studied by landing automated

equipment on its surface. There is no confirm information about whether there is a subtle life on Mars. A private organization called Mars-1 is preparing for a unilateral journey to settle people on Mars. The target is 2030, but due to economic reasons the work seems to be halting.

In addition to Mars, satellites are also sent to other planets of solar system like, Mercury, Venus, Jupiter, Saturn, Uranus, Neptune, Pluto etc. America's satellite Juno is revolving around Jupiter, Kassini around Saturn and new horizon around Pluto and are gathering information about these Planets and sending it to the Earth. Along with the planets of the solar system, satellites like Galileo, Fabos, Europa are also being studied. The main reason for human interest in these satellites is to find life on them.

Fig. 17.3 Powerful rocket, Polar Satellite launching Vehicle (PSLV)

Sun is also a subject of human study and interest in space. The reason for growth and development of life on the earth is the radiation coming from the sun on the earth. The amount of the flow of this radiation is not always the same but, it keeps on changing. They have an effect on communication satellites. So the study of the sun from outside the Earth's atmosphere is being done by sending spacecraft. India is also preparing to study the Sun by sending the space craft, The Aditya.

Another attraction of human beings in space is the asteroid. You know that millions of small bodies are found between the Mars and Jupiter. Precious metals and other elements are found on some of these. Some countries are attempting to land the satellites on them for mining. Many of these asteroids revolve on a large circular path and are causing a danger of a collision with the Earth by passing very near to it. A space craft has been sent to take the samples of such an Asteroid, Bennu. It will return to earth by 2023. By studying the sample, it will be known how much damage will be caused on earth from the impact of the collision of Bennu. India is also planning to send a spacecraft for the study of Asteroids.

Spacecrafts are also being used to obtain information of space outside the solar system.

17.4 India in space

Space research in India started in 1948 as a physical research laboratory in Ahmadabad. In 1962 the Indian Government formed the Indian Space Research Committee under the leadership of Dr. Vikram Sarabhai. This committee built the Thumba Rocket Launching Station near Thiruvanathapuram and started the space research by studing the upper layers of atmosphere.

Fig. 17.4 Dr. Vikram Sarabhai

In 1969 the Indian Space Research Committee was replaced by Indian Space Research Organization (ISRO). Since its establishment, ISRO has started developing space technology. India launched its first rocket Rohini-75 in 1969 which was only 75 mm in diameter. It is clear that initially India's rocket capacity was not enough to send a vehicle to the space with its

help. India made an aggrement with Russia and in 1975 with the help of Russian rocket sent its first spacecraft Aryabhatta into space. After the successful flight and placing Aryabhatta in Earth's orbit India book the 11th position in the field of space research after America, Russia, Germany, China, France, England, Australia, Canada, Japan and Italy. After this, India sent two more satellites in Bhaskar series with the help of Russia. In 1981 the satellite Apple was sent with the help of Arian rocket of the European space Agency. It was placed at a height of 36000 kilometers from earth. The rotational motion of the satellite at this height is equal to the Earth's rotation, this way it sends the information to India by moving along with it.

You must have understood that the two major parts of, any space mission are the rocket and the space craft. You must have fired a rocket on Diwali. You may have noticed that the more gun powder in rocket, the higher it goes. Rocket works as a vehicle for carrying the spacecraft, uphence its efficiency is very important.

Fig. 17.5 Chandrayaan in Moon's orbit

India has been successful in enhancing its rocket capacity. India soon developed a rocket in the form of satellite launching vehicle-3 (SLV-3) which was able to carry the Indian Satellites into the space. The first flight of SLV-3 failed, but after learning a lesson from it, the Rohini Satellite was successfully sent into the space in the second flight. After acquiring the ability to send the spacecraft by its own rocket, India took the sixth place in the world. After this India on its own strength has sent many satellites in space to serve the country. They are sending important geographical, remote sensing information by revolving in the Earth's Orbit. India will soon launch Chandrayaan-2 in the orbit of the Moon and it is going to land a vehicle on moon's surface.

Important information about weather are gathered and sent to India. It is also helping in the operation of radio, Doordarshan, telephone, Internet, Telemedicine, remote education etc. India has achieved great success by developing powerful rocket, Polar Satellite Launching Vehicle (PSLV), which sends the space craft in a state of orbiting the Earth pole. Due to the high reliability of this vehicle, every country loves to send its satellites from this space vehicles. The operational costs of this space vehicle developed by India are cheaper as compared to that of other countries. India which spent a great amount of money to send its first three spacecrafts by the rockets of other countries, today is earning foreign exchange by sending other countries vehicles with its rockets. India has set a new record by sending 20 satellites simultaneously in space in June 2016. Among these 17 satellites were of other countries. India developed its Geosynchronous Satellite Launch Vehicle (GSLV) which is used to launch Geosynchronous satellite. With the help of the powerful rockets India established Chandryaan-1 in the moon's orbit in 2008 and achieved success in finding water on the moon and flagging India on the surface of the Moon. In its first attempt on its own strength, India sent Mangalyaan in the orbit of Mars and made the first place in the world. The Mangalyaan of India was declared the best invention of 2014. Until now no other country has been able to do this. India will soon be launching Chandrayaan-2 into the orbit of Moon and it is going to land a vehicle on moon's surface. The devices on this vehicle will collect information about the surface of the moon and send it to India. India is also planning to send Adityayaan to study the sun.

