INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

NPTEL

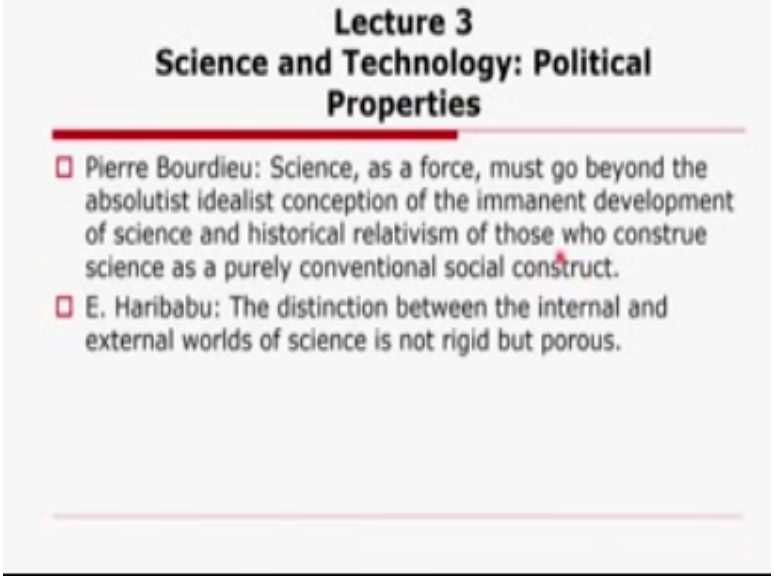
NPTEL ONLINE CERTIFICATION COURSE
An initiative of MHRD

Science, Technology and Society

By
Dr. Sambit Mallick
Department of Humanities and Social Sciences
Indian Institute of Technology, Guwahati

Just before we have with you passed away if you delivered the husilie memorial lecture.

(Refer Slide Time: 00:36)



In 2002 and it came as a paper as a research paper in the journal of the royal and topological institute In 2003 where Bourdieu stated it science as a force must go beyond the absolutist idealist conception of the immanent development of science and historical relativism of those who construe science as a purely conventional social construct when Bourdieu pointed out absolutist idealist conception of the immanent development of science.

It is it refers to the internist debate and when Bourdieu referee to historical relativism it comes under the externally say count science okay when must go beyond these two dichotomize we cannot consume dichotomize to understand science we must go beyond the construction of

dichotomize, in fact E. Haribabu, once wrote in sociological bulletin that the distinction between the internal and external worlds of science is not rigid but pores.

We just cannot make a distinction between internal and external worlds of science literature suggests that the earlier literatures suggest that no science is internally divine science develops on it is own as a science does not depend on social norms farm works for development but today what we see that no science also is determined by the kind of state that we have by the kind sociality that we have by the kind of moral farm works that we have if the kind of ethical farm works that we have and it is guided by certain epistemological questions.

Now let us go to what constitutes epistemology is a theory of knowledge or a body of knowledge but why is it so epistemology is always referred to as a body of knowledge or a theory of knowledge precisely because of the questions that epistemology address, the questions are what is knowledge, how is knowledge produced how is knowledge generated but the propionates of epistemology the scholars of epistemology perhaps forget to as one important question that was knowledge for whom who purchase that knowledge who owns that knowledge.

How is knowledge distributed weather knowledge is distributed on a an even bases or not then we encounter a sun discipline within philosophy that is called ethics okay if you combine epistemology with ethics then we get philosophy of science okay, that is why whenever we talk about STS we must look at not only epistemological concerns but also ethical concepts, ethics what is ethics.

Ethics is a study of nature of conduct but why is it so as we discussed in epistemology that is a theory of knowledge or a buddy of knowledge why is it so just because the kind of central intellectual political philosophical question that epistemology address similarly why is ethics known as or considered a study of nature of conduct precisely because of the central intellectual political and philosophical questions that ethics address, ethics also address I mean what is good the questions include what is good what is bad what is right what is wrong these ethical constitutions must be taken into consideration by the scholars of epistemology to big amount or robust philosophy of science okay and philosophy of science history of science sociology of science they always look at these considerations.

