
UNIT 31 PERCEPTIONS AND ASPIRATIONS

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31.1 INTRODUCTION

You have studied how science and technology have always been an integral part of human endeavour. By now, you are also aware of the immense potential of science and technology in mobilising resources for producing food for all, eradicating disease, providing better materials and processes for improving the quality of life. In this unit, we will have an overview of the science-society interaction and stress on the need for a systems approach. The orientation, which science and technology take, is determined by a number of factors including social factors. Science and Technology can be used for human welfare as well as to create instruments of coercion and mass destruction. We will discuss the perceptions and aspirations humankind has today, in this broad framework. In the next unit, we will discuss how science and technology can be used for all round development and for self-reliance.

Objectives

After studying this unit you would be able to:

- recognise that science influences the entire social edifice and in turn scientific development should be influenced by social needs and perceptions,
- realise the need for a systems approach in overall planning, in which social objectives must be the primary concern and
- appreciate the aspirations of humankind in a situation where science and technology can be used for human welfare or for creating instruments of coercion and mass destruction.

31.2 SCIENCE AND SOCIETY INTERACTION

We are nearing the end of the Foundation Course on Science and Technology. It is time to sum up and get an overview of the relationship between human society and its endeavour which is called science and technology.

On the basis of the units you have studied so far, it would be obvious to you that science and technology are an integral part of human activity and society; they were, indeed, founded when the first human beings acted to procure food or shelter. They have grown into a magnificent body of tested knowledge, and this knowledge is growing continually. Science and technology influence society by improving the methods of production and by bringing a change in social outlook. In its turn, conditions prevailing in a society

affect the path and the rate of growth of science and technology. Let us further discuss these two aspects.

31.2.1 Science Influences Entire Social Edifice

Science and technology are involved in all the processes of production, and, therefore, with all the goods we have at our disposal. The pen you write with, the paper you write on, the food you eat, the clothes you wear, the medicine you take, are a few examples. To produce these articles, work is done at home or in factories, or in the fields and forests. Since millions of goods are needed to sustain society, production has become a highly organised activity. You have seen in Block 1 and 2, dealing with the History of Science, how different kinds of social organisations arose as the methods and means of production changed in a society. For example, when individuals could not survive due to difficulty in procuring food and facing wild animals, they had to live in groups. Since they had no way of preserving food, they had to share equitably whatever was gathered by way of food. This “primitive” society changed when agriculture was discovered. This step by step process has been traced in the earlier blocks, right up to the present times, when robotic production and biotechnology are indicating the path which a future society might take.

The great variety of goods produced through industry or agriculture has to reach buyers or consumers. For that, trade and commerce and a system of transport are necessary, which science and technology have provided. You know of the discovery of the wheel, which made animal drawn carts possible in the olden days. Nowadays, we have jet aircraft travelling faster than sound, and huge ships transporting grain, oil or machines from one country to another. From inter-tribal exchange of goods, we have come to have international trade. In a sense, the world has shrunk. Once upon a time, 500 km was “too far” and one could not contemplate such a journey, then perhaps 2000 km was too far, because the earth was thought to be flat and you could just drop off the edge, and now one can go from Delhi to London by regular airlines in eight hours!

The great production system, supported by an equally great and intricate trade and transport system, has brought people and countries into greater interaction. Therefore, a system of communication has had to be developed using science and technology. Here again, things have changed from shouting to one another, or signalling with arms or lighting fires, to communicating by telephone, radio or computer. Our entire “cultural” life has thus been altered, or enriched, by modern means of communication. When decisions are to be made, information is needed, and that is now increasingly stored by computers and retrieved as required.

With change in the means of production, social organisations have also changed. Problems of managing large societies have continuously been tackled by evolving new methods and patterns of governance. Thus, society has evolved from the early stages of primitive community living to slave societies, kingdoms, republics, capitalism, and socialism.

Science and technology have played a vital role in the transformation of human society. They have allowed us to use the resources of the earth, the oceans and the air, and to harness the energy which makes the wheels of production or of transport to move, and communication to take place.

