

Exhibit
Catalogue



**PLANET
WE
LIVE IN**



NATIONAL
COUNCIL OF
SCIENCE MUSEUMS

Mobile Science Exhibits

THE PLANET WE LIVE IN



designed and developed in 1971 at

BIRLA INDUSTRIAL AND TECHNOLOGICAL MUSEUM
Calcutta



NATIONAL COUNCIL OF SCIENCE MUSEUMS

SECTOR V, BLOCK-GN, SALT LAKE CITY, CALCUTTA 700 091 • INDIA

JANUARY 1989

Exhibit No. 1

EARTH - A PLANET IN THE COSMOS

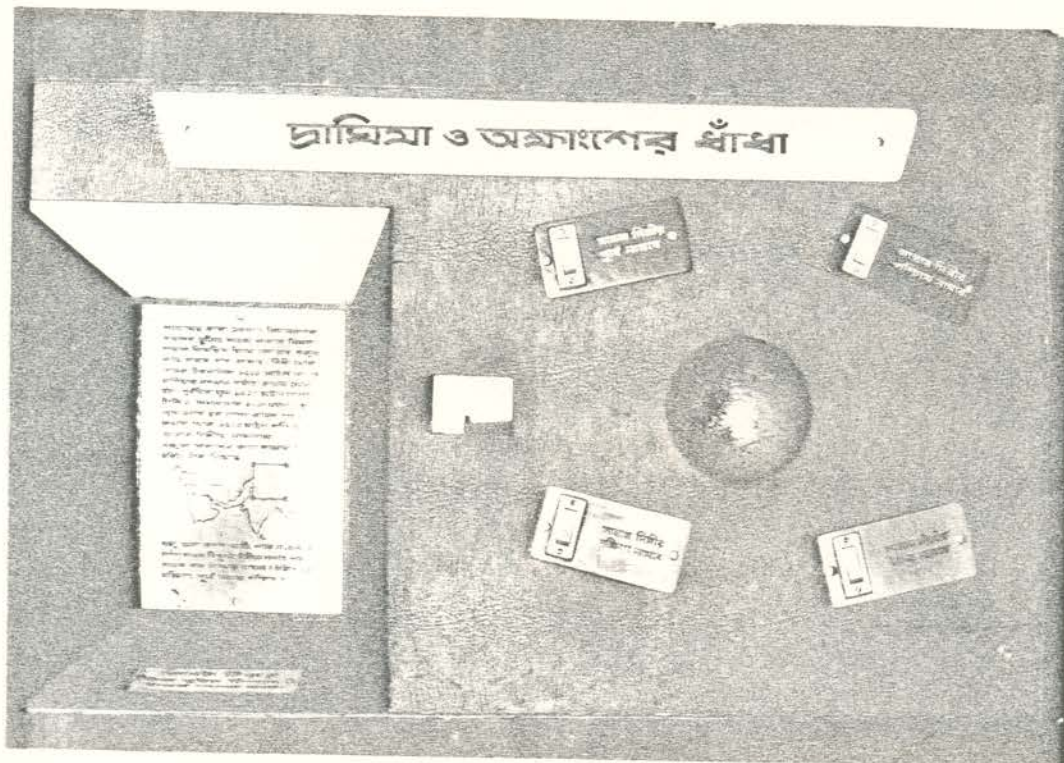


Like Moon, the Earth is also illuminated by the Sun. Half of its surface facing the Sun in day time receives the sunlight while the other surface remains in darkness. So the Earth also shows 'phases' as observed from the space-vehicles. However, the overall impression in case of the Earth is different from that of the Moon. We witness the sharp boundary of the Moon from the Earth because the Moon has no atmosphere. But the atmospheric layers of the Earth reflect and diffuse the sunlight falling on it, resulting in the indistinct boundary of the Earth's disc.

These photographs of the Earth taken from the command Module of Apollo 10 in May 1969 show the Earth coming into view as the space-craft comes round from behind the far side of the Moon.

Exhibit No.10

STORY OF AN AIR FLIGHT, LATITUDE & LONGITUDE - QUIZ



The exhibit has narrated a story of an airflight. Then four questions are put to the visitors to test their knowledge about Latitude and Longitude, like a Quiz game.

Santosh is a pilot. He went 1500 miles north of Delhi to a place Balkhaj in Soviet Union. Then he turned east and went 1500 miles eastwards to Tonkin. Then he turned south and went down 1500 miles southwards to Bathin in Burma. Then he flew 1500 miles westwards.

Where will Santosh land? Will it be at Delhi or in the North, South, East or West of Delhi.

Which one is correct?

Get the answer by pressing the correct switch

East of Delhi?

South of Delhi?

West of Delhi?

North of Delhi?

INTERNATIONAL DATE LINE



The international date line is an imaginary line on the Earth's ocean surface along 180° longitude (with minor deviations to avoid some intervening land surfaces).

As one goes eastwards the sun rises earlier. He will gain time. To maintain a standard in time he deducts a day when he reaches 180° longitude. Similarly when one goes westwards, sun rises later and he loses time. He adds a day when he reaches 180° longitude. This imaginary line is known as International Date Line.

