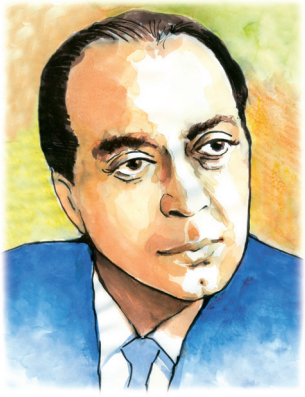
7 Science and Technology

In this chapter, we shall study India's achievements in the areas of science and technology. Also, we are going to learn about the important institutions in the areas of science and technology and their contribution.

Indian Atomic Energy Commission :



Dr Homi Bhabha

India's first Prime Minister Pandit Jawaharlal Nehru wanted to nurture a scientific temper and bring about the nation's progress. From this perspective, he set up the Indian Atomic Energy Commission on 10th August 1948. Dr Homi Bhabha was appointed as the first Chairman of the Commission. The objectives of the commission were to produce electricity from atomic energy, increase the yield of food grains and make them last longer, set up the technology for achieving this and develop nanotechnology. In 1956, the Department of Atomic Energy set up 'Apsara', a nuclear reactor functioning on atomic energy.

In 1969, an atomic power station was set up at Tarapur. A Reactor Research Centre was set up at Kalpakkam in Tamil Nadu to successfully use Thorium for generating atomic power. The role of reactors is important in developing atomic power.

Factories manufacturing the heavy water needed for the generation of atomic power were set up at Vadodara, Talcher, Tutikorin, Kota, etc. An institution called Heavy Water Projects was set up to carry out research on manufacturing heavy water within the country. It was later renamed 'Heavy Water Board'.

Let's Find Out !

28th February is celebrated all over the country as 'Science Day'.

What activities do you run in your school on this day ?

Dhruva Nuclear Reactor : In 1985, a completely Indian made nuclear reactor called Dhruva was started at Trombay near Mumbai. The Dhruva nuclear reactor uses uranium as fuel. At this center, 350 radioactive substances are produced. They are used in industry, agriculture and medicine.

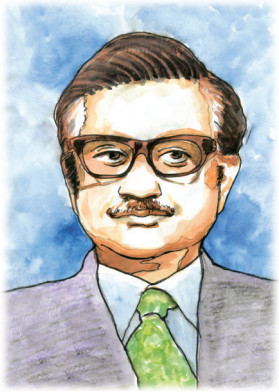
Nuclear Power Corporation of India Ltd. (NPCIL) : This Company was set up in 1987 to generate electricity from atomic energy. The objective of the company is to master and develop the technology to generate safe, cheap and environmentally profitable power and make the country self-sufficient.

Nuclear tests

First nuclear test at Pokharan :

Dr Homi Sethna

India successfully performed her first nuclear test at Pokharan in Rajasthan on 18th May 1974 in consonance with the policy of using nuclear energy for peaceful purposes



Dr Raja Ramanna

and for self-sufficiency. The reason why India took this decision was China's nuclear capability and Pakistan's desperate efforts to acquire nuclear weapons with China's help. Dr Homi Sethna, the chairman of the Indian Atomic Energy Commission and Dr Raja Ramanna, Director of the Bhabha Atomic Research Centre played a major role in conducting this nuclear test. Prime Minister Indira Gandhi took the decision of carrying out a 'nuclear explosion'. Pokharan was chosen on the basis of the required criteria for the location of the nuclear tests : far away from human settlement and no ground water reserves.

Do you know?

In 1974 when India carried out her first nuclear tests at Pokharan, the U.S.A. refused to give India the technology for defence related fields such as space research, communications and missile development. As a result, India adopted a policy of developing its own missile development programme without depending upon the U.S.A. Thus, India joined the rank of nations like the U.S.A, the U.S.S.R, France, China and Germany who had their own missile programmes.

