**Sociology of Science**
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**Lecture – 14**
**Science as Falsification: Karl Popper- Part I**

Dear students, today we will begin a lecture on Karl Popper's sciences falsification. This is one of the significant philosophical theories of 20th century. In fact, Karl Popper happens to be one of the greatest philosophers of science of 20th century. Now, let us have a little understanding about his background so that we can make sense of his theory in a much better way.

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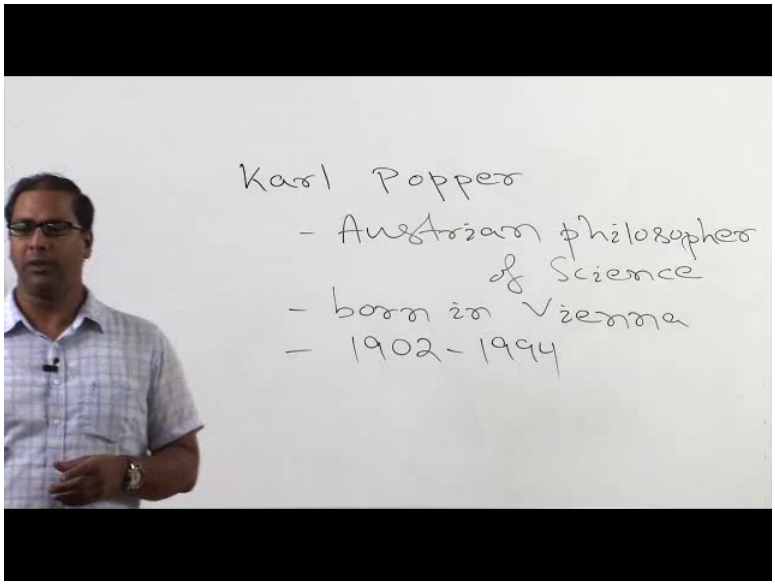


Now, if we look at the blackboard, you will see that he is an Austrian philosopher; who was born in Vienna what is his time period? 1902 to1994; that means, his active life, his active academic life, correspondent with coincided with significant social, economic, political, historical changes in the 20th. And he was also responding to that, was not only a philosopher of science, he was also a political scientist. He was also a social philosopher. He has also written books in a field of social philosophy.

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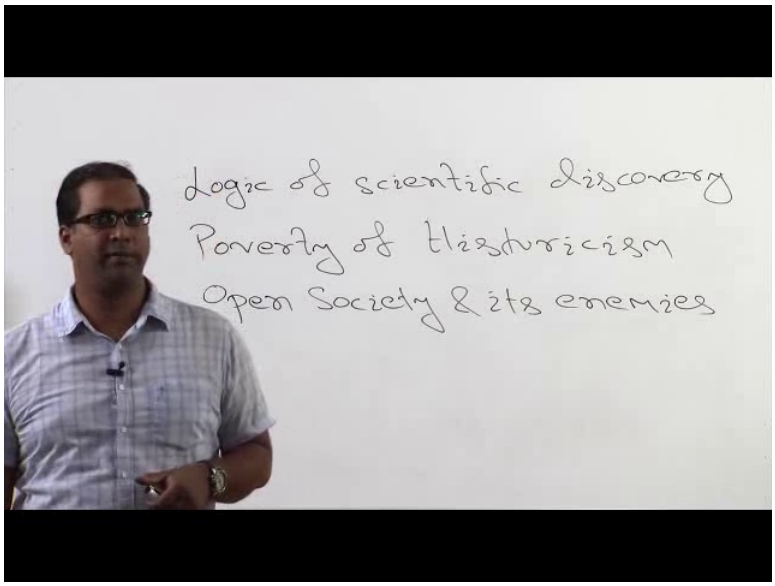


Now, these are some of the landmarks book, landmark books written by Karl Popper. For instance poverty of historicism and open society and it is enemies fall into the domain of social philosophy, political science, social sciences. What does, where does he do there? In open society and it is enemies, he critiques the totalitarian states. I told you that his time period coincided with major political upheavals in Europe.