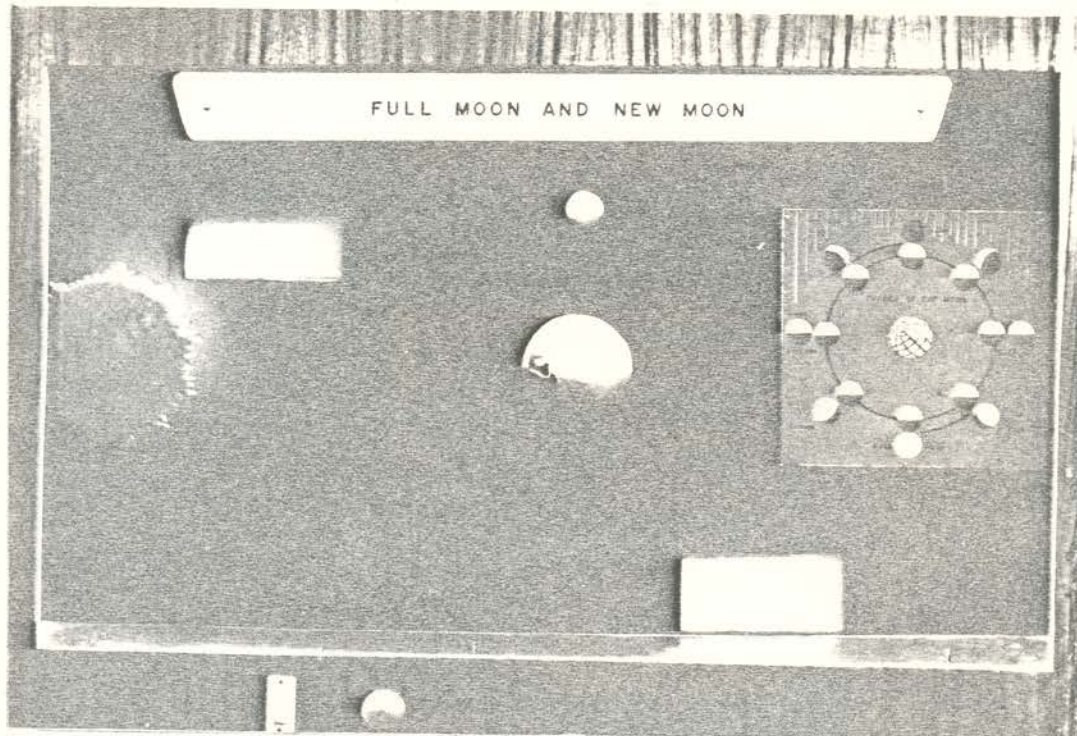
MOVEMENTS OF THE MOON



The Moon is the natural satellite of the Earth. It takes nearly 30 days to make one complete revolution round the Earth. During this period the Moon also makes one complete revolution round its own axis. That is the reason why only one face of the Moon is visible from the Earth. The plane of the orbit of the Moon makes $5^{\circ}9'$ with that of the Earth's orbit.

If we observe the Moon in the sky we shall find the Moon shifted every night at a point of about 13° farther east and the next night much farther still. From one New Moon to the next New Moon i.e. during the monthly motion of the Moon around the Earth, the phases of the Moon are seen every night in the clear sky.

FULL MOON AND NEW MOON



The Moon is an opaque body which receives light from the Sun. We can see that part of its surface which reflects the light is turned towards the Earth.

- a) The Moon has no light of its own. The Moon becomes visible when sunlight gets reflected from the Moon and reaches the Earth. When the Earth is in between the Moon and the Sun the whole disc of the Moon is visible. We then have Full-Moon.
- b) When the Moon, during the orbit round the Earth, comes in between the Sun and the Earth the face of the Moon which is towards the Earth does not get sunlight. Then we have New Moon.

Exhibit No.14

UMBRA AND PEN UMBRA

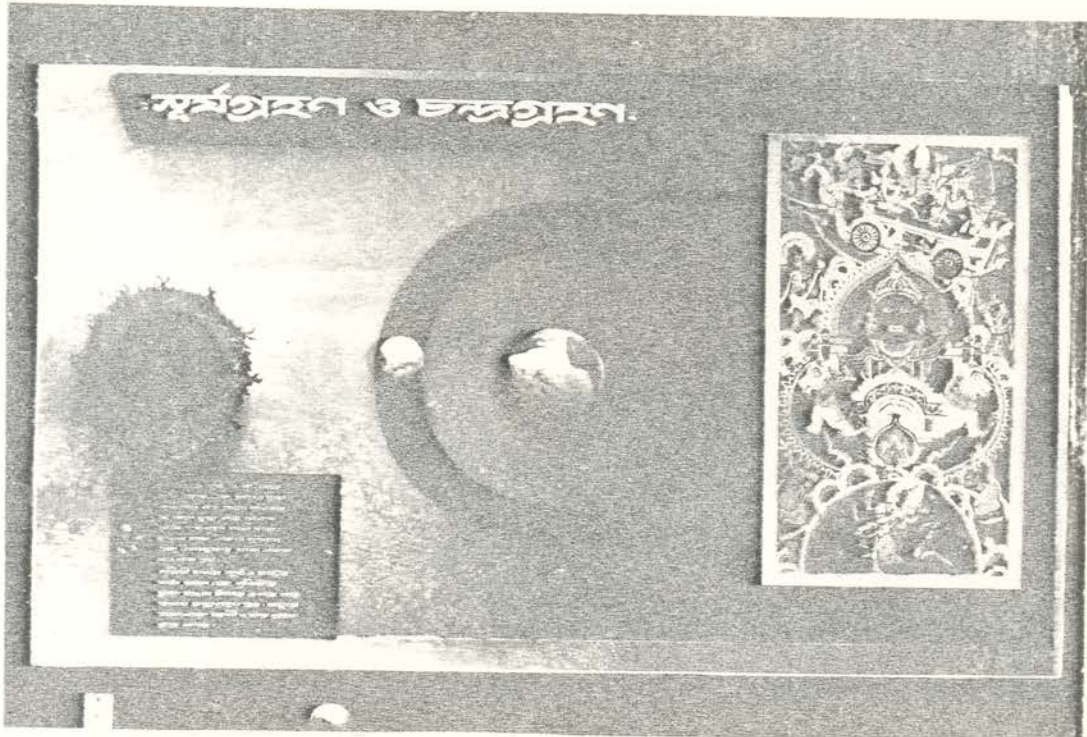


Whenever there is an obstacle on the path of light a shadow is cast behind it. The part of the shadow where no light falls from the source is called the Umbra and the other part where light falls partially from the source is called the Penumbra.

The shadows of sunlight cast by the Moon on the surface of the Earth contains both the Umbra and Penumbra. The exhibit here shows actual shadows formed by a light bulb.