Personal Effort in Space

Private companies are now taking interest in space along with the government. The objective of the private companies is to trade with space tourism. Google has encouraged this by announcing the Lunar X awards. Team Indus is preparing to win the prize in 2017 by fulfilling the conditions by landing the robot on the surface of the Moon. A private company Moon Express has obtained the permission from NASA to start the service from the Earth to the Moon. It is possible that some people will enjoy the journey to the Moon by the middle of next year (2017). The Company's cofounder Naveen Jain says that hundreds of industries like diamond, energy, mining etc will be benefited from space. The journey to deep space will be easier by installing fuel pumps on the Moon.

17.5 International space station

Fig. 17.6 Structure of International Space Station

The International space station is the satellite set up in the lower orbit of the earth. This is the largest artificial structure present in the orbit of the Earth. It can also be seen from the earth without a telescope. Before sunrise and after sunset it is seen as a white moving point. On an almost circular path it maintains a distance of 330 to 435 kilometers from the earth. It completes more than 15 revolutions of earth in a day. Because of the involvement of Japan, Canada, Russia, America and European space agency in space station adjective, International is used. China is building its own space station.

Currently there are many rooms in it, which are used for living, and are used in the form of laboratories of biology, physics, astronomy etc. Horticulture is also done here. You must have also seen the picture of the bloomed flower printed in all the newspapers. There are several solar panels at the International space station for energy production. In many rooms air is filled at atmosphere pressure. Thereby, astronauts can work comfortably for many months, staying there without wearing a space suit. They have to wear space suit while working in other rooms or working in the open. The components that created the space station were made on Earth and sent to space with the help of Russian and American rockets and in the space they were assembled to give this look to the space station. Older parts are still changed constantly.

Fig. 17.7 Burning candle in the International Space Station as compared that on the Earth

Due to the proximity to the Earth, there is a gravitational force in the space station, but due to the orbital motion, the device is like an independently falling object. You know that the independently falling objects are in the state of weightlessness, and this is why it remains in a space. Since november 2000 this station has always been inhabited. Goods and passengers keep visiting here. American citizen of Indian origin Sunita Williams had worked in the space station more than once. She has also worked outside the space station. You would love to know that Sunita had carried the book Bhagwat Geeta, Lord Ganesha's sculpture and some Samosas with her. Only the people who are selected by the governments go to the space station and like government jobs, they do the work as directed

by the government. But there is a vacant seat in Russia's space shuttle Soyuz. By paying fare a traveler can go along for a few days. While living in the International space station, astronauts do their pre-determined work and also keep in touch with the students through radio, doordarshan etc. They keep sending videos for the students. Astronauts keep talking to their family members from time to time.

The food for each astronaut is sent in plastic bags with a tag of his name. There is a limited arrangement for cooling or heating the food. But when it is old it becomes tasteless. After a few days astronauts wait for the fresh food from the earth. Drinks have to be pulled in mouth with the help of straw. Guess why glass cannot be sucked? The solid food is also taken with the help of forceps and knife. Magnet is used to keep the forceps and knife on a tray otherwise they start flying in the air. There are also special types of toilets. Urine is collected and cleaned to get pure water that is used for drinking and other activities.

Living in weightlessness has many adverse effects on the health of the astronauts. To avoid this they resort to exercise. Tools like treadmill have been installed at the space station to help in exercise. Living with one or two colleagues in a small room for a long time, creates many types of psychological problems. You may think that there will be no danger like a road accident in space? It's not like that; a lot of garbage has been got collected in the space near the Earth. Used rocket or their pieces, inactive artificial satellites, weapons sent to destroy the satellites, Natural micro meteorite etc can cause trouble by stumbling across the space station. Due to the fast speed of the rotating objects in space, the collision of small pieces can also cause major damage.

After the development of the Internet, the economic importance of the artificial satellites has increased in human life. A country can harm its enemy by destroying its satellites. Human is making efforts to extablish colony out of the earth. In view of the importance of the space station, its budget has been increased till 2024. India is not yet connected to this. It is hoped that you will continue to gather the latest information about the international space station through the internet or newspapers.

