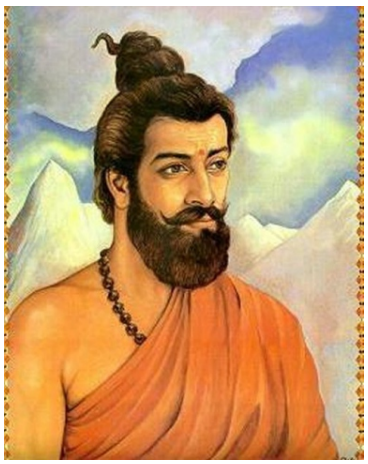
Chapter-18
Indian Scientists : Biography and Achievements

Generally science has two facets- basic sciences and application of sciences. Applied sciences impact the economy of the country and is known to have qualitative effect on life. Basic sciences develop the scientific attitude, understanding and knowledge where as the applied sciences help in our progress. From the ancient times the Indian scientists have been working towards development of both the scientific approches to make our lives better. In this context biographies and achievements of a few Indian scientists are described below in short.

18.1 Sushruta

Descendant of Vishwamitra, Sushruta was born around six hundred years before Christ. He learnt primary medical education in the ashram of Dhanwantri. Sushruta was the first to give the sophisticated knowledge of surgery in medical sciences. He refined the procedures of surgery and performed many complex surgeries and provided knowledge regarding equipments used in the surgical procedures.



Sushruta

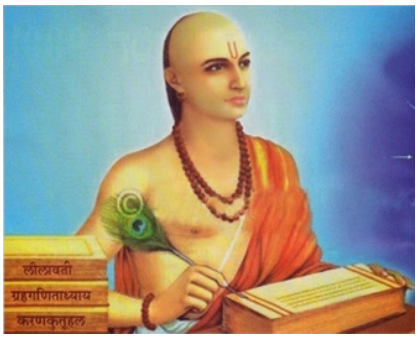
He has written 'Sushruta samhita' in which details of surgery is described. Long before the Joseph Ester, Sushruta thought of antiseptic and sterlization. He directed his subordinates and disciples to heat the equipments to kill bacteria. He used non poisonous leeches to speed up blood clotting.

In ancient scriptures, around 26 centuries old, examples of plastic surgens of ear, nose, lips etc. performed by him were given. He may be called the father of plastic surgery. He provided knowledge of 101 equipments. Many of his equipments were earlier versions of spring forceps or cutter or forceps for bandage etc. He also gave ideas for cleaning procedure of the operation area.

Conclusion : India was far ahead of other countries in medical sciences. Sushruta's grantha was translated in many languages and is very famous. Sushrut is one of the greatest surgeons.

18.2 Charak

Charak was the great acharya (Professor) of Ayurveda form of medical sciences. He was the first doctor who gave the concept of digestion, metabolism and body immunity. According to him the body has three main defects in its functioning- Pitt, Vaat and Kaf. Imbalance of these three leads to different diseases.



Charak

He wrote a grantha named Charak samhinta around 200 years before Christ. It is one of the ancient surviving grantha on medical sciences. It is

writtten in sanskrit. The grantha is divided into 8 sections and is both in proses and verses

More than 2000 years ago Charak discussed about principles of genetics. He knew the reason of determination of gender of child. Children suffer from genetic defects like blindness, lameness because of some deficiency or defect in child's father or mother. He told that heart is the controlling centre of the body and is connected to main arteries.

He has also given directives for doctors and medical students. Acccording to him doctors should not keep enmity with patients in any case. People associated with medical profession should not disclose household information of a patient to others. Doctors should always be ready to learn and acquire knowledge.

Charak has a meaning- to walk (sanskrit). Acharya Charak used to travel a lot to cure common people suffering with various ailments and to educate them and hence he was called Charak.

18.3 C.V. Raman

Chandrashekhara Venkat Raman born on November 07,1888 in Trichirapalli city of Tamil Nadu state of India. His father was Chandrashekhar Ayyer and mother was Parvati Ammal. His father was a lecturer in physics in Waltear college. Raman passed Inter in first division with scholorship from Waltear college in Visakhapatnam. He passed Master of Sciences in 1907 at the age of 19. He got M.Sc. with the highest distinction from University of Madras.

C.V. Raman

At the age of 19 he passed government competetive exam of economics in which literature, history, sanskrit and political sciences were the topics. He joined as Deputy Auditor General in government of India.

He also workded on musical instruments like Veena, Mirdang, Tanpura and other Indian instruments as well as western musical instrumetns like piano, violin etc and discovered the harmonic nature of the sound.