Exhibit No.15

SOLAR AND LUNAR ECLIPSE

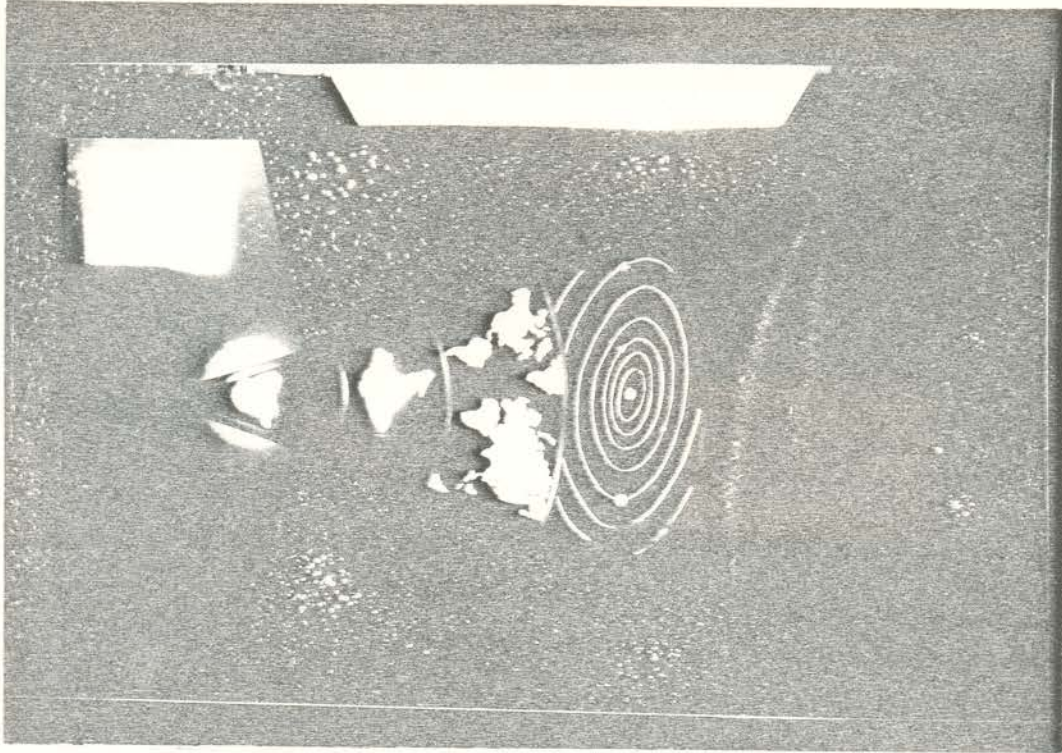


This exhibit explains the causes of two big phenomena on the Earth, known as the solar and lunar eclipses.

When the Moon, during its movement round the Earth, comes in between the Sun and the Earth and the shadow cast by the Moon falls on Earth, then from those parts of the Earth, which come under the shadow, solar eclipse is visible. When the Earth comes in between the Sun and the Moon and the shadow cast by the Earth covers the Moon then, lunar eclipse is visible from the Earth.

Exhibit No. 16

WHAT IS OUR ADDRESS



This exhibit shows a graphical presentation of the minute size of one's residential house in comparison with the vast universe he belongs to. The address for his identity will look like this:

Prasanta Roy
P.O. Raghunathpur
Dist. Purulia
State: West Bengal
INDIA
WORLD
Solar System
Milky Way
Cosmos
?

Exhibit No.17

MAN MADE MOONS



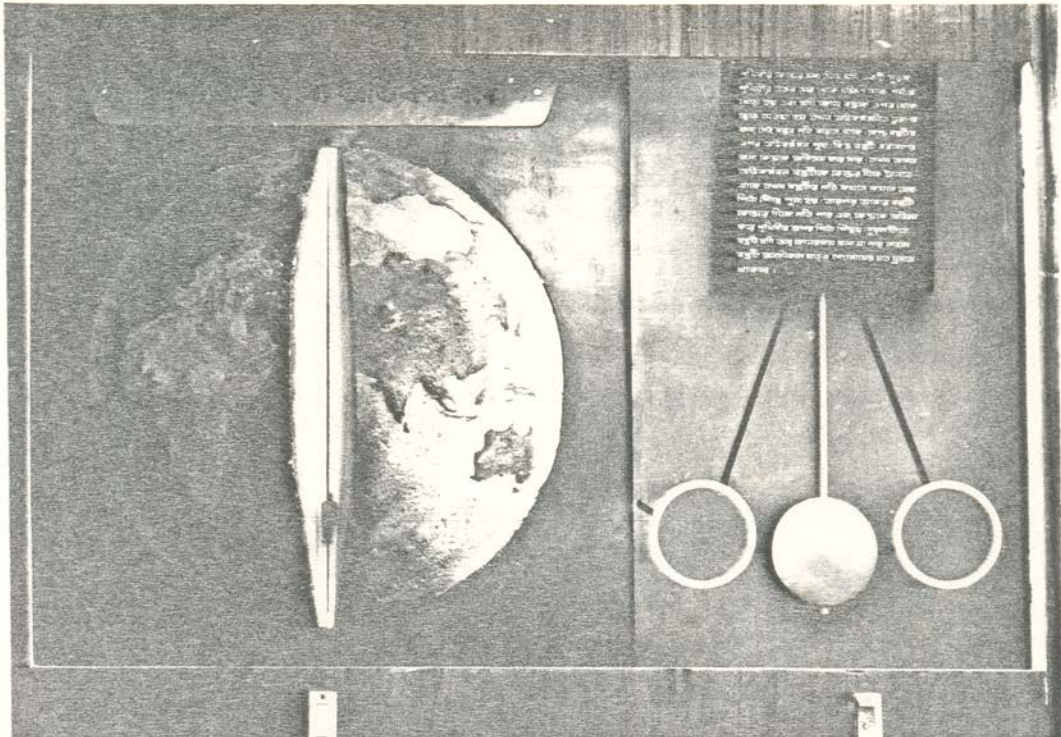
The Moon is the only natural satellite of the Earth. Before 1957, there were 31 known natural satellites revolving around the planets. On 4th October 1957, the first artificial satellite, 'Sputnik I' was launched by the Soviet Union. On 3rd November 1957, Soviet Union launched 'Sputnik II', a much larger satellite containing the dog 'Laika'. Since then, scientists of several countries sent thousands of artificial satellites to space for space exploration. These satellites, like the Moon, revolve around the Earth at different altitudes with different velocities, depending upon their distances from the Earth.

[illegible]

All objects attract one another towards itself. This force of attraction is known as Gravitation. Newton discovered the Laws of Gravitation. When a rocket journeys towards the Moon the gravitational attraction gradually decreases. There is a zone after which the lunar attraction predominates and the velocity of the rocket again gradually increases. The rocket has to start the retrorocket to lower its velocity for landing on the Moon.