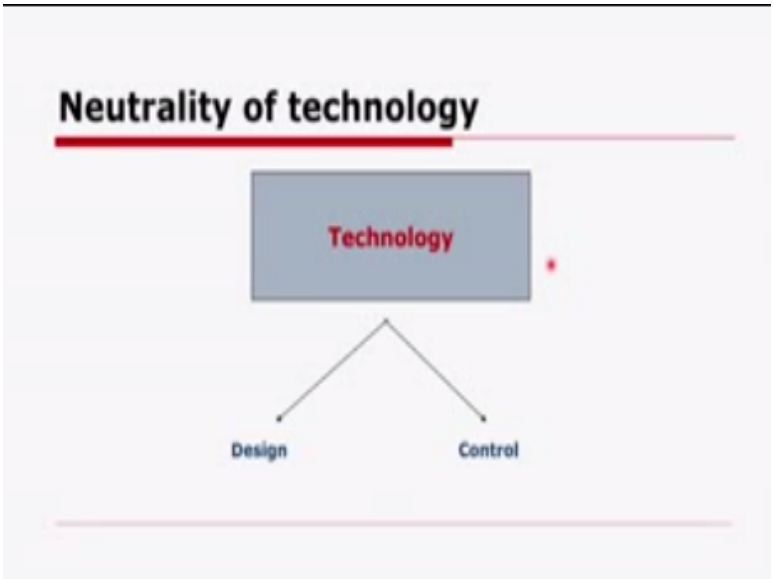
Perhaps in general if you look at many scientists they do not look at science as a science on a philosophical rear okay very few scientists do that for example Einstein okay he did Bernoulli did that I mean in fact scientists themselves they have come out of that internalize or the kind of liberality that sciences progresses they have come out of and what they have achieved that we see in this kind of relationship between science technology and society philology of science history of science and sociology of science okay.

(Refer Slide Time: 07:04)

When we discuss when we say the relationship between science and technology and the relationship between science technology and science and technology on the one hand and society on the other okay one can say that and I am trying to go ahead with again the debate, debating the contours okay one message no science can develop on it is own technology also can develop when it shown that is known as technological determination okay, technological determinism postulates the idea that technology develops as the soul result of an internal dynamic and then un mediated.

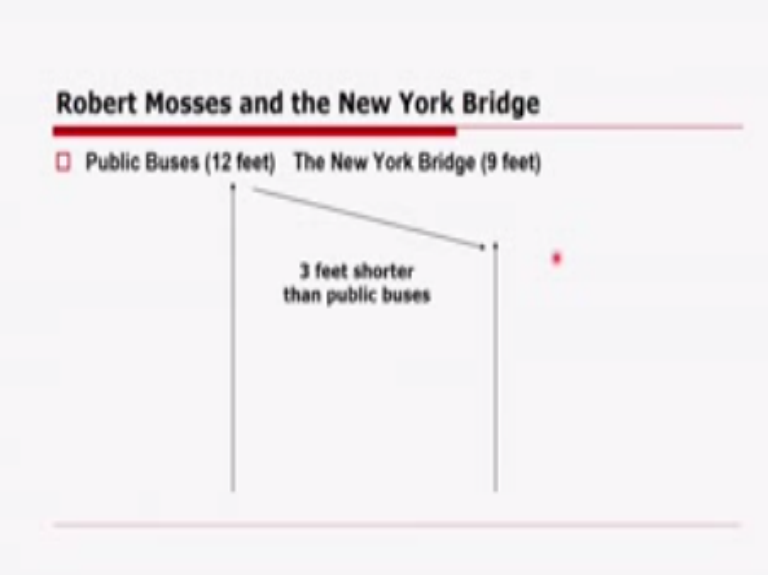
By any other influence mold society to pre it better is okay this is a case of internalist account, but how ST scholars try to challenge this position of internalist to internalist account of science how scholars of STS scholars within STS they try to challenge the prorogues in of technological determinism okay.

