6. Science, Technology and Philosophy

Preface

Science and technology are the key words today. Technology has occupied every sphere of our life. We always discuss the goodness and badness of technology. Science is not just a subject in academic curriculum. It's important for the students of philosophy to know what exactly is science and how does it's knowledge affect us. The present lesson discusses the correlation between science, technology and philosophy. Once we understand their true nature and correlation, we develop a perspective to look at the issues and problems created by technology and human life.

6.1 The interrelation between science and philosophy

Historical overview of Philosophy shows us that the questions it considers and the answers it puts forward have changed in the course of time. The rise of modern science is a crucial juncture in the journey of philosophy. In the past few centuries, science has more or less tackled the central metaphysical question 'What is?' and is moving fast towards solving the riddle of 'How do we know?' Therefore, today's philosophers have to constantly tackle questions such as 'What is the subject matter of Philosophy?' 'What is the nature of the relationship between philosophy and science?'

Different scholars hold different opinions on these matters. Science studies the experiential, material world as we know. Those who believe that there is no reality beyond the material world agree that such a world can be known only through scientific methods. Their ethical views are also based on their materialistic, scientific outlook. It does not have any reference to the other world.

However, some philosophers believe that there is not a strong enough support for the view that what does not fall within the limits of sense experience, does not exist. They are of the opinion that there is a reality, an abstract, supersensible, transcendental reality beyond this world. That is why the study of this reality does not come within the scope of science. The answer they give to the question 'What is? rejects materialism. For this reason they answer the epistemological question 'How do we know it?'differently. They have to consider questions such as can the super-sensible reality be known?'Íf it can be known, how?'Can intuition, mystic experience be considered as sources of knowledge?'These philosophers believe that it is the job of philosophy to attain knowledge of this reality and in the light of this knowledge, guide us about how life should be lived. They think that

unless we know how human beings are related to this reality, we will not be able to know what is beneficial for humans and how can we achieve it. In short, even after accepting the usefulness and the value of science, these philosophers believe that there are some obvious limitations of science. Philosophy has something different to offer even in the field of metaphysics and epistemology.

Epistemology began discussing scientific methodology extensively, after science came to be well-recognized as a field of study that gives us extremely elaborate knowledge of the empirical world. What exactly is scientific method? What are its strengths and limits? Is it suitable for all fields of knowledge? And the likewise questions were deliberated in epistemology. The development of social sciences under the influence of natural sciences kindled a widespread rumination on whether they should have a uniform methodology. We got to know about Humanities in one of the earlier chapters. Humanities do not use scientific method, so their very position in the knowledge-scene was questioned.

The whole review suggests that although science has successfully resolved major questions in philosophy, metaphysics and epistemology are significant till date due to the continuity of philosophical inquiry. Philosophy today aims at synthesizing philosophical questions with answers from science and creating a coherent, comprehensive perspective of looking at the world. Value-concerns comprise an important part of these perspectives. Ethics, Aesthetics engage chiefly with value-concerns. The problems we face while living in the twenty-first century are somehow associated with scientific and technological progress. We must sufficiently grasp the nature of science and technology in order to understand these problems and establish our moral stand. Only then we may get to their root and be shown the way to right answers.

6.2 Problems generated by technology

We live in the world dominated by science and technology. Technology occupies our lives. We keep discussing the curses and blessings of Technology. Technology has brought the world closer and has broken it apart at once. We see people sitting with heads sunk in mobile phones without even looking up to talk. We witness road accidents. Technology has helped us achieve tremendous speed but the very speed is posing threats to our life.

Weaponry has become unimaginably destructive today. The impending possibility of its usage is the biggest dread of humanity.

Pollution is yet another crisis. We are surrounded by trash. Our natural resources are fast depleting and degrading. Innumerable species are in jeopardy. All this is inevitably affecting the standards of human health and human life.