Exhibit No.19

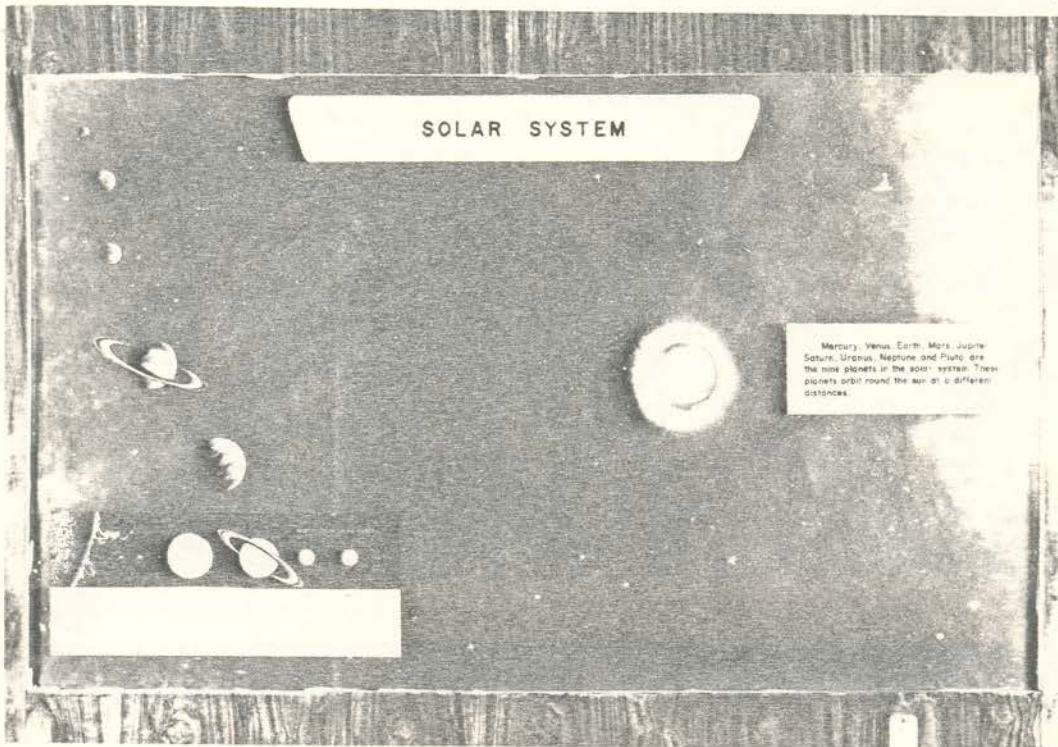
GRAVITATION INSIDE THE EARTH



If a frictionless tunnel is driven through the centre of the Earth and if a body is released from the surface then the velocity of the body gradually increases. The gravitational force of attraction is zero at the centre of the Earth. But /due to its inertia the body crosses past the centre. Then again the gravity attracts the body towards the centre and the velocity decreases until it becomes zero at the surface and the body moves farther on. Then again the body accelerates towards the centre. If there is no resistance to the motion of the body it will swing like a pendulum inside the tunnel with a time period of approximately 84 minutes.

Exhibit No.2

SOLAR SYSTEM

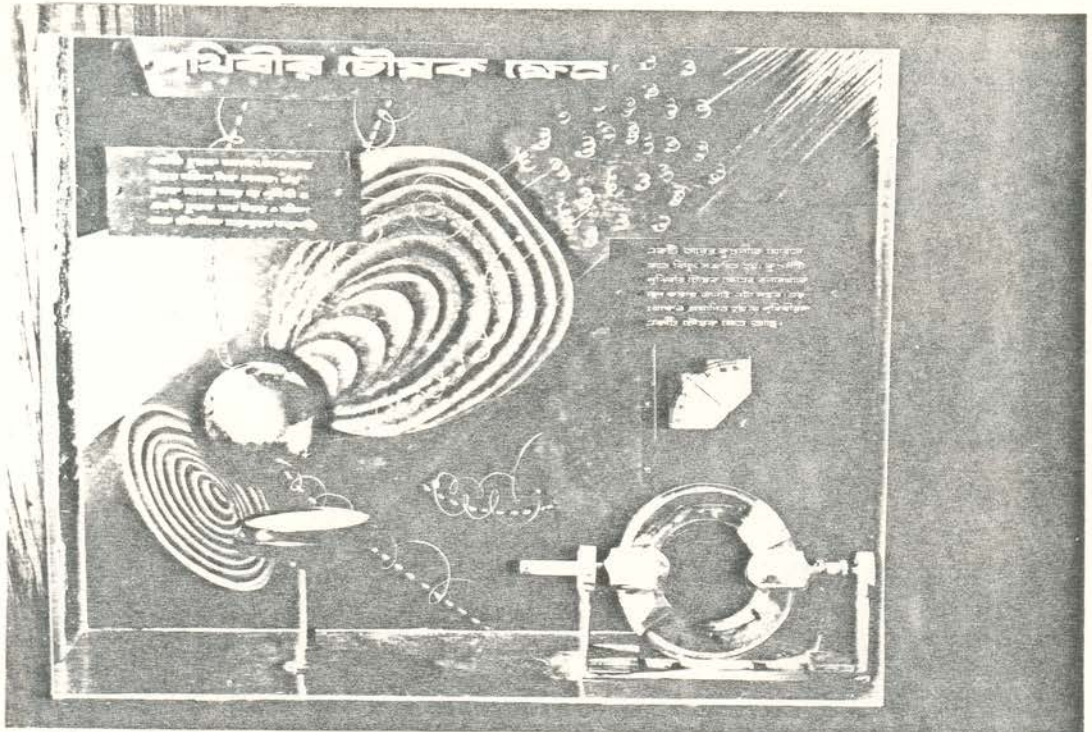


Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto are the nine planets in the Solar System. These planets (revolve) orbit round the Sun at different distances.

The orbits of the planets generally lie in the same plane. The shape of the orbits is elliptical and these are also at variable distances from the Sun. For example, Mercury is the nearest planet to the Sun and Pluto, the farthest one. The sizes of the planets also differ from each other. The Solar System also includes the comets and the meteors which move in orbits of a shape different from that of the planetary orbits.

More information about the planets are given in the chart on the exhibit.