We also need education and training for the people to man the vast network of production, distribution, communication and administration. Therefore, there is the need to continuously advance knowledge and to improve all products and systems for the benefit of humankind. Men and women of ideas are needed, whom an educational system suited to a particular society could help to train. Such an education system itself would be based on science and technology. For instance, printing presses to produce books, factories to produce paper, audio-visual aids, all kinds of apparatus needed for laboratories are products of science and technology. In addition, science and technology would also influence the ideas, philosophy and attitudes prevailing in our times.

Society Influences Scientific Development

But just as science and technology provide all the “nuts and bolts”, as well as many of the ideas that hold our society together, society itself provides the environment and atmosphere for science and technology to either grow fast, or stagnate or even decay! Science and technology do not exist independent of the society, its culture and the value system. They are a part of the socio-economic and political framework of a given society.

Motivation for the practical application of science and, hence, its growth and use comes from the economic needs of the society. The economic planning and policy of a society determine its social programmes and the purposes and goals of society’s production activity, which in turn provides the incentive for scientific growth. However, answers to questions like what kind of economic policy will be pursued, whether the social programmes will be implemented, and to what extent, depends on the political and social organisation of a society. Thus, science and technology can be more directly influenced by the general policies and social structure of a society.

For example, when economic growth is purely determined by market demands, artificial demands for goods are created by advertising, even though there is no pressing need for them. Ideas of people are sought to be moulded by propaganda carried on by radio or television or even by education. The competition to produce more goods, increase profits or the desire to provide fancy goods to an influential section of a population results in one kind of development of science and technology. On the other hand, if a society desires and plans to improve rural life or give priority to public health or provide a certain level of nutrition to all citizens, the tasks and consequent development of science and technology should follow a different path.

Still another example is the question of spending money on weapon of offence or defence that naturally affects science and technology. It is known that the world today is annually spending Rs. 15 lakh crores (15×10^{12} rupees) on weapons and their development. This not only takes away money needed to feed, clothe or provide health and shelter to people, but it also prevents the development of science and technology for constructive purposes.

SAQ 1

Discuss briefly how developments in the following areas have affected the living styles of people. Write your answers in the given space.

i) Transport

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ii) Communication

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iii) Education

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We can conclude that science and technology are part and parcel of a larger social system, whose other components are industry, agriculture, trade, distribution of goods, communication, education, government and administration etc. As human beings interested in human welfare, if we wish the greatest human assets-science, technology, education and culture to flourish and advance, we shall have to adopt an “over all” or a systems approach.

31.3 NEED FOR A SYSTEMS APPROACH

Science and technology cannot be advanced by viewing them in isolation. The whole social, economic and political system will have to work in unison so that all round advancement can take place.

31.3.1 Primacy of Social Objectives

Furthermore, we see that every thing has two sides — the good and the bad. Science and technology can benefit people; we can protect our environment, make good use of earth's resources, provide enough food for all, and cure diseases. On the other hand, one could develop weapons of mass destruction; in fact, the world arsenal of nuclear weapons is so large that just 1% of it, used deliberately, or by some error, can destroy all life on earth. *The choice is to be made by human beings constituting society.*

Society can be so organised as to maximise profits or to maximise human welfare. Society may put emphasis on "economic growth" which may make the rich richer and the poor poorer; or it may choose to combine growth with egalitarian distribution of benefits. Society may emphasise industrialisation, irrespective of what impact it has on human environment or the finite resources of the earth, as has been happening in some countries ever since the Industrial Revolution in the middle of the 18th century. Or society may choose such technologies or such industries as tend to preserve our resources and living environment.

It is obvious, that first of all, any country, such as India, must clearly spell out a consistent set of social objectives that it wants to achieve. Then, the tasks can be set for various sectors, such as industry, agriculture, transport, communication, health and education etc. The science and technology either available or to be developed can then be visualised. Planning and gradual achievement of targets are necessary to get to the desired goals.

Healthy social thinking which reflects one's concern for others, and a responsible social action stemming from that are needed. And if this Foundation Course in Science and Technology has helped to generate such ideas, it has served a truly educational purpose.