Important Points

1. The organisms outside Earth are called Aliens. Since man started to understand his environment, one question arose in his mind that are we alone in the Universe? Is there life on any other planet outside Earth ?
2. With the development of radio astronomy, it is now known that the chemical atoms which gave birth to life on earth are abundant in space.
3. Pioneer-10 spaceship travelled out of our solar system by passing near Jupiter, but no sign of any external civilization was found.
4. Life is also being discovered on planets like our Earth and their snow covered satellites. It is also being searched on Europa the satellite of Jupiter in our solar system.
5. Alen Stophen, a senior scientist at NASA says that today the people of earth have very strong evidence that in the coming decade life outside the Earth will be discovered. In 20 to 30 years definite proofs about the aliens will be collected.
6. After the origin of life, it is very difficult to make the environment worthy for life and to sustain it in the same form.
7. After life has been produced on a body it begins to react with the physical environment of the planet. This dialogue can be both positive and negative.
8. On earth the development process from micro-organism to human beings have been possible. To this positive recharge dialogue was named Gaiyn hypothesis. (Mother land) by scientists James Lovelock and Lyn Margulis (1974).
9. To maintain life on planet temperature has to be maintained at one level. This is possible by regulating the green house gases. This is possible by Gaiyn regulation, as it happened

on earth. Some people consider this Gaiyn regulation hypothesis influenced by religion and reject it.

10. The International space station is a satellite set up in the lower orbit of the earth. This is the largest artificial structure present in the orbit of the earth.

11. On a circular path it maintains a distance of 330 to 435 kilometers from the Earth. In one day it completes more than 15 revolution of the earth.

12. Only the people selected by various governments go to the space station and like government jobs, they do the work as directed by the government. But a seat is kept vacant in the space shuttle of Russia. By paying the fare a person can go with them for a few days.

13. During the Second World War, German Scientists invented the rocket and sent the first man made device into space in 1942. After the Second World War the United States of America started using German Scientists and German equipments for military and non-military research purposes. The first image of the earth from the space was taken in 1946. With the help of German scientists in 1947, Soviet Russia also came into the field of space research.

14. Russia was the first country to send first organism into space, landed the first human in space, (Yuri Gagarin) first space walk, landing unnamed spaceship on any space object, Establishing of space station, Salute-1 etc. In July 1969 America landed first human on moon and tried to show that it had outclassed Russia.

15. Today the communication system of the world has become fully based on artificial satellites if the internet does not work properly, business activities along with television will come to a halt. By spying other countries and by destroying the artificial satellite of another country they can be put to economic crisis. It has resulted in military importance of artificial satellites

16. Space research in India started in 1948 as a physical research laboratory in Ahmadabad. India will soon make Chandrayaan-2 send it into the orbit of the moon and will land one vehicle on the surface of the moon. The machine engaged in this vehicle will check the surface of the moon and send information back to India. India is also planning to send Adityayaan to study the sun.

Practice questions

Objective type questions

1. The word Alien means-
   (a) Jadu
   (b) Organism outside the Earth
   (c) Complex Organism
   (d) Organism similar to cow

2. Life is possible outside the Earth-
   (a) On any star
   (b) anywhere
   (c) On planet similar to Earth
   (d) On any planet

3. First space craft to move outside the solar system was-
   (a) Chandrayaan-2
   (b) Mangalyaan
   (c) Pioneer -1
   (d) Pioneer- 10

4. Instruments used for listening to the murmuring in the universe-
   (a) Radio telescope
   (b) Telescopes
   (c) Microscopes
   (d) None of these

5. From which place can you see the sunrise 15 times a day?
   (a) At pole
   (b) At international space station

(c) At mars

(d) At moon

Very short type questions

6. Which place is the living place for humans outside the earth?
7. Which organism has given rise to the danger of global warming?
8. The physical environment of the earth and the organisms living on earth together form a system. What is this phenomenon called?
9. During the origin of the earth, the environment was very hot and explosive. How much time did it take to cool down?

Short type questions

10. How many planets similar to the earth can exist in our galaxy the milky way?
11. What is the meaning of the word Alien?
12. According to Darwin, how did the first organism originate on earth?
13. What were the scientists scared of during the launching of the pionner-10?
14. What do you mean by creative and destructive forces?

Essay type questions

15. What was the man's imagination about the organisms outside the earth during the launch of pioneer-10. What steps were taken to be safe from the assumed danger?
16. Assume yourself to be in International space station and describe your daily routine?
17. Explain the current scientific thinking about life outside the Earth. What is your view?
18. Explain the importance of satellites in details?
19. Explain the importance of India in the world of space campaign?

Answers key

1.	(b)	2.	(c)
3.	(d)	4.	(a)
5.	(b)		