In 1917 Raman resigned from his government job becuase he was not able to give time to scienctific reserach and became the First Palit Professor of Physics in Calcutta University. During his tenure he discovered Raman effect in 1928. In 1930 Raman got Nobel prize for his famous discovery of Raman effect. Raman effect is also known as Raman scattering. Raman scattering is the inelastic scattering of a photon by molecules which are excited to higher vibrational or rotational energy levels. Important fact with this discovery is that he and his student K.S. Krishnan used very few and cheap equipment around costing two hundred rupees for the experiments.

In 1949 he was appointed as the First National professor by the Government of India. In 1954 Raman was conferred Bharat Ratna' by Government of India. For his work towards friendship between nations he was awarded Lenin Peace prize in 1957. He was also given Knighthood in 1929.

He explained the reason for blue colour of sea and space. He studied the Raman Effect in solids, liquids and gases He also carried out scientific research on magnetic field, X-rays, structure of crystal, and acoustics. He died on November 20, 1970. In his honour on 28 Februaary India celebrates Science day.

18.4 Dr. Homi Jehangir Bhabha

Bhabha was not only a great scientist but also an art administrator and lover. He was also an excellent artist and his paintings are exhibited in British art galleries.

Dr. Homi Jehangir Bhabha was born on October

30,1909 in a prosperous Parsi family in Mumbai. His early studies were in Cathedral and Johan Connon school in Mumbai and at the age of 15 he entered Elphinstone College Mumbai. Afterwards he went abroad to Cambridge Universtiy for further studies. He obtained a degree in mechanical engineering in 1930 and then started working on theoretical physics. His research was manily in cosmic rays and nuclear energy. In 1942 he was appointed lecturer in cosmic rays.

Bhabha was related to industrialist Tata family. In 1937 he studied cosmic rays with Watler Heitler and described that primary cosmic rays from other space interact with the upper atmosphere to produce particles observed at the ground level. The particles interact with air particles and produce showers of particles like electrons. He discovered these nuclear particles which were afterwards known as Mesons.

Dr. Homi Jehangir Bhabha

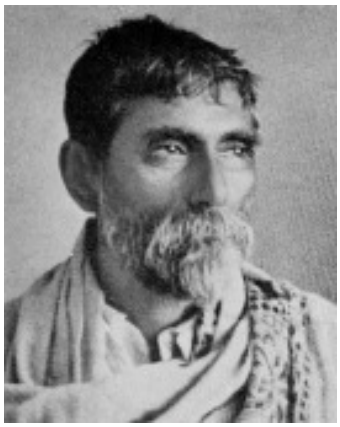
He was instrumental in the establishment of Tata Institute of Fudnamental Research (TIFR) in 1945 with the help of Dorabji Tata. In 1948, Atomic Energy Commission was formed and Bhabha was appointed its first chairman. He was also appointed the director of nuclear programme in India. Under his guidance atomic reactors Apasara, Cirus and Zeralina were commissioned. In 1963 the construction of first atomic power plant was started in Tarapur, Maharastara.

He is also known as the father of Indian nuclear science programme. In September 1956, 81 nations held conference in New York for establishment of atomic agency and Bhabha was elected chairman of the conference by common consent .

He died in a plane crash near Mont Blanc in Germany on January 24, 1966. In 1967, the Atomic Energy Establishment Trombay (AEET) was named after Bhabha to honour his dedication to nuclear energy in India and was named Bhabha Atomic Research Centre (BARC).

18.5 Dr. Prafulla Chandra Ray

Dr. Prafulla Chandra Ray was born in Raruli Katipara village of Khulana district of earstiwhile Bengal on August 02,1861. His father Harish Chandra Ray was a wealthy person and an expert in Persian. His early school education was in this village. Then his father migrated to Calcutta and he was admitted to famous Hare schoool of Calcutta. Beacuse of severe illness he returned to his village for a few years and again he resumed studies at Albert school Calcutta.



Dr. Prafulla Chandra Ray

In 1879 he cleared the entrance examination for admission to Metropolitan school. As there was no science classes in Metropolitan school so he used to go to Presidency college for science classes and laboratries as external student. He developed his curiority towards chemistry and in 1982 he was awarded one of the two Gilchrist prize scholarships after an all India competitive exam.

He did not complete his course for his degree

and went to Edinburgh University, Britain for B.Sc. Afterwards Ray completed DSc from the same university in 1887. Among his fellow workers were Professor James Walker, FRS, Alexander Smith and Huff Marshall. They all were motivating factors for his interest in chemistry He was elected vice president of Edinburgh Universtiy chemical Society in 1988.

After his return to India he joined Presidency College as temparary Assistant Professor in chemistry. He observed that many British teachers with lesser qualification than him were on higher posts and higher salaries. He complained about this inferior treatment to native intelligentsia to the director. The director told him satirically that if your are such an able chemist then why don't you start your business.

