

**Research Methodology**  
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**Lecture - 03**  
**Subjective Thinking Versus Objective Thinking**

In the last class, we learned that in doing science, we ask questions and try to find the answers to these questions. Now, it is not true that only in the modern age we ask questions and try to find answers. Even in the ancient times, people had questions, asked questions and tried to find answers to these questions. Why is the sky blue? How does the universe look? Where did it all come from? These are the natural questions and they also asked these questions and tried to answer them.

When I am talking about ancient times, I am talking about all the civilizations that existed before what is known as the modern age—the Greek civilization, the Egyptian civilization, in India we had the Vedic age, the post Vedic age—all that I am considering with a single nomenclature: ancient time.

But the way these people in the ancient times tried to find answers to the questions—that radically differs from the way we, in the modern times, try to find answers. So, that is what we will try to understand today: how they tried to answer questions and how do we do that.

Well, in the ancient times the way to answer a question was that, if somebody had a question, the way he or she would try to answer the question is through personal realization. The person would think deeply on that particular question and whatever would seem to be the answer, would be the answer for him or her.

For example, how does the universe look? Somebody may have that question. He or she would think deeply on the question and what that person will feel the universe looks like, for him that would be the shape of the universe. So, one would try to answer every question through personal realization, through deep thinking. But since each person is different, their way of thinking and personal realization are different.

Therefore, for each question there would be plural answers. Different people thinking about a question would arrive at different answers. So there would be different schools of

thought, different ideas fighting with each other at times. So, the point that I am trying to make is that in that kind of thinking each question will have many answers.

Now, there would be some people who would feel that it is not necessary for me to think up an answer. If there is a wise man, whatever answer he or she arrives at is good enough for me. Let me trust him. So, there would be wise men and the answers given by them would be believed by many. There would be followers, and schools of thoughts would develop. That was the style of thinking of that time.

And in all that, nobody ever cared to check whether an answer is correct or not. That is because the whole art of checking whether an answer is correct or not had not developed at the time. So, nobody bothered to find out whether the answer is correct.

This mode of thinking, where the person, the subject, thinks and according to his own personal realization, arrives at an answer—this mode of thinking is called subjective thinking.

Subjective thinking. ‘Subjective’ because the subject thinks and whatever answer he or she arrives at is the answer for him or her. Other people might subscribe to that view or might contradict that view. So, for a single question there will be many possible answers and that was the way of thinking of that time.

Let me give some examples. When I give examples, it would be good to cite examples of real stalwarts of a time. During the ancient times there were a few stalwarts and Aristotle was one such stalwart of the Greek period. He was actually an intellectual giant, because he assimilated all the knowledge that was produced up till that time and organized that in a form that was believed by people for centuries, in fact, millennia.

But at that time, the way of thinking was subjective. What was the effect of that? For example, he wrote a book on mechanics, physics in general, and in that, he faced the question: why do things move? He saw that a cart is pulled by a horse. The horse pulls the cart and so the cart moves. He generalized that observation to come to the conclusion: ‘force produces motion’. He wrote it in his book: as a general theory force produces motion.

Neither he nor anybody after him for a long time bothered to check whether the assertion is correct or not. It was something that Aristotle said and therefore, it must be correct. That was how things went for a long time.