He was a Jewish, his parents were Jewish. Hence, when Germany attached Austria to it is empire and during the Nazi era he feared for his life. And he was also looking for academic opportunities outside Europe. And he landed a job at University of Canterbury College at Christchurch. Now, that is where when he this is a time of second world war, and he was teaching at university of Canterbury college Christchurch, and that is where he wrote his book open society and it is enemies. He was a strong proponent of liberal democracy. And he felt that social criticism is a perfect way to ensure liberal democracy.

It was a staunch he launched a staunch criticism of totalitarian states. Dictatorships and he felt that open society is only possible if there is liberal democracy. Poverty of historicism is about a criticism of Marxian theory of historical materialism. Logic of scientific discovery is his contribution, his toroties in the philosophy of science. Now, interestingly Popper was born in Vienna which was the intellectual capital of Europe in the early part of 20th. He came in contact with many of the intellectuals. In fact, at home he had an intellectual his father was a lawyer and was a bibliophile. A bibliophile, somebody who loves books, somebody was fond

of books, somebody who keeps books and his father had an enviable collection of 12000 to 14000 books. He is he was exposed to books different knowledge claims right from his childhood and that I had an significant influence on his intellectual development by 1919. He became enamored by became influenced by Marxism. In fact, he also enlisted himself as a member of social democratic workers union of Austria, but soon he became disenchanted with Marxism he felt that it is Maxism is not a science, it a it is a pseudoscience and this idea of science, pseudoscience what is science this is what we are going to look at in this lecture through Hisah discussion on science as falsification.

Now, little more background is required to understand this in 1990 was the first time when the Albert Einstein's general theory of relativity was empirically substantiated was empirically proved with evidence concrete evidence that is through Eddington light experiment.

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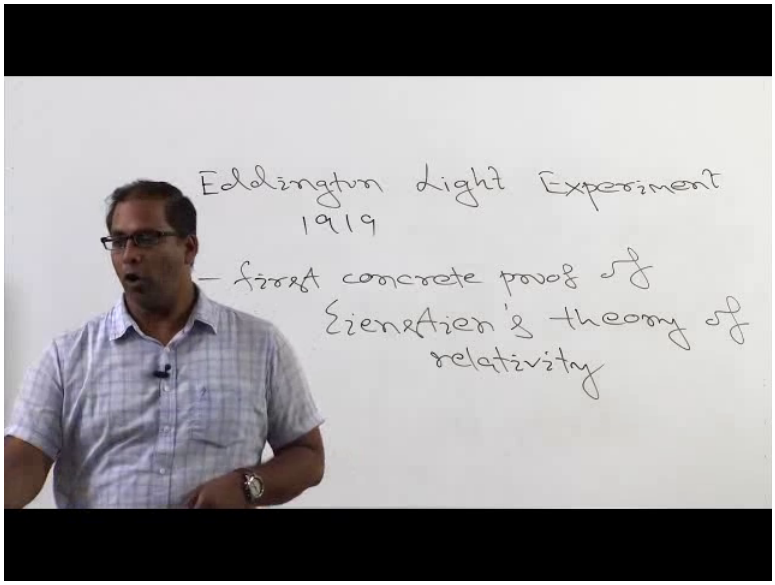


Now, we all of us know that Einstein proposed gravitational theory. According, to the theory of gravitation the light get gets attracted by solid bodies, heavier bodies. Now, his proposition was that this stars distant stars who were closer to the sun. When the light from those stars come to earth they come from a direction in such a direction that it appears as if his, the stars original position has shifted. Because, it is light gets attracted by the gravitational force of sun. Now, how do we prove this? You cannot prove that you cannot observe stars in daylight, at night is difficult to is impossible to measure the distance between the stars and the sun.

What do you do? In 1999 Eddington experiment was conducted where a very powerful camera was used to capture sun during a solar eclipse. What was done? Was that the sun was captured during solar eclipse? And the distance from star to sun could be measured later on and the same star was captured at night same constellation of stars were captured at night.

This is the first time it could be proved that this theory of gravitation is true, because one could based on this photographs one and the calculations subsequent cas calculations, one could come to the conclusion that the stars original position appears shifted because, it lights get attracted by sun. Now, it has this this entire phenomenon had a deep influence on Karl Popper I told you that by then he was already a Marxist, but soon he became disillusioned with Marxism. He also was working with Alfred Adler, one of the prominent psychologists of that era, who was in Vienna. Vienna was also the epicenter of social science psychological sciences natural sciences. He came in contact with many of these intellectuals.