He took this seriously and with a meagre sum of Rs. 800 he started Bengal Chemical Works in 1892. Afterwords it was renamed Bengal Chemicals and Pharmaceutical Works Ltd in 1901. It was first pharmaceutical company in India. Soon it became a big business and gave way to other entrepreneurs to start businesses. He died on June 19, 1944 at the age of 83.

18.6 Dr. Panchanan Maheshwari

Dr. Panchanan Maheshwari was Indian Botanist. He was born on November 09,1904 in Jaipur. He studied at Allahbad University and started teaching at Agra college. Afterwards he taught in Allahabad, Lucknow and Dhaka universities. In 1948 he joined Delhi University as head of Botany Department.

Dr. Panchanan Maheshwari

His research contribution was in plant embryology. He developed a new branch by mixing embryology and tissue cultrue. He developed technique to provide artificial nutrition to different parts of flowers for their development.

His students were from America, Argentina, Astralia and other countries. Around 60 students did doctorates under his supervision.

Dr. Maheshwari represented India in many international conferences in botany. He developed centre for tisue culture and embroyology and to honour his research he was elected a Fellow of Royal Society (FRS) in 1965.

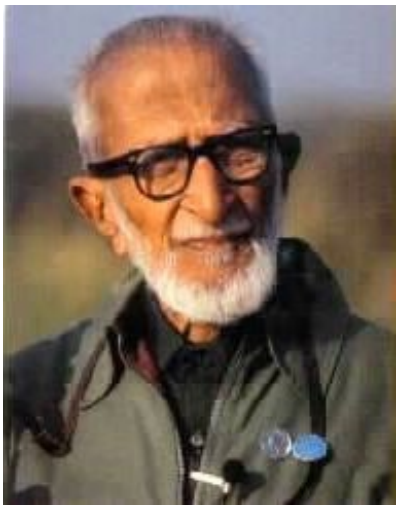
He died in May 18,1966 in Delhi

18.7 Dr. Salim Ali

Dr Salim Ali was born on November 12, 1896 in Sulemani Muslim family. He was an Indian ornithologist and naturalist. He is also referred to as Birdman of India. He was the first person who systematically conducted surveys on birds all around India. His books on Indian birds helped in popularising ormithology in India. In 1976, he was awarded the Padma Vibhushan, the second highest Civilian Honour of India. After 1947, he became the main person behind the Bomaby Natural History Society. He used his personal influence for getting government support for the organisation. He was also instrumental in creating Bharatpur Bird Sanctuary (Keoladeo National Park). He worked hard to stop the construction of a dam that was a threat to Silent Valley National park.

Under the guidance of the secretary of Bombay Natural History Society, W.S. Millard, Salim started studying birds thoroughly and identified an unusual sparrow that he had shot for sport with his toy air gun. Millard identified it as yellow throated sparrow and showed Salim the collection of stuffed birds in the collection of society. He gave a few books to start collecting birds and one of the books was common 'birds of Mumbai.'

In his autobiography "The Fall of a sparrow "



Dr. Salim Ali (Ornithology)

Salim writes that the event of yellow throated sparrow was life changing event for him because this event led him into ornithology.

Primary education of Salim Ali took place in Bombay. Later on he went to St Xavier's College, Bombay. He decided to take up the job of a guide to lecture in Prince of Wales Museum for Rs. 350 as he was not having formal university degree and then decided to continue his studies. He was awarded honorary doctorate by Aligarh Muslim University (1958), Delhi University (1973) & Andhra University (1978). He died in 1987 after prolonged cancer of prostate at the age of 91. In 1990 Government of India esablished Salim Ali Centre for Ornithology and Natural history.

18.6 Dr. A.P.J. Abdul Kalam

Dr Abdul Pakir Jainulabdeen Abdul Kalam was born on october 15, 1931 in Dhanush Kodi town of Rameshwaram district of Tamilnadu. His father was Jainulabdeen and mother was Ashiamma. His elementary education was in Rameshwarm and for high school he went to nearby town Ramnathpruam's Schwartz Higher Secondary School to study science. Iydura Soloman was his source of inspiration. Kalam made three points of teachings of Solomon as the basis of his life. In Solomon's words-willpower, faith and hope are three necessary points for a successful life.

Dr. A.P.J. Abdul Kalam

In 1954 he joined Madras Insitute of Technolgy to study aeronautical engineering. In 1958 Kalam was appointed senior scientist in Hovercraft project under Defence Research and Development Organisation. Influenced by Kalam's dedication and hard work, Prof M.G. Menon took him to Indian Space Research organisation in 1962. His golden period of life started from here.

Kalam took the training of technique of laucnhing of Rockets from NASA and first Rocket 'Nike Apache' was launched by India from Thumba. He was appointed project director of SLV project and under his directorship SLV III suceessfuly deployed 'Rohini' Satlellite into orbit.