(Refer Slide Time: 08:19)



What we say whether a technology is neutral or not or whether a technology determines human action or not okay depends on the way technology is designed and the way technology is controlled.

(Refer Slide Time: 08:36)



Okay let me give you an example from the construction of the New York bridge by Robert Mosses, Robert Mosses plan this bridge in the 1960s and 70s in the US he was a famous engineer no doubt about that he built a built the New York bridge of 9 feet height at that time public buses.

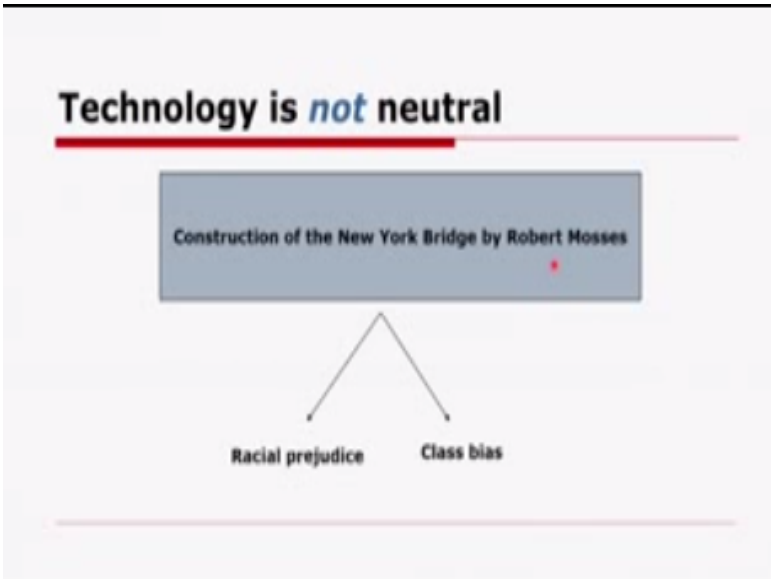
(Refer Slide Time: 09:01)

The public buses whereof 12 feet height.

(Refer Slide Time: 09:08)

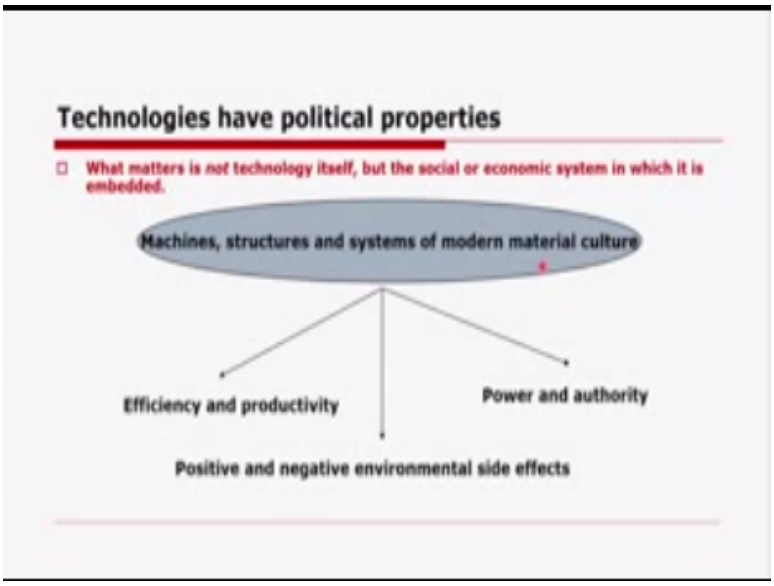
Now you see.

(Refer Slide Time: 09:08)



The now the public buses cannot inter that New York bridge okay, now if you look at this now the constructs an of the New York bridge by Robert Mosses and who Robert Moses had different kind of agenda source agenda for this at that time public buses where used by the blacks and the pole, hence the construction of the New York bridge by Robert Mosses reflects racial bridge of these an class by as.