Second Nuclear Test : On 11th May 1998, India carried out its second nuclear test to prove its nuclear preparedness. Three tests were done on this day. One of them was of the Hydrogen Bomb; Prime Minister Atal Bihari Vajpayee assured that there would be no first use of nuclear weapons by India. But the USA imposed economic sanctions on India immediately.

Missile development

Dr APJ Abdul Kalam

Prithvi : In 1988, India successfully tested the missile Prithvi and in 1989, the missile Agni. The entire world took note of India's programme of developing nuclear missiles indigenously.

Integrated Guided Missile Development Programme (IGMDP) was conceived by and carried out under the leadership of Dr A.P.J. Abdul Kalam. Defence Research and Development organisation (DRDO) undertook the task of building the missiles.

Prithvi-1, a surface to surface ballistic missile was given to the Army, Prithvi-2

Do you know?

In 1958, Defence Research and Developement Organisation (DRDO) was established under the Department of Defence of the government of India. The objective of this organisation was to make India self-sufficient with respect to means, equipment and weapons required for defence. After 1983, this organisation developed several missiles under the leadership of Dr A.P.J. Abdul Kalam. Dr Kalam has made a great contribution in the production of missiles. Dr Kalam is known as the father of India's missile programme. He is also refered to as the 'Missile Man' of India.

was given to the Air Force while Prithvi-3 was given to the Navy. Prithvi had the capacity to carry nuclear weapons of 500-1000 kg. Prithvi could travel a distance of 150-300 km due to the nuclear ballistic missile.

Agni : In order that China and Pakistan get an idea of India's missile strength and India's borders remain secure, Agni-1 was tested. This military missile had a range of 700 km. Later Agni-2 and Agni-3 were also produced.

Akash and Nag missiles : In 1990, the missile Akash was developed to fire from land into air. This missile has a capacity to carry 720 kilogram explosives at supersonic speed and a range of 30 kilometres. The missile Nag was made in order to destroy the tanks of the enemy. It is of the 'fire and forget' type. India has militarily become secure due to the production of missiles.

Space research : In 1961, Indian National Committee for Space Research (NCSR) launched India's first research rocket from Thumba Equatorial Launch Center in Thumba in the State of Kerala.

In 1967, our indigenously built rocket Rohini-75 was successfully launched. The next stage was the successful launch of the first Indian satellite Aryabhatta in 1975 with help from the Soviet Russia.

This success proved that Indian scientists can indigenously build and launch a satellite. Indian scientists were confident that they could acquire the technology for sending a message from the Earth Station and to assess the working of the satellite.

Indian Space Research Organisation (ISRO) : After the success of the basic programme in space research and rocket-related project, Indian Space Research Organisation was established on 15th August 1969 in order to carry out further space research. The headquarters of ISRO are at Bengaluru. ISRO activated the space station at Sriharikota in Andhra Pradesh for launching our satellites in space.

Bhaskar-1 : India launched remote sensing experimental satellite Bhaskar-1 from the Soviet Russia in 1979 in order to observe various things on the surface of the earth by remote sensing technology. This remote sensing technology would be useful for India's development by regarding water bodies, mineral deposits and forecasting weather. The photographs taken with the help of this technology about the bowels of the earth, environment and forests were important. Another area in which the information from this satellite was useful was oceanography. In 1981, 'Bhaskar-2' was launched from Soviet Russia.

APPLE (Ariane Passenger Payload Experiment) : The first completely indigenously built satellite by ISRO in India, APPLE was launched on 19th June 1981 from the French Guiana. 'APPLE' was beneficial in the field of education. The objective of providing emergency telecommunication services was successful.

Indian National Satellite (INSAT): In August 1983, the satellite INSAT 1-B was launched in space. Because of this satellite, a major revolution came about in the areas of telecommunication, television, radio, weather forecasting and space research in India. Due to INSAT, 207 Akashwani or Radio stations could be connected to each other. This mechanism was also useful for search and rescue of people caught in some

disaster like a shipwreck or an air plane crash, for forecasting weather, to look for and follow cyclones or storms, in the fields of telemedicine and educational institutions. The telemedicine service enabled the population from remote areas to get advice and treatment from expert doctors. Public Primary Health Centers in villages have been connected with superspecialty hospitals through INSAT.