Mentions of these and many such issues often fall on our ears. We are aware of the intimate connection between science and technology. But while trying to grasp the problems generated by technology, it is very important to understand what technology is. It is equally important for a student of philosophy to know what science is and how the knowledge of science affects our

lives. In this chapter we shall try to understand the nature and interrelations between science, technology and philosophy. The awareness of their nature and interconnections shapes our outlook towards problems raised by technology.

Up to now we've glanced at certain philosophical questions. We looked into questions such as 'What is?', 'How do we know?' and 'How does knowledge affect our conduct?' And we saw also that these questions were answered differently in different times.

Once upon a time, mythology came to be in an attempt to provide 'true' answer to 'what is'. The causality of rain-cycle as it is explained in Thor's tale might sound utterly fantastical to us today. We might not accept it as the 'factual/true reason' behind rains. Because science has explained the phenomenon of rain in a different way. This causation can be verified by everyone and that is why a majority of people find it satisfactory / reasonable.

(The word 'science' is being used as 'natural sciences' here.)

Science	Technology	Philosophy of science and technology
The study of laws of Nature	Processing of physical matter	Analysis of nature, function and purpose of science and technology

Subjective, objective and intersubjective reality

Science is the study of laws that can be observed in the objective reality. What is **objective reality?** It is the kind of reality that can be verified by anyone. This reality is not a figment of someone's imagination nor is it a matter of collective faith. The reality that can be verified by everyone using sense perception and other instruments is called objective.

When someone says, 'I am so happy I'm floating in air!' we do not wonder how is it possible when he/she can clearly be seen sitting, when gravity is acting on him? Nor do we believe he/she to be literally floating in the air. We understand that it is a **subjective** feeling or a way of expressing joy.

There is also an **intersubjective reality.** Its existence depends on what several people believe in. For example, the bank notes that we use are a piece of paper. Paper is a material object but the value / worth of this particular kind of piece of paper is a part of intersubjective reality. This reality is not a part of the objective natural world unlike gravity even though its value is accepted by one and all. The value of a bank note is ascribed and presupposed by humans. It can fluctuate. What can change and what can't change can be known once we understand what is objective and what is postulated.

Let's talk!

Describe the examples of subjective, objective and intersubjective reality to your classmates.

The journey of science:

Science discovers laws that apply across space and time. They are called 'universal laws of nature'. But these laws were not revealed at once. We have

travelled a long way from the world of imagination to objective reality. It can be called the journey of science. Science detached its course from mythology, religious beliefs and philosophy. Humans had certain customary beliefs in the past which had religions sanction. For instance, it was believed for a long time that the earth is static and the sun revolves around it. Galileo challenged this belief in 16th century. He shook the popular belief and had to suffer a great deal as a result. Science has busted many such conventional ideas and notions by illuminating what is real.

But even today scientific opinion isn't uniformly acknowledged. Even today questions pertaining to objective reality are provided with imaginative answers. People consult quacks and exorcists; they believe in sorcery, they consider it a bad omen if a cat cuts across their path. Hence it is very important to know what science is, how it works, what information it has presented us with so far, how this information is utilized and how it ultimately affects our lives.

Science has answered lots of 'what is's and 'how do we know's in every walk of life. Physics tells us that the world is made up of particles. The particles have actions-interactions amongst themselves and formulate elements. Biology tells us that the earliest DNA of a living molecule was formed by matter alone. The law of evolution explains the progression of the living world.

The voyage of science continues. There remain aspects of universe to be unravelled and atoms to be unfolded. The road is endless in a way. But science doesn't ask itself where it should halt. It continued its explorations even after discovering the fundamental laws. It is not in its hands to ascribe a purpose to this journey. That is deliberated in philosophy.

Technology and science are intimately connected. Sometimes we altogether mistake technology for science. We live in a world submerged in technology as it were. No sphere of life remains untouched by it. Anyone can hardly imagine living without technology. But we know that technology results in disturbing as well as enjoyable experience. Sometimes it salvages, sometimes it wrecks. This being so one has to formulate one's technology-policy. Is technology capable of resolving the problems it has created? Would it require help from science and philosophy? Let us first understand what technology is. Let us examine the connection between science and technology and look into the approach philosophy adopts over the two.