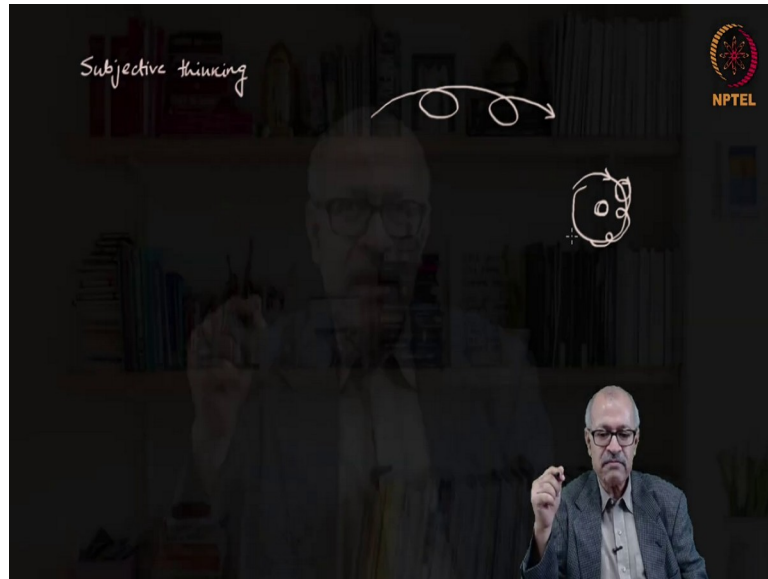
He faced the question: if a heavy body and a lighter body are released at the same time, which one will fall faster? He ruminated on this particular question and came to the realization that the heavier body will fall faster, and he wrote it. And since at that time there was no process of checking, his disciples and people after him simply believed that a heavier body would fall faster.

How does the universe look? Well, at that time it was believed that the earth was static it was known that the earth was round. It was known that the earth was not flat.

So, the earth was round, but static. People saw moon going around it, the sun going around it. So, Aristotle said that there is a static earth and the moon goes around the earth, the sun goes around the earth. And then there were other things we see going around us. These are the planets.

Planets are seen. The word 'planet' came from the word wanderers: they wander across the sky in the starry background. And people had noticed that they have very peculiar trajectories. It is not that they go from one side to the other. If you observe one planet for a long time, say a planet like Mars, then you would find that it goes from one side to the other and then it slows down, then it stops, and then goes backwards, and then again goes forward: something like a motion like this.

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It goes forward and then stops and goes backwards and again goes forward, something like this. And all the other planets were also seen to have such peculiar motion. Aristotle thought that, these planets are embedded on transparent crystal spheres and somebody moves them in this peculiar way and so, the planets, which are embedded on the crystal spheres, also move.

And after this realm of the planets, there is a dark canopy containing the stars—fixed stars—and that is the end of the universe. That is what he thought. He wrote it down and people believed.

Another man in the antiquity thought differently. For example, Ptolemy thought that the planets' motion is actually that the earth is static at the middle, and the planets move in circles over circles. So, this circle is going like this; this circle is going like that, so that the actual movement will be something like this.

So, two different views. Same question, two different answers. These things were quite common at that time. This is a characteristic of the subjective mode of thinking.

This way of thinking was first challenged during the Renaissance period. Before that, the subjective mode of thinking, people believing others. Religious dogma became dominant and people were required to believe in certain things. That went on for a long time and finally, during the Renaissance, that began to be questioned.

During that time, Galileo Galilei was teaching in the university of Pisa. He was teaching mathematics and mechanics, and naturally he had to teach what Aristotle wrote. These were, you know, part of the established belief at that time—something that was taught in the universities.

Instead of just saying that heavier bodies fall faster and the lighter bodies fall slower, he simply said that let us go and test it. As the legend goes, he took his students to the leaning tower of Pisa, and dropped one heavy mass of rock and a smaller mass of rock at the same time and they came down with the same sound.

Whether this story is true or not, that may be a bit controversial. But it does not really matter because it was Galileo who, by other experiments, by rolling balls on inclined planes, proved that actually they would fall at the same time. Thus for the first time somebody said ‘let us check it’. So far we have believed things, now let us check them.

And with that, we saw a complete change in the way we sought answers to our questions. This new view would say that what I am thinking, what I believe, might be wrong. And therefore, it is my task to test it, to check whether I am thinking right or not. And how to test? How to check? By observation and experimentation.

Galileo, in fact, did both. On astronomical bodies he built a telescope and observed. You cannot do an experiment on astronomical bodies. Through the observations he established that the Copernican idea that the sun is at the centre of the solar system, not the earth, is right.