Technological progress : A factory manufacturing railway engines, Chittaranjan Locomotive Works was set up at Chittaranjan in Bardwan District in West Bengal. Steam engines, electric engines and engines running on diesel were manufactured here. The first diesel engine was manufactured at the Diesel Locomotive Works at Varanasi. India started exporting railway engines to Sri Lanka, Bangladesh, Tanzania and Vietnam.

Telex service : The Department of telecommunications under the ministry of Communications started the telex service in 1963 to transmit typed messages from one part of the country to another rapidly. In 1969, the telex service started in Devanagari script in Delhi. Later it spread all over the country. This service began to be used in different fields. With the rise of internet after 1990, the significance of this service reduced.

Satellite Communication Centre : In order to establish satellite communication with the help of an artificial satellite, a domestic satellite communication earth station was established in 1967 at Jodhpur Tekra near Ahmedabad. This made it easy to train scientists and technicians in setting up and running an Earth Station within the country. In 1970, a centre was established at Aarvi near Pune, equipped for international telecommunication service.

Pincode : From 15 August 1972, the Post and Telegraph Department started the six digit Pincode system in the country. The Postal Index Code is intended to bring efficiency in distributing the mail. In this system the country was divided into nine regions. The first digit of the Pincode indicates the region, the second digit indicates the Sub-region, the third digit shows the main disbursement district while the remaining three digits show the location of the local post office. For Maharashtra, 40, 41, 42, 43, 44 are the first two digits. In 1986, the speed post service was started to send postage rapidly.

International Subscriber Dialling Telephone Service (ISD) : In 1972, Overseas Communication Service was established in Mumbai for the management of international telecommunication service. In 1976, the International Subscriber Dialled Telephone Service was started to connect Mumbai and London directly on phone. Alongside the telephone service, services like telex, teleprinter and radio images were started. In 1986, Videsh Sanchar Nigam Limited (VSNL) took a big leap in this field. Before that, Mahanagar Telephone Nigam Limited (MTNL) was a public sector company for giving telephone service in big cities. In the 1990s, Videsh Sanchar Nigam Limited held the distinction of being the main internet service provider in India. The contribution of Sam Pitroda in this field is significant.

Mobile : On 22nd August 1994, the mobile phone service started in India. At this time a mobile handset cost Rs.45,000 and calling was at ₹ 17 per minute. By 1990, many private companies came in this field. This made the service cheaper.

Let's discuss.

Find out about the various changes that have taken place in mobile phone technology. Discuss its advantages and disadvantages.

Bharat Sanchar Nigam Limited (BSNL) : In 2000, the telecommunication department was restructured. The responsibility to make policy decisions was retained with the Telecom Department and Bharat Sanchar Nigam Limited was established to actually provide the services to consumers. Along with the telephone service, cellular phone, internet, broadband services were also made available.

Oil and Natural Gas Corporation (ONGC) : In 1956, the Oil and Natural Gas Corporation was established to search for the deposits of mineral oil and natural gas and to increase their production. After Digboi in Assam, mineral oil deposits were found in Ankleshwar area in Gujarat. Later, mineral oil and natural gas deposits were found in the gulf of Khambhat in Gujarat.

In 1974, the Oil and Natural Gas Corporation started digging an oil well in 'Bombay High' area with the help of Russian scientists by a drillship called 'Sagar Samrat'. From 1975, mineral oil and natural gas began to be extracted from there. Later, more than 8500 oil wells and 33 natural gas wells dug eventually in this area began to contribute 38% of the total mineral oil production in the country and met 14% of the country's demand for crude oil.

Railways and Technology : The technology adopted by railways has a big role in the history of modern India.

Do you know?

E. Sreedharan is famous by the nickname as 'Metroman'. His work regarding 'Delhi Metro' and 'Konkan Railway' is noteworthy.