Let's collect!

Collect the news reports on incidents where technology proved beneficial or ruinous. Create posters and exhibit them in class.

Technology is processing of matter. For example, in an earthen pot, a wooden raft, a woolen clothing the raw material is processed to various degrees. It was nothing but technology when the primitive man chipped a stone into an axe. Everything is technology in a sense, right from cultivation of land to today's smart-phones.

Let's write!

Write down the instances of use of technology in day-to-day life.

6.3 The interrelation between science and technology

Did the ancient man posses the knowledge of natural laws and their mechanisms while he was crafting tools from stone? It would not have been necessary. He could keep experimenting, working on the material and advancing the technology. But the experiments revealed fundamental facts about matter to humans. They came to know, for example, while handling numerous materials that there are 118 elements on earth. All we see around us is diverse forms and states of those very elements. We know this through the periodic table. The processing of the elements is a matter of technology but the periodic table is fundamental science.

Let's search!

What is a periodic table? What is its significance?

We realized that the periodic table had many uses. It became easier to know how the elements would compound with each other, what their characteristics would be. Science and technology work as a pair. They influence each other.

Technology and man

If technology is the processing of matter, this processing doesn't take place on its own. Someone has to work on it. Secondly, creation of by-products is an inevitable consequence of processing. Heating water on chulha (stove) will inevitably produce smoke and ashes. The undesirable by-products are called 'waste'. The combustion of petrol/diesel produces smoke. We call it pollution because this smoke bothers us. Electric vehicles do not produce smoke and we think they are 'clean' but the havoc that electricity-based technology wrecks on resources is well beyond our perception. It enormously contributes to pollution. More complex the technology, more the by-products, more cumbersome the task of disposing them off. It also has many psychosomatic hazards.

Let's talk!

Discuss the examples of by-products.

We are aware of innumerable stages of complicated technology and the problems they create. We can't, as a result, put a finger on what exactly we gain through all the efforts and harm. What do we expect from technology? - security, comfort and entertainment. We live in houses. A house/a shelter protects us from uncertainty in nature. A ceiling fan cools us. Television entertains us. It costs us something. And it is paid in form of efforts and damage. We have to go on calculating what we gain for what we pay. Can it be estimated all the time? And can it be followed through? What are your experiences and observations?

Let's write!

Explain the cost we pay in terms of efforts and harm for a mobile-phone. Also write its advantages.

Technological solutions for technological problems, some might say! Electric geyser apparently reduces the efforts involved in collecting firewood. But we must see that people take various kinds of efforts to design technical

equipments / gadgets. Their usage, maintenance, repairing and disposal keeps swallowing our time and labour. This gives rise to various labour classes. Some have to do harsh physical labour; some have to do more intellectual labour. Everyone becomes a cog in the labyrinthine system of machines.

Sr. No.	Simple technology	Complex technology
1	Less number of processes on the source material	More number of processes on the source material
2	Less by-products produced during the processing	More by-products produced during the processing
3	Direct and instant effects in form of efforts and harm	Indirect and long-term / delayed effects in form of efforts and harm
4	Less manpower is required for production, usage, maintenance and repairing	More manpower is required for production, usage, maintenance and repairing. Tensions and compromises become unavoidable

Let's look at an example. In olden times people heated water on chulha (the traditional stove). It is still used at many places. What does one have to do? One has to collect the firewood, light the stove etc. It involves certain efforts. Someone has to be responsible for collecting the firewood; someone has to suffer the smoke of the chulha. It causes damage but people cook food on it, people obtain light from it. Which means the technology of chulha affects everyone in different ways. The effort and damages can be experienced immediately.