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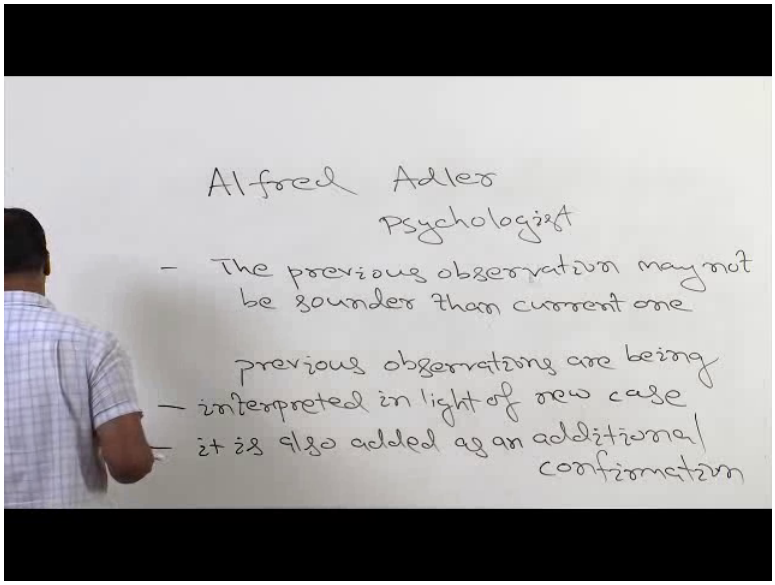


Now, he was working with a Alfred Adler as a volunteer, he was a student volunteer was helping Alfred Adlerian his social work experiments on young children in the working-class neighborhood of Vienna. He was working in his social guidance clinic now, Adler had a theory that this theory of inferiority complex and he could explain every psychological phenomenon through the theory of inferiority complex. One day, Popper who was working with Adler he brought a child whom he felt his case study does not exactly fall into the domain of infinity complex of Adler. He felt that this is not Adlerian when he discussed this

with Adler.

Adler said that when I can always explain it can always be explained interpreted in the light of my theory of inferiority complex. Now, that surprised Karl Popper he said how's that Adler said that is because of my 1000 fold experience then Popov said then this must be your 1000 fold plus 1 experience it was a comment, but this what he actually meant was very simple he said that in case of Adler, to restart the discussion of Popper and Adler, Adler was working on working class children as part of a psychological experiments it was being helped by Karl Popper, who was working as a volunteer and Alfred Adler had it had developed a theory of inferiority complex to explain psychological phenomenon.

One day Popper brought a child whom he felt is not an case that is his feeling his case study his story cannot be explained within the theory of inferiority complex propounded by Adler, but Adler said. Yes, I can when Popper asked how and say is because of my thousand-fold experience then Popper felt said immediately then this must be you thousand-fold plus 1 experience what he actually meant is that in case of Adler. All the previous observation may not be sounder than the current one, but it is being interpreted in the light of the new case, like for instance in this case and it is all considered as an additional confirmation. He did not he was not convinced about the logic that is being used by Adler to substantiate, his theory.

Now, this is an example of Adler a personal experience of Popper through Adler's theory of inferiority complex which led him to believe that science has to have certain basic parameters, to be considered as a science, to have a scientific for a theory to have a scientific status, it has to have certain basic characteristics and this theory does not constitute scientific theory and I have already told you that he was already disillusioned with Marxism and he felt that Marxion theory is this pseudo-scientific theory I have already told you that he was very much influenced by the Eddington light experiment which formally officially substantiated the gravitational theory of Einstein.