EARTH'S MAGNETIC FIELD



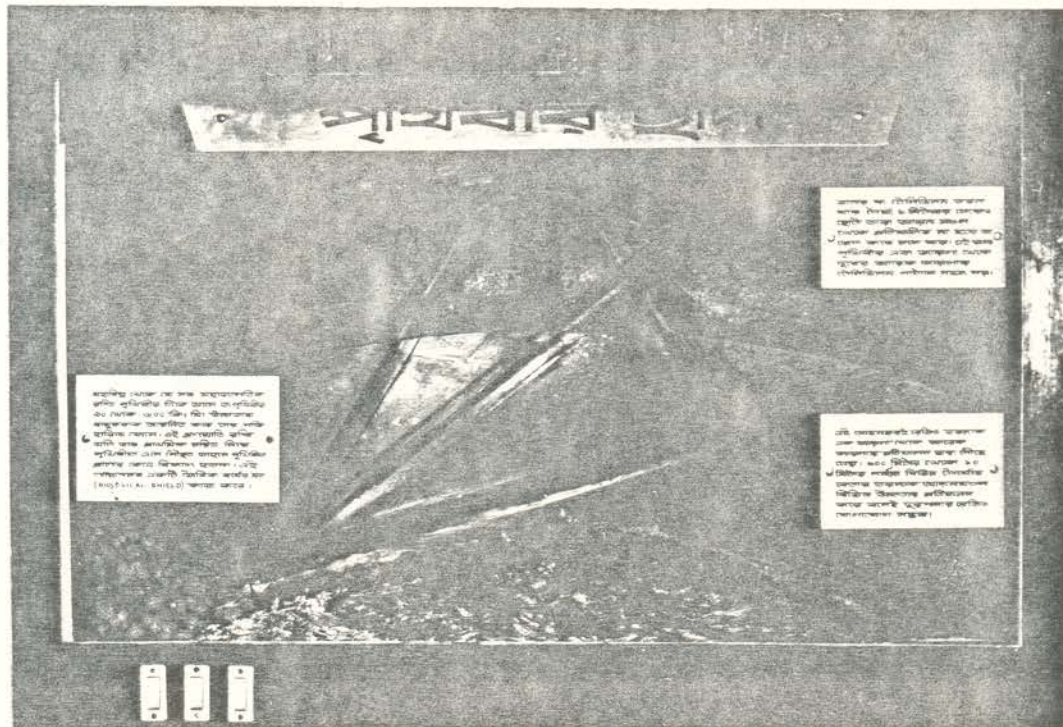
- a) A magnetic needle always shows North-South direction. This proves that the Earth is also a magnet whose poles are situated near the geographical North and South poles.

The magnetic axis of the Earth is inclined by 12° with its axis of rotation. The North magnetic pole of the Earth is near Hudson Bay and the South magnetic pole is somewhere in the Antarctic continent.

- b) When a coil is rotated current is induced in the coil. This happens because the coil cuts the magnetic field of Earth. This also proves that the Earth behaves like a magnet.

Exhibit No.21

ROOF OF THE EARTH



- a) The cosmic rays ionise the gases and vapours of the atmosphere at heights ranging from about 90 km. to 600 km. above the Earth. In this process the cosmic rays lose the energy. The ionised layer is called Ionosphere. It acts as a biological shield and protects the Earth from the strong and harmful radiation from outer space.
- b) The Ionosphere reflects back the radio waves to Earth. Radio waves of different wave lengths ranging from 200 meters to 10 meters are reflected from different heights in Ionosphere and thus make the long distance radio communication possible.
- c) Radar and television waves, which have high frequency, are not reflected by the Ionosphere. Due to this it is not easy to transmit television waves.

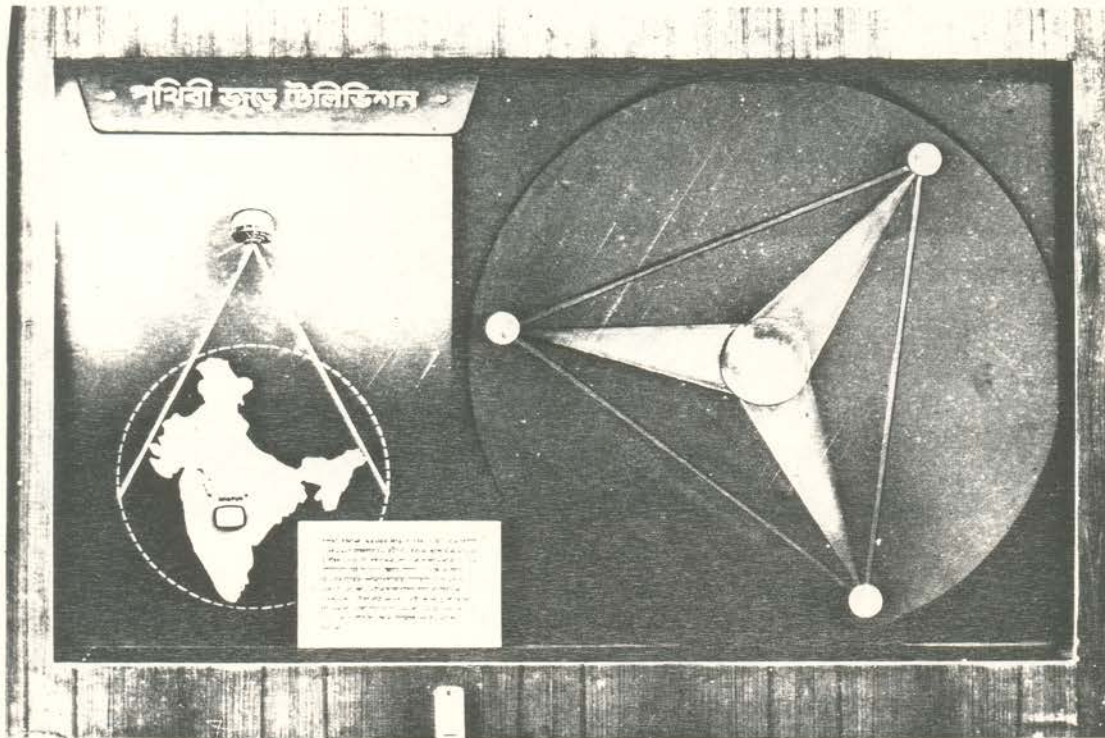
Exhibit No.22

COMMUNICATION SATELLITE



- a) Television waves are not reflected from the Ionosphere. They travel in straight paths. Because of the curvature of the Earth and in view of the line of sight path of the waves, the range of transmission is limited. It is possible to relay television by erecting large number of towers along the path. But three-fourth of the Earth's surface is water. Hence it is practically not feasible to erect television towers.
- b) It is possible to transmit television signals by placing telstar communication satellites in space. The first telstar was launched in space on 10th July 1962. Telstar revolves round the Earth once in 2 hours 40 minutes. It makes possible the radio or television transmission between two earth stations as far as 6000 miles apart from each other.