In 1983 Kalam was appointed Chief Executive of Integrated Guided Missive Development Programme (IGMDP) and he played very important part in development and launching of 'Prithvi', 'Agni', 'Trishul', 'Nag', and 'Akash' missiles. He was present during First Nuclear Test at Pokaran and was Chief Project Coordinator for Pokaran-II nuclear test in 1998. For his important contribution to the development of missiles in India he is also known as 'Missile Man'.

Dr. Kalam was elected to the highest Consitutional post and served as the president of India from 2002-2007. Government of India honoured him with Padma Bhushan (1981), Padma vibhushan (1990) and Bharat Ratna (1997).

On July 27, 2015 Dr. Kalam died of cardiac

arrest while delivering a lecture in IIM Shillong. It was a great sad back not only for India but for the whole world.

Important Point

1. Charak was a great Acharya of Ayurveda. He had written Charak Samhita around 20 centuries ago. It is in sanskrit and contains in detail the human antomy, diseases and thier medication. ^
2. Sushrut was one of the greatest surgeons of ancient India. Around 26 centuries ago he introduced caesarean operation, antiseptic, sterlization and plastic surgery.
3. Sir C.V. Raman was born in 1888 in Trichirapalli. At the age of 19 he was selected Deputy Auditor General of Government of India.
4. Dr. Raman discoverd 'Raman Effect' for which he was awarded Nobel Prize in 1930. According to Raman Effect when light passes through transparent medium then because of scattering its frequency changes.
5. Born on october 30, 1909 Dr Homi Jehangir Bhaha became the First President of Atomic Energy Commission, Under this guidance atomic reactors Apsara, Cirus, Zerlina were established. He discovered mesons.
6. While woking in ISRO and DRDO, Dr. A.P.J Abdul Kalam provided international identity to Indian space and defence sector Missiles like Prithvi, Nag, Trishul, Akash and Agni were developed under his leadership.
7. Pokharn Nuclear test of 1998 was performed under his guidance. In 1997 he was awarded Bharat Ratn.
8. Dr. Kalam was elected for the highest constitutional post of India 'The President' in the year 2002.
9. Dr. Panchanan Maheshwari was a Botany scientist. His specialization is plant embroyology. With the help of combination of embrygology and plant tissue cultrue, he developed different parts of flowers with artificial nutrition.
10. Dr. Praful chandra Ray was a chemical scientist. He developed many medicines with very small amount. This work was done in Bengal chemical and Pharmaceutical works. This factory later on became worth crores of rupees. Many new industries started following the early success of this venture.
11. Dr Salim Ali is known as 'Bird Man of India' and is scientist of natural history. His study was on birds. He was instrumental is establishing Bombay Natural History Society. His special conribution was in the establishment of Keoladeo National Park and Silent Valley National park.

Practice questions

Objective type questions

1. For which branch of enginering Dr. A.P.J. Abdul Kalam studied at Madras institute of Technology.
   (a) Computer (b) Aeronautical
   (c) Electrical (d) Electronics
2. In which year did Sir C.V. Raman got nobel prize?
   (a) 1928 (b) 1930
   (c) 1932 (d) 1934
3. Who is ornithologist ?
   (a) Dr Panchanan Maheshwari
   (b) Meghnad Saha
   (c) Dr. Praful chandra
   (d) Dr. Salim Ali
4. Where is Bhabha Atomic Reserach Centre (BARC) situated?
   (a) Madras (b) Dehli
   (c) Kolkata (d) Mumbai
5. Charak Samhita is written is which language?

(a) Hindi (b) Persian

(c) Sanskrit (d) Urdu

Very short type qeustions

6. Dr. Bhabha identified which particle in the cosmic rays?
7. Sushrut was descendent of which saint?
8. According to Charak what causes genetic defects?
9. First appintemnt of Dr.C.V. Raman was on which post ?
10. Which reactors were established under the guidance of Dr. Bhabha
11. Which Scientist was instrumental in the establishment of Keoladeo National Park (keoladeo Bird Sanctuary)?

Short type questions

12- What is the contribuiton of Dr. Kalam in defence and space research?

13- What is Raman effect? What is its importance?

14- What is the contribution of Dr. Panchanan Maheshwari in Botany?

15. Match the following

(i) Bird Man of India	(a) Sushrut
(ii) Missile Man	(b) Dr. A.P.J. Abdul Kalam
(iii) Father of Plastic surgery	(c) Dr. Bhabha
(iv) Father of Indian Nuclear Science	(d) Dr. Salim Ali

Essay type questions

16. Discuss the life history of Sushurut and his contribution in science.
17. Discuss the life history of Dr A.P.J. Abdul Kalam and his contribution in science.
18. Discuss the life history of Sir C.V. Raman and his contribution in Science.
19. Disucuss the life history of Dr. Salim Ali and his contribution in Science.

Answer key

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