Let's juxtapose it with how an electric heater or geyser works. How is electricity generated? Till date we produce most of our electricity from coal. We extract coal from mines. We process it, burn it, heat water on it, convert the water into steam under high pressure and use this steam to run an engine. The running engine generates electricity.

This is the entire procedure. The electricity then has to be stored, it has to be distributed to far off places. This requires a stupendous system at work. Innumerable people have to work under hazardous, unhealthy conditions. The disposal of the resultant smoke and ashes becomes a serious problem. The manufacturing and repairing process of a geyser is equally tedious. Multitudes of people have to work together, work in unfavorable conditions and face the stress in complicated systems. New technology is invented to resolve the issues borne by the old. But it brings its own problems. We must observe the technology that creates less trouble and the one that creates more.

In the instance of a chulha we can see that women mostly have to do the difficult chores. They have to search for firewood; they have to breathe in all the smoke. Now what would happen if everyone would treat these problems as their own? How can the chulhā technology be improved? One must heat water but one wishes to avoid the problems involved in generation of electricity. What can be the alternatives? Many innovators across the world are working on technology that is hassle-free, which addresses local needs. Technology must not be focused

only on machines and gadgets, it must also be considerate about the users, the effects it has on them and the disparities that arise out of it. Sensitive technology is the way to sustainable development.

Simple technology: generating less number of problems

Chulha

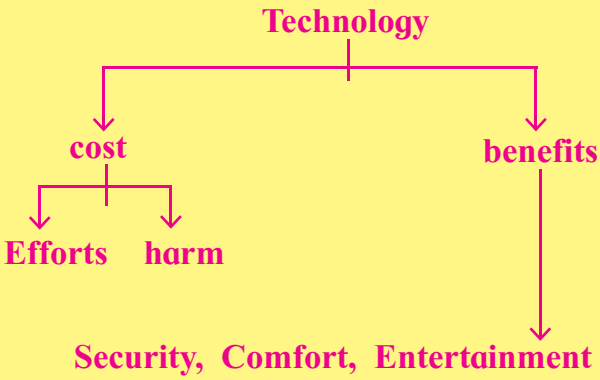
Complex technology: generating more number of problems

Power Plant

Alternative technology

Smokeless chulha

Effects of technology of humban beings



Let's do!

Find an example and make a chart / drawing of changes brought about by technological progress.

Science, technology and economics

'We get paid for all the labour and harm. We earn money. Isn't it the most important thing?', you may say. All things, except air, now cost money. What do we pay for? - Goods and services. Goods and services are nothing but matter and energy.

Things are produced by processing matter and its human beings or non-human organisms that carry out these processes. They 'run' on the energy they get from food. One may assume that all will be well if we invent machines to do the job. But again, it takes humans to produce, use, maintain and dispose of the machines. Economics is based on goods and services, which are governed by laws of the material world. Science informs us about these laws. This is how empirical sciences and economics are connected.

Technology solves problems on the

one hand and raises more problems on the other. Today we cannot possibly imagine living without technology. This doesn't mean technology is evil or wrong. The history of humanity illustrates that some technological inventions are so ingrained in human life that it'd be utterly impossible to survive without them – cooked food, clothing, housing etc. These have become fundamental to our lives and very few can manage to live without them. This means we shall have to put in the necessary efforts for some amount of technology at the least.

Let's talk!

Select a case and make a map or chart about the changes brought about by technological progress. There are several alternatives/choices for the kind of food, clothing, shelter we can have. Do we explore them, is that possible or do we simply do what the majority of people do? What are the criteria for these choices? – Discuss in groups.

Several other kinds of technology occupy our lives today and much of it isn't well-embedded in our lives. The brain cannot concentrate on more than one thing when we drive a car, for instance. That is why talking on the phone, texting, reading while driving can cause fatal accidents. It is baseless to assume that it won't happen to us. We should be aware of technology and our biological heritage. We choose to look only at the brighter side of technology. We haven't learnt to think holistically.