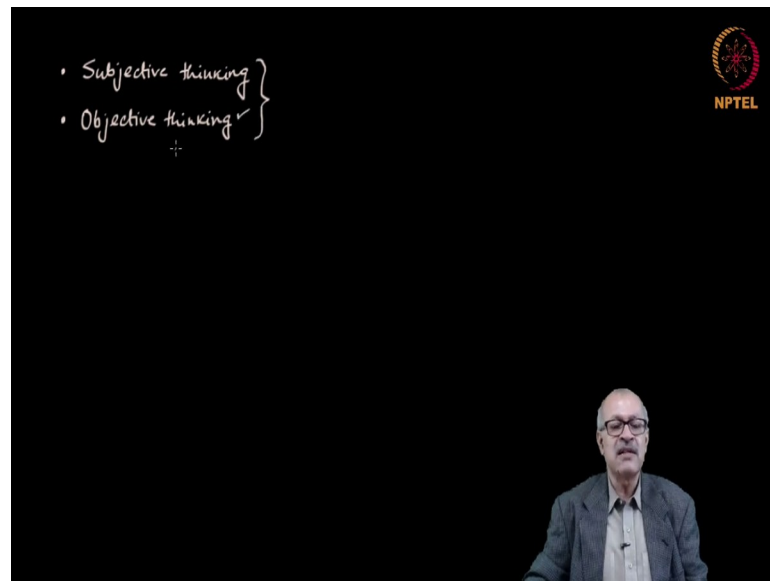
The crucial observation of Galileo that convinced him that Copernicus was right was that the planet Venus has phases. He realized that a planet can have phases like the moon has phases: new moon, full moon, half moon—that kind. Full shape of the planet Venus, a crescent shape of the planet Venus or practically disappeared planet Venus.

This kind of phases of Venus can happen only if it is an interior planet. If the earth were at the centre, and the sun were moving around it, the other planets were also moving around it, then there cannot be phases of the Venus. There cannot be phases of an exterior planets also. And he also observed the satellites of Jupiter and then argued that if the satellites are seen to be going around Jupiter, there cannot be a crystal sphere on

which Jupiter is embedded because then the satellites cannot go around the planet Jupiter.

So, you see he was checking whether the existing established beliefs are correct or not and he was making the point: whatever we believe, whatever we feel, whatever we theorize, these things can be wrong and it is our task to check it against physical reality.

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With that was started another way of thinking, called objective thinking. Objective thinking is where the object, the material objects, they tell us what is truth rather than we think up what is truth. The object tells what is truth. So, that is the objective thinking.

Now, science completely rests on objective thinking and one of the major tasks of science is to eradicate subjective thinking. But we know that, since we live in the society, we cull our thinking, thought process, from the society. Since subjective thinking is still prevalent in the society, therefore it goes into our minds and it does affect our science adversely. Therefore, science has built very elaborate procedures by which we eliminate subjective thinking from our scientific results.

I will come to that in the later lectures: how we do that. But this is something to be understood that there are two processes of thinking: subjective and objective, and science rests on objective thinking. This is why the time from Galileo is known as the 'Age of

science', because he introduced a new process of thinking and science progressed with that process of thinking.

But does that mean there was no science before Galileo? No, that would be too simplistic a statement. Even though the method of thinking was not correct, but still many people, through their personal thinking, personal realization, did arrive at the right answers in many cases.

For example, Leucippus and Democritus in Greece, and Kanada in the Indian subcontinent, they arrived at the conclusion that everything is made of minute particles. If you break everything, you will get at the end some further unbreakable particles called atoms. Even though this idea is quite different from the modern idea of an atom proposed by John Dalton, but still in many ways it is more advanced than the other thoughts of that time.

So, they almost arrived at the answer, correct answer, by personal realization. These things happen. Take for example, Archimedes. He arrived at the correct understanding of the elementary machines like pulleys, like gears, like levers, by actually thinking about them and of course, he did experiments on them. So, even before Galileo there was science, but the methodology of science had not yet developed. That is what I am trying to mean.

So, I have talked about the two major processes of thinking and we have arrived at the conclusion that it is the objective thinking that we have to practice. A scientist has to practice the objective way of thinking.