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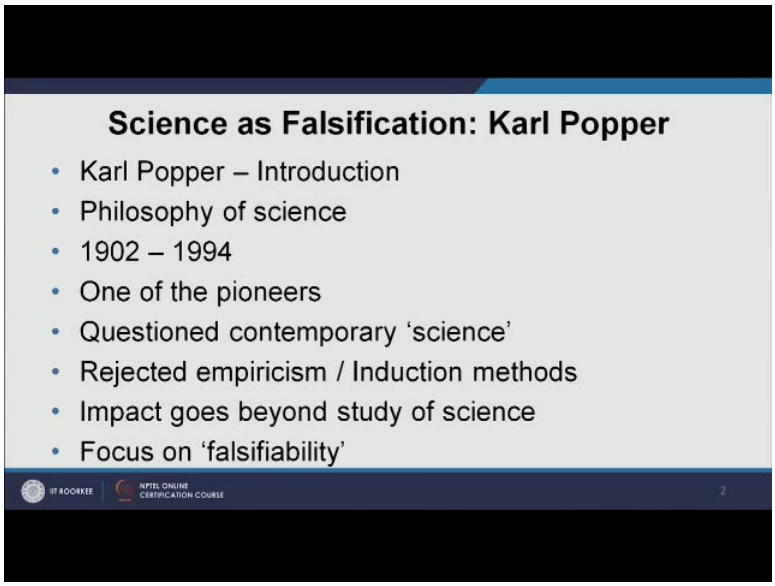


Now, we already know that Karl Popper who was born in Vienna and was born to a intellectual environment was born in an intellectual environment was absorbing all the new ideas of his era of his time and when he was looking for a job outside Europe in order to escape the Nazis he found a job in new Zealand and that is when he wrote a book called open society and it is enemies which is a strong critic of the total Italian states and he is a strong proponent of liberal democracy as a political system.

Then after his time or tenure at New Zealand he came and joined the London school of economics just after the Second World War as a professor of logic and scientific method. and after 3 years he moved to London university which and joined there as a professor of logic and scientific method and he retired in 1969 and in the meantime he kept on publishing he was a prolific writer kept on publishing made new arguments, novel arguments and became one of the most famous philosophers of science of 20th century. While, working in the post war Europe, he developed his idea of falsification.

And In fact, he published that and, in that publication, he makes an argument that science should be considered any theory should be considered scientific. If it can be falsified he was a he rejected empiricism and inductive methods. He questioned the contemporary science his idea was that any theory which should be or which can be falsified, negated, rejected, is a good science, is a good theory. Now, to explain this further ill make use of some of the, I will show some of the statements in blackboard and we will see which statements are falsifiable

which statements are non-falsifiable.

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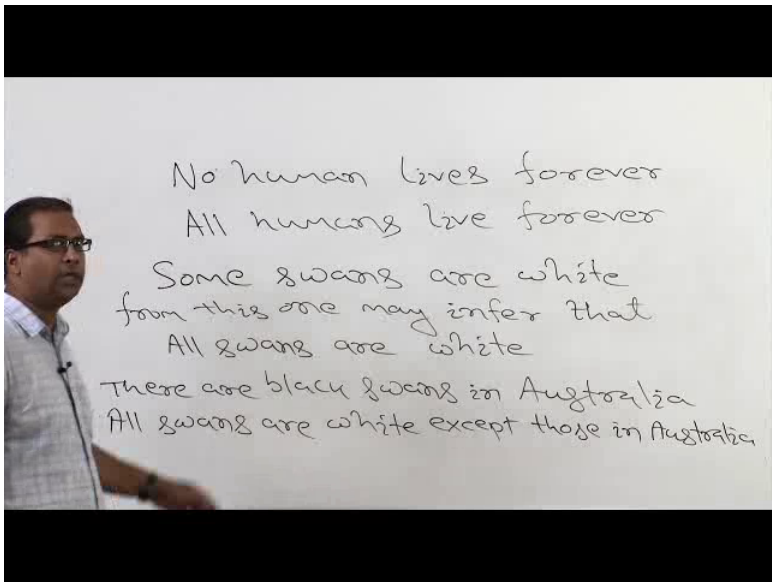


Now, look at the statements, no human lives forever, all humans live forever. Which one can you falsify? Can you falsify? The first statement no, but you can always falsify the second statement. That is all humans live forever how can you falsify it? By producing a dead human body by producing a by bringing a dead human being to the laboratory you can always say that all humans live forever. You can falsify this. Now, if initially wits started looking at this statement that no human lives forever which is not falsifiable, but we can always falsify the second statement that all humans are live forever, by producing a dead human being. Now, let us look at another statement.