TELEVISION ROUND THE WORLD

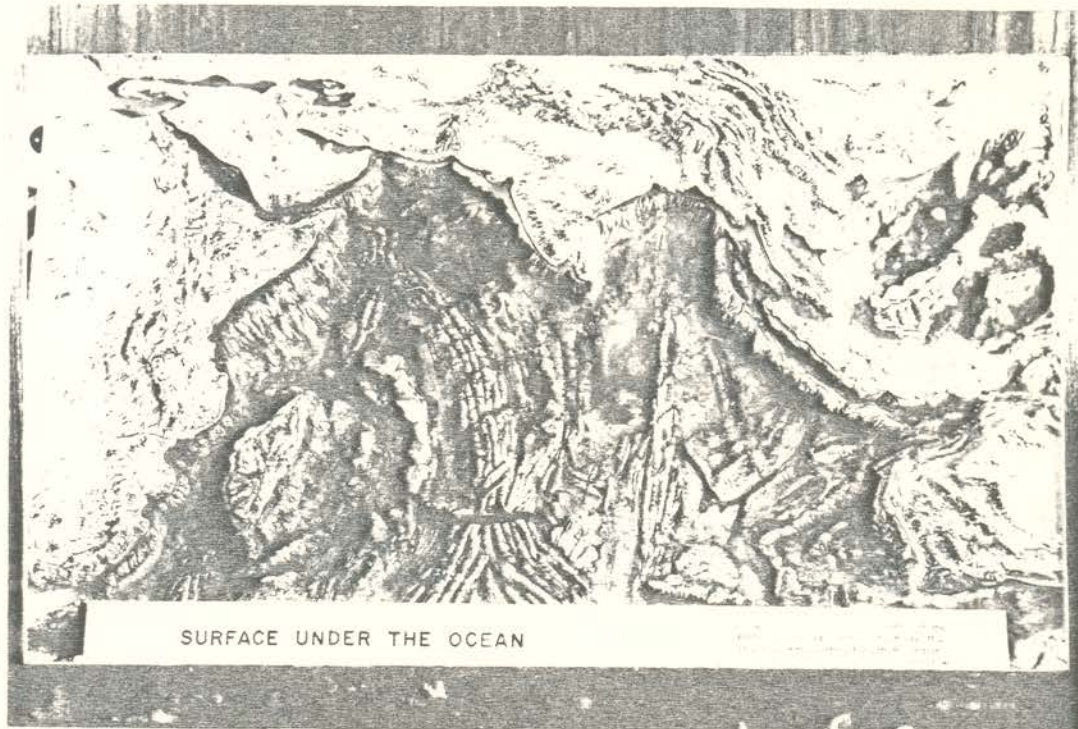


This model explains how communication through television is established around the Earth with the help of artificial satellites, such as 'Telstars', placed high above in the sky.

Three telstars are placed 120° apart at a height of 35,680 km. above the surface of the Earth. At that height the velocity of telstar is same as that of the daily motion of the Earth round the axis. Due to this any place on Earth keeps the same position relative to the telstar. Such satellites are called syncom satellites. By such satellites it is possible to transmit television to any place on the Earth.

Exhibit No.3

SURFACE UNDER THE OCEAN



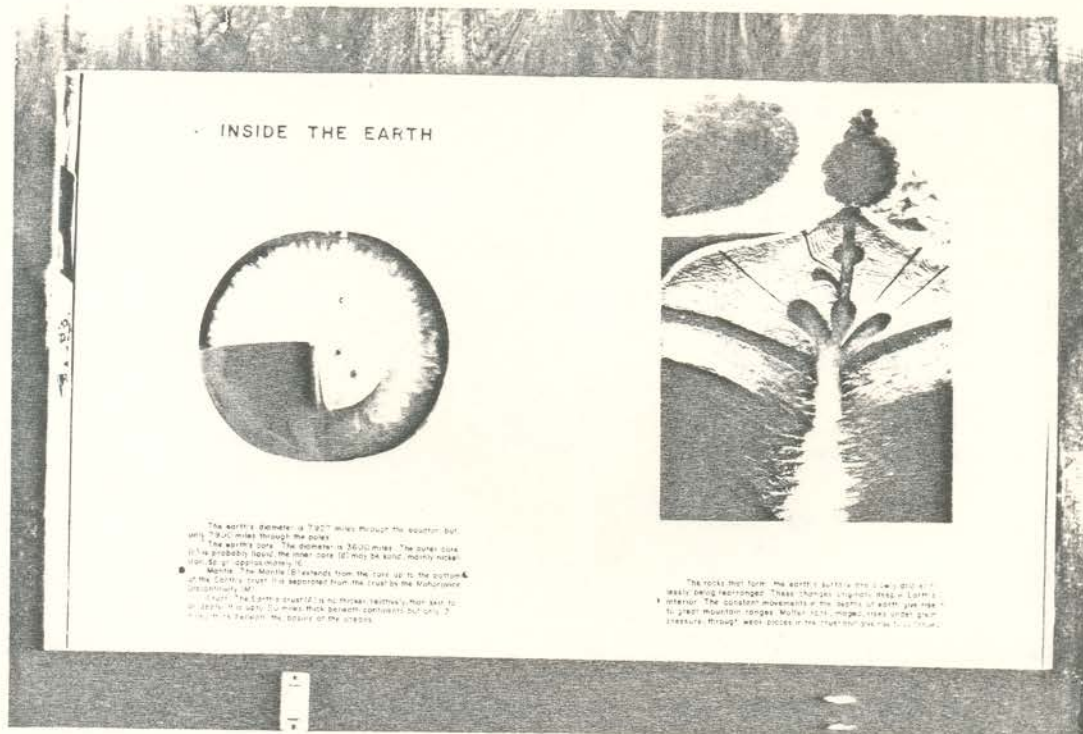
About three fourth of the Earth's surface is covered by oceans. The Pacific Ocean has an area of more than 63 million square miles. The average depth of the seas is 12,000 feet i.e. 4 kms. approximately, compared with an average land height of only 0.8 kms.

In the sea bed, mountains higher than Mount Everest and gorges deeper than the deepest canyon on the Earth's surface are found. Oceanographers are always engaged in intensive research to reveal the landscape-details of the ocean floors.

In the model, the structure of the surface beneath the Indian Ocean, Bay of Bengal and Arabian Sea are shown.

Exhibit No.4

INSIDE THE EARTH

Inside the Earth

- a) The Earth's diameter is 7927 miles through the Equator, but only 7900 miles through the Poles.

The Earth's core:

The diameter is 3600 miles

The outer core (C) is probably liquid, the inner core (D) may be solid, consisting mainly of nickel, iron, with sp.gr. of approximately 16.

Mantle:

The Mantle (B) extends from the core up to the bottom of the Earth's crust. It is separated from the crust by the 'Mohorovicic' Discontinuity (M).