6.4 Introduction to environmental philosophy and the concept of sustainable development

Human use of technology is not a recent phenomenon as we saw. It has a generations-old history. But initially extra-somatic energy – the kind that we get from combustion of wood or coal or oils - wasn't used in enormous quantities. The iron age began four thousand years ago, and our natural surroundings have been undergoing drastic, rapid transformations since then. The use of steam for generating mechanical energy was invented at the end of 18th century and the changes gained an unforeseen pace. Electrical energy was invented soon after and transformed the entire tech-scene. Now people think that life won't be possible without electrical energy. In the west, the discourse over effects of complex technology on other life-forms and on posterity substantially began in the 1970s.

The entire process encroached and disrupted the intricate web of life on earth. Ecosystems came under threat. Air, soil, water got polluted. Humans were in great crisis. But we couldn't forecast this. We realized it after innumerable changes had taken place. How to turn back the wheel of time?

Let's talk!

We can't revert the circumstances but what then can be done? What measures can taken on individual and collective level? Discuss.

Do you know?

The ill-effects of American industries on ecology became a great concern in the 70s. Marine biologist, author, and conservationist Rachel Carson was at the forefront of this deliberation. Her book 'Silent Spring' informed common people on this pressing issue and this gave rise to a wide-spreading movement. The book talked of hazardous effects of chemical pesticides, DDT in particular. American industrial circles and politicians were forced to take notice of the objective observations presented in it. DDT got banned.

This is a perfect example to understand 'What the world is?' (a web of living and non-living things); 'how do we know' (instruments and experiments) and 'how it affects our actions' (the ban on DDT).

Rachel Carson

6.5 philosophy's changing stand on science and technology

Philosophy doesn't expect itself to interfere directly with the objective world. Because in that case philosophy will turn into science. The analysis of the anthropocentric view of technology (where human interests determine what is beneficial and what is not) falls within the scope of philosophy. The adequacy and moral status of scientific methods and instruments are discussed in philosophy. For example, experiments on animals is an ethical concern. Thus, we can observe the interrelationship between science and philosophy.

Philosophy doesn't restrict itself to what is and how do we know. It also asks if existence has a meaning, a purpose; if it can have a purpose, if it has value, what kind of value, how to ascertain that value. Even if science tackles what is in its entirety, philosophy must search what should be. It must be marked here, that standing where we are now in the course of the development of knowledge, no discipline can stay untouched by the influence of other disciplines. All branches of knowledge are inevitably linked to one another. Every discipline therefore has to be aware of what's going on in other disciplines. It has to be in touch with them. This is especially important for philosophy because from the very beginning it has consciously attempted to contemplate the world in a holistic fashion. A relevant, contemporary philosophization is required to maintain a contact with science and technology. That is why in this chapter we have tried to understand the nature of science and technology.

Next year we shall discuss ecology, medical sciences and social disparity from philosophical perspective.

EXERCISE

Q. 1 Fill in the blanks choosing the correct option from the bracket.

(a) That which can be verified by all using sense organs and instruments is called ..... world.
(objective, subjective, imaginative)

(b) The laws that apply in all times and at all places are called ..... laws.
(human, universal natural laws, evolution)

(c) ..... is the processing of matter.
(Philosophy, Science, Technology)

(d) Science provides comprehensive knowledge of the ..... world.
(imaginary, theoretical, material)

Q.2 State the differences.

(a) Complex and simple technology

(b) The function of science and philosophy

(c) Objective and subjective reality

Q.3 Write a short note on the following/ present your opinions.

(a) Problems generated by technology

(b) Importance of science for human well-being

(c) Collective reality: real or imaginary

Q.4 Discuss in detail: the impact of science and technology on human life.

Q.5 Write dialogues on the following.

(a) A conversation among friends on celebrating eco-friendly festivals.

(b) Advantages and disadvantages of a phone/T.V.

Activity

Find a real-life instance of person(s) who refuse to use certain forms of technology and don't have problems living that way.