Some swans are white from there we can always infer that all swans are white, but suppose somebody says, but there are black swan's found in Australia what do you do you have to change your statement because then this statement all swans are white it is easily falsifiable. Because, you can you just have to produce a black swan to falsify the statement. Once you have produced black swans, the statement can also be restated as all swans are white, except those found in Australia. Now, please look at this statement all swans are white except those found in Australia, can you falsify it? No, according to Popper this is a bad scientific theory, because it cannot be falsified.

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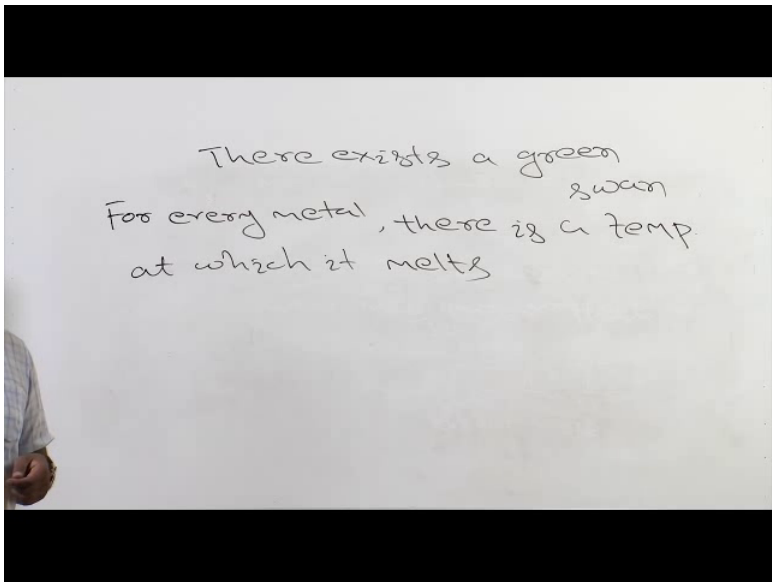


There exists a green swan one, can you falsify this statement? No, according to Popper, this is again a unscientific theory, it is not a theory at all. Because, what is wrong what is wrong with this statement? According to Popper, there is no time space dimension given we do not know where those green swans are found. We do not know what is the time period, when this greens ones are found. We cannot falsify this statement hence; it does not constitute a sound scientific theory. Again, look at the statement can we falsify this? We cannot, there is for every metal there is a temperature at which it melts, you cannot falsify this statement according to Popper, this is this does not constitute a scientific theory.

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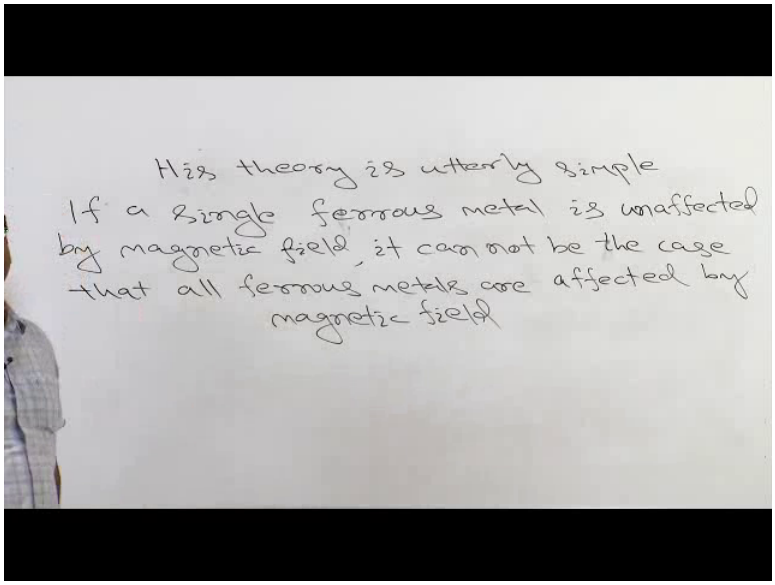

Now, his theory is quite simple. He says if single ferrous metal is not affected by is unaffected by magnetic field, it cannot be the case that all ferrous metals are affected by magnetic field. That is one single instance is sufficient to prove to disprove a theory, to falsify a theory. He was a strong proponent of falsification theory and that theory of falsification he used to demarcate between science and non-science, science and pseudoscience. For him Einsteinian theory of gravitation is scientific because, it could be falsified.