Crust:

The Earth's crust (A) is no thicker, relatively, than the skin to an apple. It is upto 20 miles thick beneath continents but only 3 miles thick beneath the basins of the oceans.

- b) The rocks that form the Earth's surface are slowly and endlessly being rearranged. These changes originate deep in the Earth's interior. The constant movements in the depths of Earth give rise to great mountain ranges. Molten rock, magma etc., rise under great pressure through weak places in the crust and give rise to volcanoes.

OCEAN OF AIR



We live at the bottom of an ocean of air. The total weight of the atmosphere has been estimated as 5000 million tons and the standard atmospheric pressure at sea-level is 760 mm. of mercury. It is impossible to give a definite upper limit to the atmosphere. The density decreases as we go higher until it is no greater than that of the inter-planetary medium. Traces of what may be called "atmosphere" extend out to 500 miles.

The atmosphere constitutes several layers as described below:-

TROPOSPHERE:

This is the first layer above the surface of the Earth. Clouds and weather occur in this region. The main gaseous constituents of this layer are oxygen and nitrogen.

This troposphere is separated from the layer above it, called STRATOSPHERE, by a thin layer of thickness of about 3 miles, called TROPO-PAUSE.

STRATOSPHERE:

This layer contains Ozone (O_3) which protects the Earth's surface from shortwave radiations from space to develop life on Earth. The upper part of this layer, a region above 19 miles, is known as MESOSPHERE.

IONOSPHERE:

The scientists pay more attention to this Ionosphere because it contains electrically conducting layers capable of reflecting radio waves for our communication systems. At polar latitudes, a beautiful natural phenomenon, called 'Aurora' appears in this Ionosphere. Above this, there exists a layer called EXOSPHERE.

DIURNAL AND ANNUAL MOTION

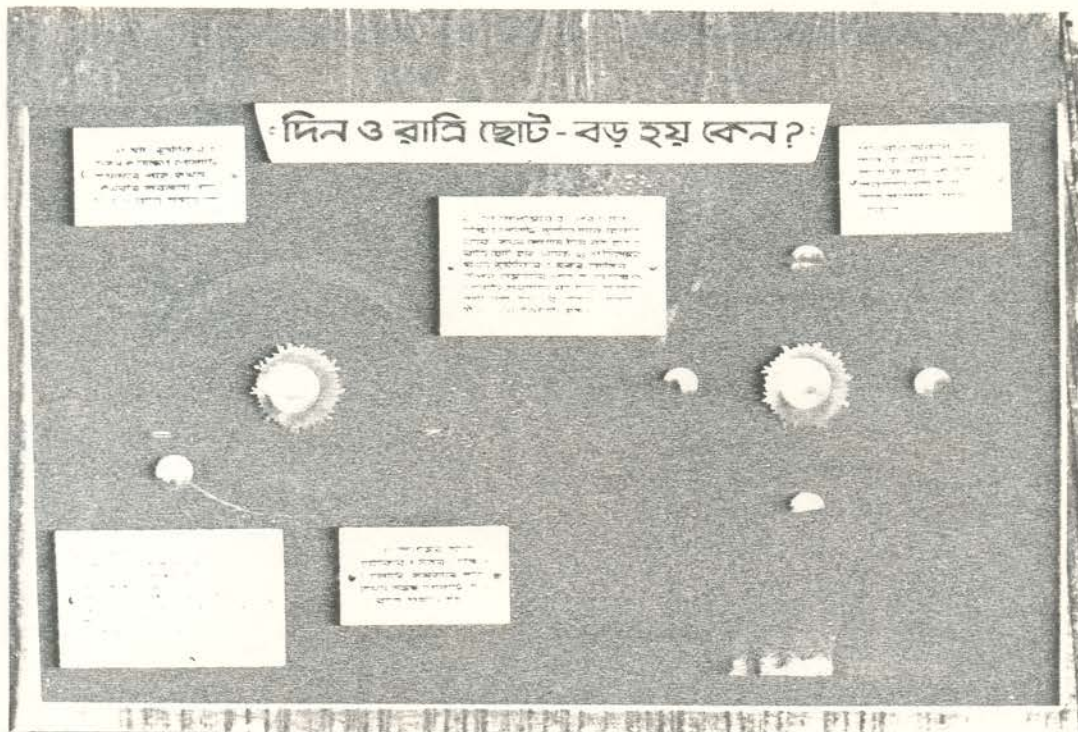


The Earth makes a complete rotation daily on its own axis in 24 hours. This motion is called diurnal motion. The Earth also makes a complete revolution round the Sun in an elliptical path in 365 days and 6 hours. This is called annual motion. The axis of the Earth makes an angle of $66\frac{1}{2}^{\circ}$ degrees with the plane of the orbit.

The above tilt of the Earth's axis and this annual motion of the Earth cause the 'Change of Seasons' on the Earth.

Exhibit No.7

VARIATION IN DAY AND NIGHT



The exhibit explains why and when the durations of day and night vary during a whole year.

(a) On 21st March the sun rays fall equally on the North and the South hemispheres. Then the earth has equal day and night on all places.