Konkan Railway : Konkan Railway started in 1998. There are several records of technology to the credit of Konkan Railway which stretches over the four States of Maharashtra, Goa, Karnataka and Kerala over a distance of 760 kilometres. There are 92 tunnels on this track. The 6.5 km tunnel at Karbude is the longest tunnel. There are 179 big and 1819 small bridges on this track. Out of these, the 2065.8m long bridge on River Sharavati near Honnawar is the biggest. The 64m tall bridge on River Panval near Ratnagiri is India's tallest bridge. For avoiding accidents on tracks that are prone to landslides, there are sensors fitted to the railway engines.

In order to bring efficiency, accuracy and coordination in the reservation system in rail travel, computerised reservation system was started for the first time in Delhi in 1984. In the same year, the Metro was started in Kolkata.

In this way India has been making progress in the fields of science and technology. New inventions have been made. India is an important 21st century nation, which has always used technology for establishing peace in the world. India is making all these advancements in order to be the foremost among nations in the 21st century.

In the next chapter, we shall learn about the progress India has made in the fields of commerce and trade.

Exercises

1. (A) Choose the correct option from the given options and complete the statements.

(1) ..... was named as the first Chairman of atomic energy commission.

(a) Dr Homi Bhabha (b) Dr Homi Sethna (c) Dr A.P.J. Abdul Kalam (d) Dr Raja Ramanna

(2) ..... was the first completely indigenous communication satellite made by ISRO.

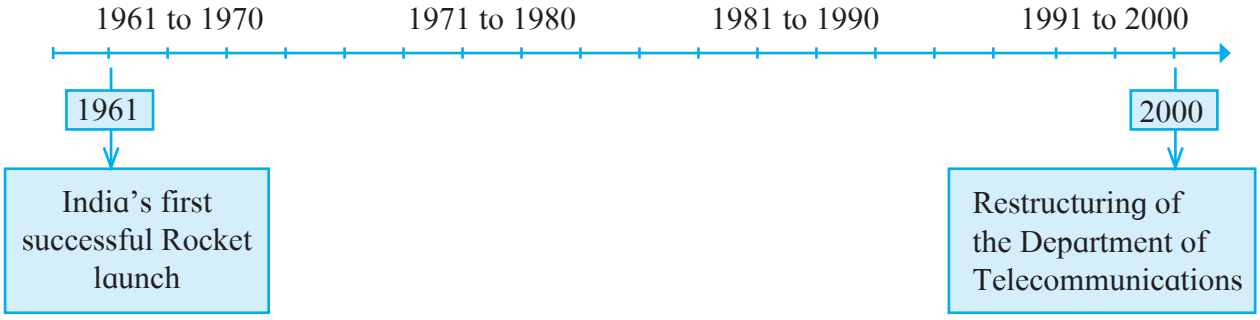
(a) Aryabhatt (b) Insat 1 B
(c) Rohini-75 (d) Apple

(B) Identify and write the wrong pair.

(1) Prithvi – surface to surface ballistic missile
(2) Agni – surface to underwater ballistic missile
(3) Akash – from surface to air attacking missile
(4) Nag – anti-tank missile

2. (A) Complete the activity as per the given instruction.

Prepare a timeline of the progress of India in science and technology.



(B) Write short notes on-

(1) Space research
(2) Telex service
(3) Pokhran nuclear test
(4) Bhaskar - 1 satellite

3. Explain the following statements with reasons.

(1) Pandit Nehru established the Atomic Energy Commission.
(2) India decided to conduct nuclear tests.
(3) USA imposed economic sanctions on India.

4. Answer the following questions in detail.

(1) Which of the everyday services are influenced by the satellite technology?
(2) Why is Dr. A.P.J. Abdul Kalam called as the 'Missile Man'?
(3) How one can do computerised reservation for rail travel?
(4) Write the key features of Konkan Railway.

Projects

(1) With the help of the internet find information about 'Thumba Equatorial Launch Centre'.
(2) Visit a nearby radio/television centre and get more information about it.

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