Food for thought

Philosophy, like all other studies, aims primarily at knowledge. The knowledge it aims at is the kind of knowledge which gives unity and system to the body of the sciences, and the kind which results from a critical examination of the grounds of our convictions, prejudices, and beliefs. But it cannot be maintained that philosophy has had any very great measure of success in its attempts to provide definite answers to its questions. If you ask a mathematician, a mineralogist, a historian, or any other man of learning, what definite body of truths has been ascertained by his science, his answer will last as long as you are willing to listen. But if you put the same question to a philosopher, he will, if he is candid, have to confess that his study has not achieved positive results such as have been achieved by other sciences. It is true that this is partly accounted for by the fact that, as soon as definite knowledge concerning any subject becomes possible, this subject ceases to be called philosophy, and becomes a separates science. The whole study of the heavens, which now belongs to astronomy, was once included in philosophy; Newton's great work was called 'the mathematical principles of natural philosophy'. Similarly, the study of the human mind, which was a part of philosophy, has now been separated from philosophy and has become the sciences of psychology. Thus, to a great extent, the uncertainty of philosophy is more apparent than real: those questions which are already capable of definite answers are placed in the sciences, while those only to which, at present, no definite answer can be given, remain to form the residue which is called philosophy.

Reference:
Russell Bertrand: Problems of Philosophy, Chapter 15, 'Value of Philosophy'

Thought

Thought, I love thought.
But not the jiggling and twisting of
already existent ideas
I despise that self-important game.
Thought is the welling up of unkown
life into consciousness,
Thought is the testing of statements
on the touchstone of the conscience,
Thought is gazing on to the face of
life, and reading what can be read,
Thought is pondering over experience,
and coming to a conclusion.
Thought is not a trick, or an exercise,
or a set of dodges,
Thought is a man in his wholeness
wholly attending.

- D. H. Lawrence

Let's try

1) Think of someone you know who you think is a really good person. What makes that person a good person?

2) Let's all think. What are you thinking about?

   Can you think about what you're thinking about?

   Let's try wondering. What are you wondering about?

   Can you wonder about what you're wondering about?

3) Think of something that's real.

   Is there a way it might not be real?

   Think of something that's not real.

   Is there a way it could be real?

4) Wonder why

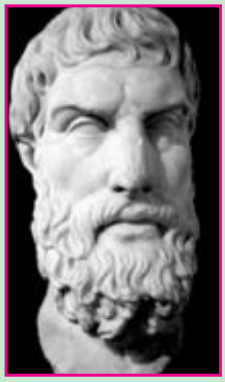
   Wonder how

   Wonder what

   Wonder when

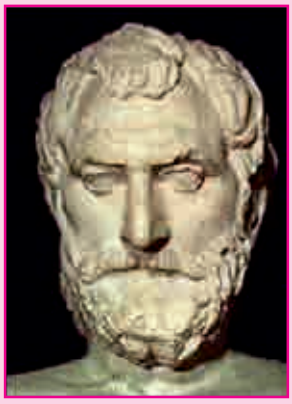
   Wonder who

   Wonder if



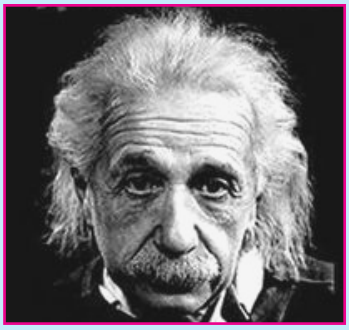
Happiness and freedom begin with a clear understanding of one principle. Some things are within your control. And some things are not.

– Epictetus



"The most difficult thing in life is to know yourself."

– Thales



A person who never made a misake never tried anything new.