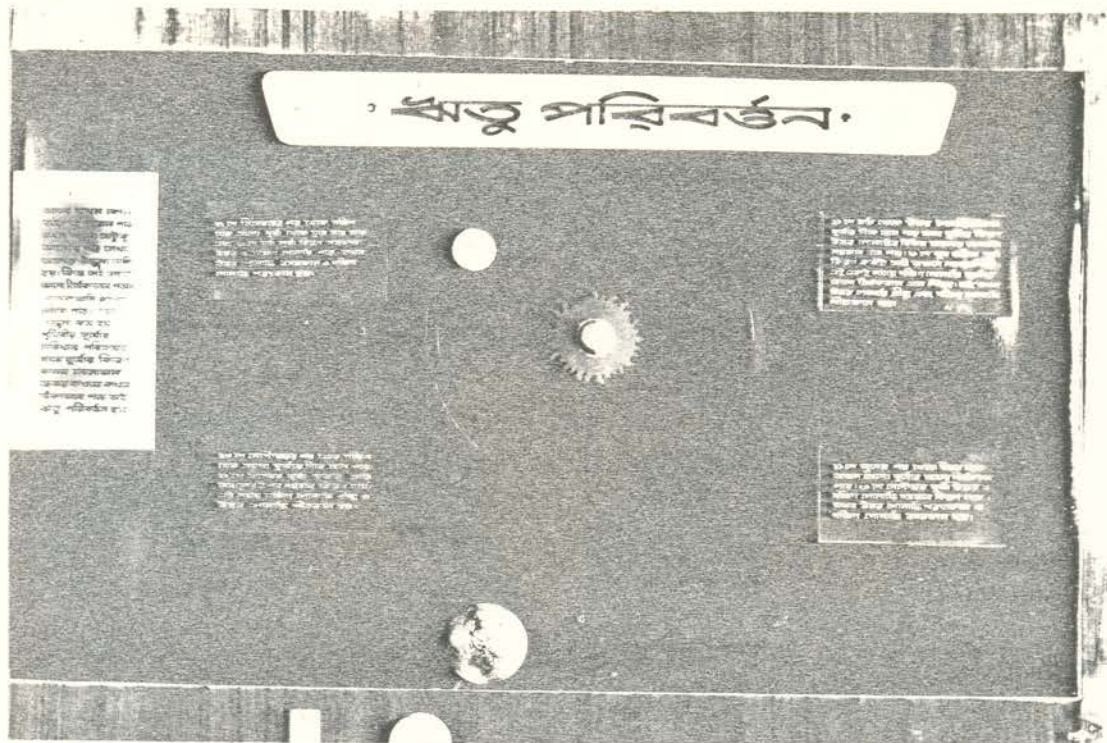
(b) After 21st March the Northern hemisphere gradually starts tilting towards the sun and on 21st June the sun rays fall vertically on the Tropic of Cancer. Then the Northern hemisphere has the longest day and the shortest night. In Southern hemisphere the opposite happens.

(c) On 23rd September light falls vertically on the Equator. Day and night are equal on all places on Earth.

(d) After 23rd September the Southern hemisphere starts tilting towards the sun. Then the days start becoming longer and the nights shorter. On 22nd December when sun rays fall vertically on the Tropic of Capricorn the Southern hemisphere has the longest day and the shortest night, while in the Northern hemisphere, the opposite happens.

(e) If the axis of the Earth was not tilted from the plane of the orbit of the Earth, the days and nights would have been equal everywhere on the Earth.

CHANGE OF SEASON



The change of seasons is a great natural occurrence on the Earth's surface. This is explained here in detail.

(a) After 21st March the Northern hemisphere gradually starts tilting towards the sun and becomes maximum on 21st June when sun rays fall vertically on the Tropic of Cancer. During this time sun rays fall on the Southern hemisphere obliquely. Due to this, during this period of Northern hemisphere has summer and Southern hemisphere, winter.

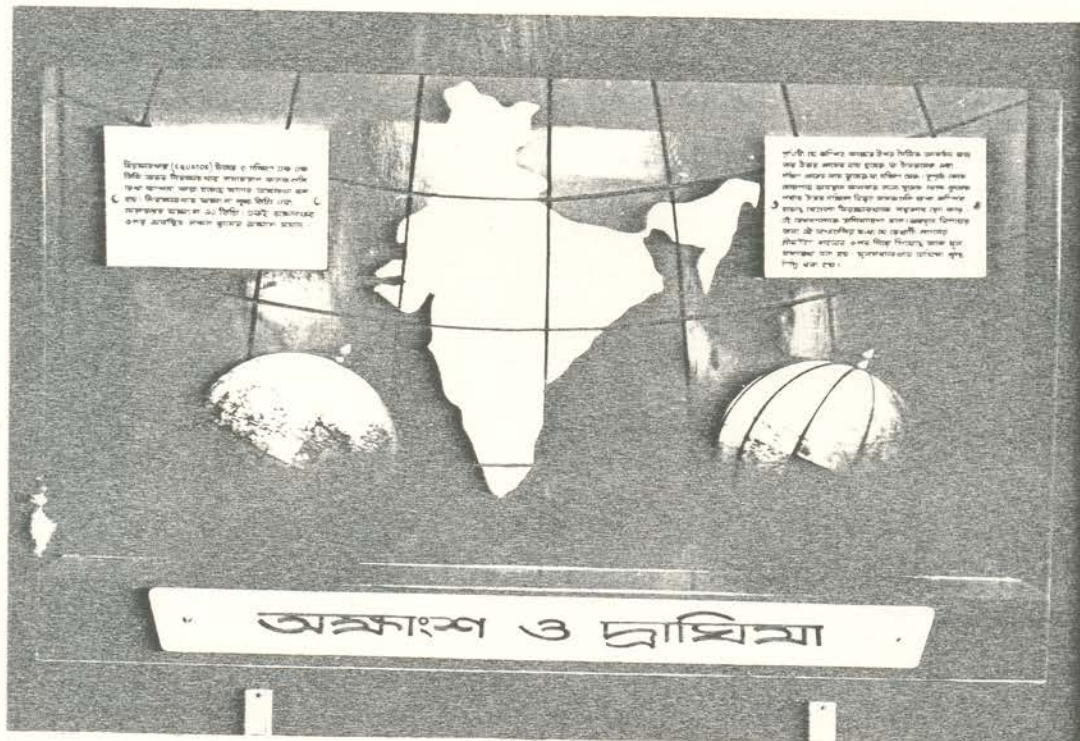
(b) After 21st June the Northern hemisphere starts tilting away from the sun and on 23rd September the sun rays fall vertically on the equator, when both hemispheres get equal amount of sun rays. Then the Northern hemisphere has autumn and the Southern hemisphere, spring.

(c) After 23rd September the Southern hemisphere starts tilting towards the sun and on 22nd December the sun rays fall vertically on the Tropic of Capricorn. Then the Northern hemisphere has winter and the Southern hemisphere has summer.

(d) After 22nd December the Southern hemisphere starts tilting away from the sun and on 21st March the sun rays fall vertically on Equator. Then Northern hemisphere has spring and Southern hemisphere, autumn.

(e) The change of season occurs because of the tilt in the Earth's axis. When the sun rays fall vertically on a place, the concentration of energy received is more. But when the sun rays fall obliquely the rays are distributed over a wider area.

LATITUDE AND LONGITUDE



The Earth is almost spherical in shape. Hence the positions of places on the Earth are conveniently expressed in degree-angles which are made at the centre of the Earth by those places.

The position of a place on the Earth's surface may be described by giving its latitude and longitude. On maps and globes the lines running east and west parallel to the Equator are called parallels of latitude. The lines running north and south through the poles and perpendicular to the Equator are the meridians or longitude.

Latitude is measured in degrees north and south of Equator. Longitude is measured in degrees east and west of Greenwich, a place east of London. Longitude passing through Greenwich is known as Prime Meridian and is in 0° longitude.