With this overview, you would be able to read the following short description of scientific and social evolution of our institutions. What you have studied in earlier blocks has in a sense, been summarised and brought to a focus in what is presented below.

31.3.2 Evolution of Science and Some Social Ideas

In antiquity, when human beings picked up a stone, and threw it at another animal, either to kill it or to save themselves, the first step in the evolution of science was taken. With the increasing use of discovery and invention, their pattern of development became markedly different from that of other animals, and a complex set of social institutions grew around them. This also posed before them two sets of problems, which beset them even today:

- control of the material world, and
- control of human beings.

Control of the Material World

Human culture has evolved through a number of important steps: from use of stone implements to use of copper (c. 5000 BC) to the invention of wheel (c. 3500 BC) to use of iron (c. 1500-1000 BC), and to more recent developments in the use of various metals. On the energy front, fire was discovered long ago. Traditionally power has been supplied by human and animal muscles, wind and flowing water. Use of steam in the 18th century

ushered in the industrial revolution. Now of course, other sources of power such as nuclear fission have become available.

The experience gained in dealing with the world of materials resulted in creation of knowledge, which when abstracted and systematised became science; and when applied to develop new articles and the processes of making them, became technology.

Control of Human Beings

The art of acquiring knowledge, and using it for making the articles needed brought different people together in a common endeavour. With increasing complexity of jobs to be performed, the problem of initiating and directing people to perform the jobs came to be of critical significance. The task was divided into two broad areas; actually doing the work, and directing it. Consequently, people were also divided in two categories, those who did the work and those who directed them. With the advent of agriculture, it became possible for human beings to produce more than their need, and, thus, it became possible for some to live without actually doing any work. The invention of writing, further strengthened the division. Those who directed others to do the work became guardians of knowledge. As this division hardened, the question of making people do things which were required to be done, became more and more important. Techniques had to be developed to make people acquiesce into the scheme of things organised by the guardians of knowledge, who lived on the surplus produced by those who laboured, without doing the work themselves.

Looking back at the evolution of human society, it appears that three approaches to control human beings have been followed:

- obtaining voluntary co-operation
- through disciplining, such as in the army, and
- by instilling fear.

The use of a particular technique depends upon the type of society. To organise an equitable and just society, the technique of voluntary co-operation was adequate. This technique meant an understanding, on the part of citizens, of the issues involved, and dissemination of the existing knowledge. In the past it was, sometimes, done by religious leaders and later by political parties. In societies in which a few lived at the expense of others, cornering all the gains to themselves, the other two techniques were used. To increase the efficacy of these techniques, a number of **stratagem** were employed. Severe punishment was prescribed for breaking the prescribed rules; fatalism was encouraged; rewards were promised in the after-world, that is after death; and myths were created to justify and perpetuate superiority of a small segment over the vast majority.

The problem of controlling people created a dual vision: of an equitable and just society as preached by religious prophets, social reformers and political thinkers, and of unlimited control of a few men over a large number, to make them obey their command and do things at their bidding. In this process, it may appear ironical that the control of material resources (which created the basis for bringing people together) became secondary to control over people. The more was the society patterned and command, the greater became the use of materials to control them through propaganda machinery and weapons of coercion and war. However, control of human beings has been found to be far more difficult than the control of materials of all kinds.

SAQ 2

Fill in the blanks in the following, using appropriate words:

- i) A approach is needed if we wish science and technology to be used for

- ii) Systematised knowledge about the material world became
This when applied to develop new materials or processes became
- iii) While control over material world has opened immense
for human welfare, control over human beings has resulted in
conflicts.

31.4 RELEVANCE OF PAST TO PRESENT

One may question the relevance of all this to contemporary society. Why should one be concerned at all with what has gone before? Is it not better that attention be directed to the problems of the present rather than go back into history?

Our contention is that, though the scale of the present day problems is different, they, nevertheless, are in essence a continuation of the age old dilemma of the control of human beings. Should it be done through voluntary effort, by creating an understanding of the problems and in the light of existing knowledge, by motivating people towards a common cherished goal and to arrive at decisions by participation of the people? Or, should men and societies be controlled for the benefit of a few, maintaining a high level of ignorance and fear? The shape of the future society would depend on the decisions which are taken now.