– Albert Einstein

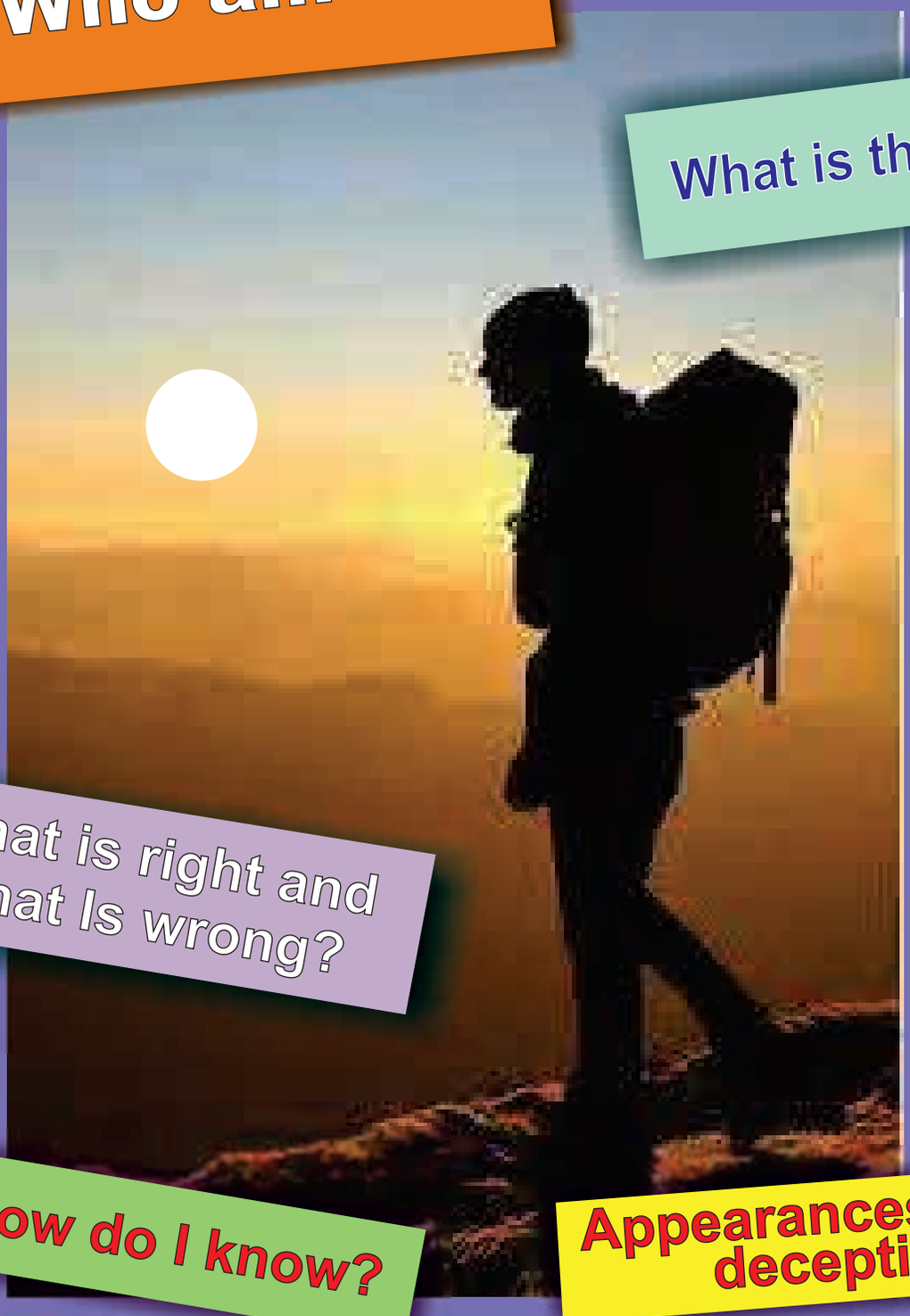
"Real knowledge is to know the extent of one's ignorance."

– Confucius

Notes

Who am I...?

What is this world?



What is right and what Is wrong?

How do I know?

Appearances are deceptive

Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune.

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