If Eddington experiment had gone wrong, if it had produced results that was not in sync with Einstein's argument and gravitation, then this theory would have been rejected. But this theory could have been falsified. Hence, any theory which has a high-risk element to it, which is which can be easily falsifiable. Which can be rejected, any of it is a aspect that for him constitutes a strong scientific theory.

I told you about Adler, and his theory of inferiority complex. He was not at all convinced with that argument that Adler gave that this is because of my 1000-fold experience that I can prove that this is another a case which falls directly under domain of my theory. And we have already explained the logic that the previous observation was men may not have been sound or than the current one, but it was being interpreted in the light of the new case. And it is all considered as a additional confirmation. He was not convinced about the logic that is that was being employed there to prove or disprove a theory. So, he was concerned about this thing in science; that is, the problem of demarcation.

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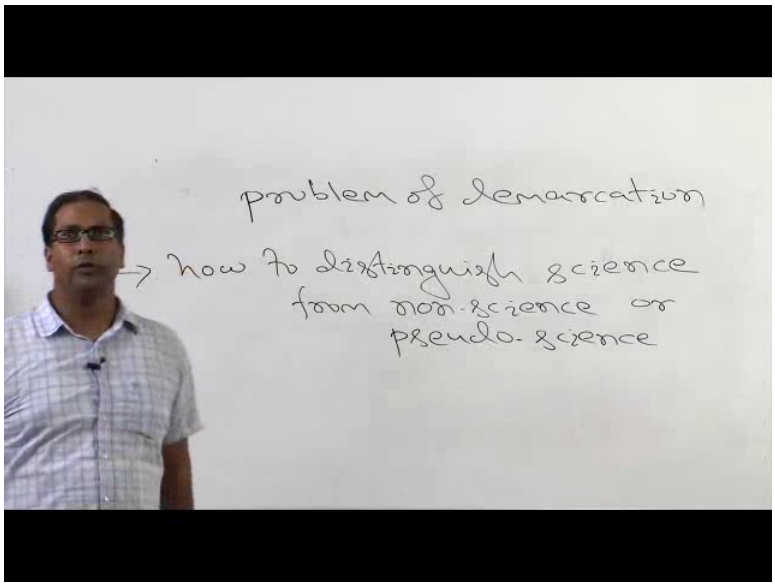

His concern was to distinguish between science and non-science. How to distinguish science and pseudoscience?

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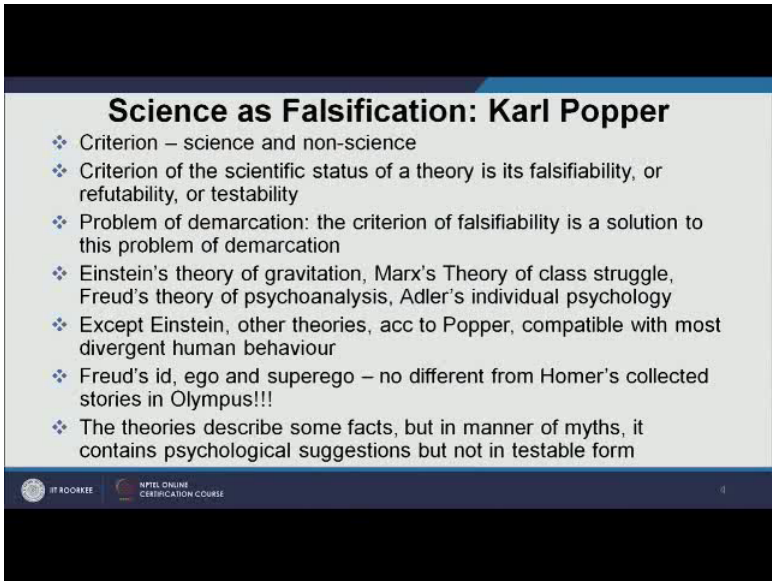


That is why he developed this a jargon the problem of demarcation. Problem of demarcation is nothing but for him it is a ploy to demarcate science from non-science, science from pseudoscience. Well look at in the next lecture, how he goes about doing that. He developed certain principles of falsification, through which he felt science can be any theory can be considered as scientific and he was as he rejected empiricism. He rejected verifiability for him falsifiability was a main criterion to decide to demarcate science from non-science, which will discuss further in the next lecture.

Thank you.