It is a fact of history that the crisis of each of the earlier societies led to their total disruption. An unjust society, maintaining inequality, cannot last long. The wasteful use of materials creates an economic crisis which cannot be overcome without reforming the society. Each reform or re-arrangement of society created the hope and vision of a just society, soon to turn sour, leading again to a new unjust society based on inequality.

Many countries of the world, today, are passing through one or the other stage of a crisis.

Before a closer look is taken at the present crisis, it may be worthwhile looking at how some of the features of the present society have emerged since the Industrial Revolution.

31.4.1 Science and the Creation of New Vision

Rapid development of science in Europe, nearly 350 years ago, when the working of the material world began to be clearly understood, created a great sense of confidence in human intellect. And it generated a hope that reason would be used in social matters too in order to solve problems and improve conditions of living for all. It created the possibilities of a new prosperity and brotherhood of men. The development of technology generated new resources, particularly in terms of steam and electric power and it provided to people, materials and products hitherto outside their reach. Each new step, each new success, created new aspirations and hopes, and generated the feeling that a world-wide fair and just society, bestowing dignity to man, would be created.

In the process, results were achieved and startling new opportunities were created, but soon the vision and hopes turned sour. The capabilities generated by the growth of science and technology started being misused for the purpose of exploitation of human beings and whole societies, and for the purpose of conquest and destruction. The beneficial uses which should have been shared by the people at all levels of society were limited to, and served, only a small group of people and a few countries. For example, inequality among people continued unabated in England, the exploitation of the Indian resources and dumping of British goods in India created greater poverty here and ruined Indian handicrafts and industries. Freedom of the Indian people was trampled upon. Numerous wars were fought for the possession of colonies, and this became more and more destructive because of advances in technology of weapons.

In the last five decades, many countries have thrown off the colonial yoke. However, since they still depend on the developed countries for scientific and technical know-how

they are now able to make their choices about the way they want to develop. A growing realisation of this situation has emerged among the people of these countries.

31.5 NEW PERCEPTIONS AND ASPIRATIONS

These developments and disappointments with the social outcomes of scientific advances have served to awaken scientists to a new dimension of problems which had been glossed over so far. It is instructive for us to have a glimpse of what new perceptions are arising.

Contrary to the belief held until a few decades ago, that man, society and environment have infinite capacity to absorb technology, it has been found that serious damage is being caused to all three. Therefore, alternatives are being thought of.

In the last few hundred years, greater emphasis has been laid on the rights, privileges, intellectual growth and the like of the individual. At the same time, technological innovations have been aimed at meeting individual requirements, in fact, even individual fads and fancies. All kinds of goods, whether they are clothing or fashion items, or food and smoke or even entertainment are designed, with numerous alternatives for each, and advertising is done for promotion of their sale. It has come to be realised that in doing so, a heavy cost has been paid in terms of wasteful utilisation of scarce resources, consumption of energy and other problems connected with urbanisation. Let us take the example of making motor cars each one more beautiful, bigger and shinier than the other. It involves spending a great deal of petrol for the need of one person. Besides, roads are being choked with traffic, and the environment is being loaded with fumes, while most people travel in crowded buses with great discomfort. It is being felt that to fully utilise production capacities and to avoid wasteful consumption and other problems, individual options have to be limited and social solutions have to be found and promoted.

There was a time when scientists pressed unconditionally for more money to be spent on scientific research. But in this case also, the situation is changing. Huge amounts are being spent on research; either on weapons, like more powerful bombs or on systems of delivering them by planes, rockets and missiles. Large scale research is being done to instal powerful lasers in satellites etc. It is being increasingly felt that this kind of research and the use to which it is put only threatens humanity, while not enough is being done to eradicate diseases. Firstly, the opportunity was seized by some in advanced countries to attack science itself, rather than its misuse. Science is portrayed as if by nature it is a disrupter of human values and societies and an instrument of exploitation. The other trend is to assess technological solutions in terms of their human, social and environmental consequences, and to subject the choice and application of technology to such a total assessment.

One can say that these developments mark the end of the euphoria towards science and technology and the emergence of more sober and mature views on technological developments and their applications.

In the era when technology was considered an unmixed blessing, it was believed that technological developments had an inevitable direction, starting from the simplest to the most complicated. For instance, the historical development of the production of energy was considered to be "progress" from the use of wood to nuclear energy, through various inevitable intermediate stages. However the energy crisis and the health and environmental hazards related to big industries pumping pollution into the air, rivers and the sea, and rapid consumption of finite resources of the earth, such as coal, wood, oil etc. have directed attention to the non-conventional sources of energy, which used to be utilised extensively prior to Industrial Revolution. There is a realisation that it is no longer possible to continue to use resources indiscriminately, on the scale at which they have been used so far. This has directed attention to the use of raw materials and generation of energy from renewable sources, such as wind, water, biogas, sunlight etc. In terms of scientific research, this has given great significance to research in new fields, in order to develop new technologies.

Such perceptions about science, technology and society have found reflection in the growing aspirations of the peoples of the developing world. The developing countries have in the recent years tried to bridge their social barriers to establish relationships which help them in breaking the vicious circle of under-development. Their peoples have raised demands for self-reliant growth and a certain minimum quality of life for all sections of the population. Realisation has also grown that science and technology can be harnessed to meet social goals.

SAQ 3

Write in the space given, at least two ways in which communication media can be used for:

i) Social good

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ii) To serve the interests of a few

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31.6 SUMMARY

- In this unit, you have had an over-view of science and society interaction. You have learnt that science influences the entire social edifice, the material as well as ideological, and in turn science itself is influenced by the society and its objectives. Before any project is taken up, its positive as well as negative aspects, the effect it will have on human beings and environment must be properly evaluated. "Social good" must have primacy in the overall planning and the use to which science and technology is put. With the immense potential of science and technology to better the quality of life for all, or to generate weapons of mass destruction, the choice before mankind has become imperative. New perceptions and aspirations have arisen in a changed world situation.

31.7 TERMINAL QUESTIONS

- 1) In a total systems approach, what are the various factors which should be kept in mind while planning a large dam or a thermal power station?

- 2) What do you think are our social objectives in India? List at least three areas in which science and technology can help us in achieving them.

- 3) Comment on the statement, "The immense potential of science and technology has set humankind rethinking about its use."

31.8 ANSWERS

Self Assessment Questions

- 1) i) Transport: with the development of transport, goods produced in the industry can reach the people. Transportation has helped in the establishment of national and international trade. With the help of various means of transport, people can cover the distance of hundreds of kilometres in just few hours.
- ii) Communication: with the advancement in communication, people can see what is happening elsewhere in the country or the world, and talk to each other though separated by large distances. Further, radio and television has also brought cultural harmony amongst people.
- iii) Education: education is the primary requirement for people to understand the developments in science and technology. With the help of education, they are able to make full use of the various resources.
- 2) i) Systems, human welfare
ii) Science, technology
iii) Possibilities, social
- 3) i) Social good—awareness of hygienic conditions, diseases etc. amongst people. To tell people about their rights, privileges and responsibilities.
- ii) To serve the interest of a few – advertisement about variety of T.V. sets, telephones, cars etc.
Advertisements about new fashions in clothes.

Terminal Questions

- 1) Factors to be kept in mind:
 - a) Total capacity of the dam, thermal power and how many people will be benefited by it.
 - b) Situation, i.e. whether it is away from the city or not.
 - c) What effect will it have on the environment of that area.
 - d) How many people will be displaced.
- 2) a) Increasing industrial production
b) Growth in agriculture
c) Egalitarian distribution of benefits
d) Science for human welfare.
(Elaborate these points, i.e. how science and technology help to achieve these objectives)
- 3) Science can be used for the welfare of human beings and also for the destruction of humankind. It is up to an individual person, community or country, how to make use of science.