(Refer Slide Time: 10:04)



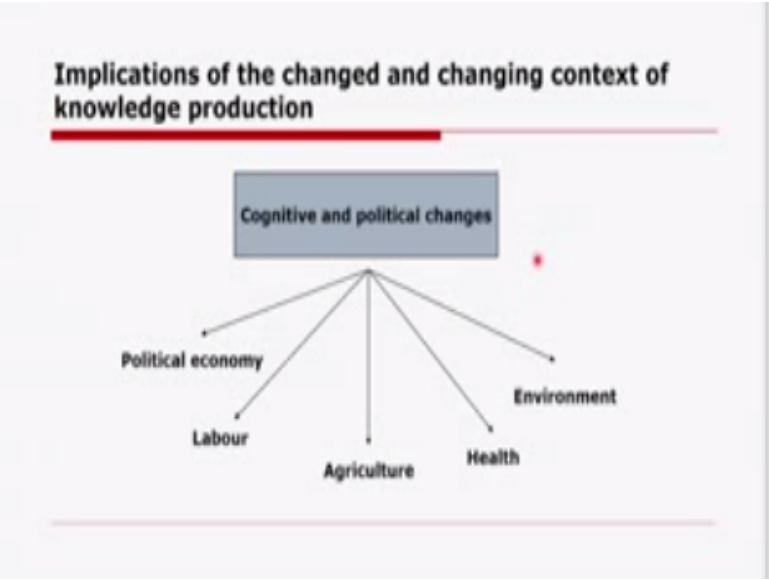
That is why technology is also politically said socially said okay how you design your technology and how you control your technology okay, I let me give you an example or from in dual context the way public roads in India are design I always we always feel that the way they are been designed there always anti pedestrians okay we can go and on and giving this kind of examples that is why a when I say technology is not neutral this is an externally stay account of science this is an externalist characterization.

Of technology or science okay technology is has in here and political properties from this example of the construction of the New York bridge what we can conclude what matters is not technology itself, but the social or economic system in which it is embedded social like systems economic system cultural system political system is very much important in the context of the evolution of a technology, the permission of technology machines struck here is an systems of modern material culture that we see to today.

They are known not simply because of efficiency and productivity or positive and negative environmental side effects, but the way they embody power and authority, there is a difference between power and authority but I do not want to dwell up and this right now, very often we say that authority is legal where edge power is not legal but I am not going to discuss this right now because it requires a different course all together to deal with this, that say when we say power and authority at very much embedded in the permission of a technology in the evolution of a technology.

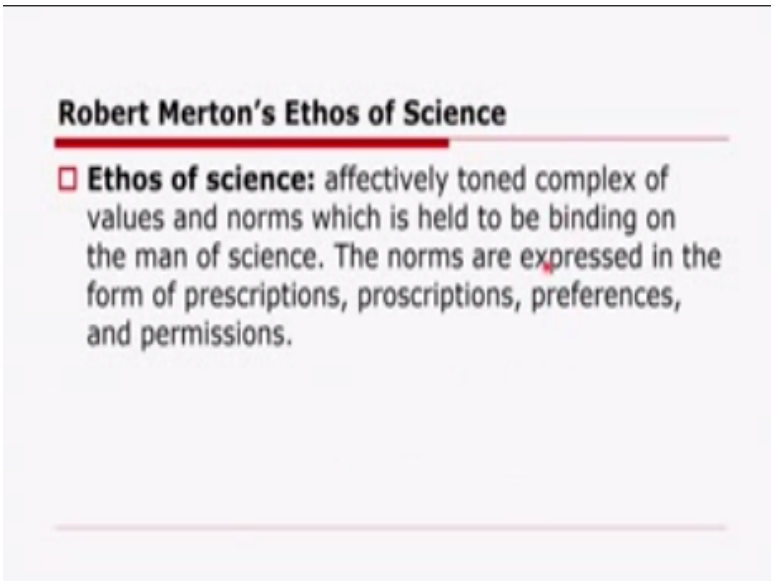
Okay I re try it the point that what matters is not technology itself but the social or economic system in which it is embedded then what kind of implications that we have.

(Refer Slide Time: 12:49)



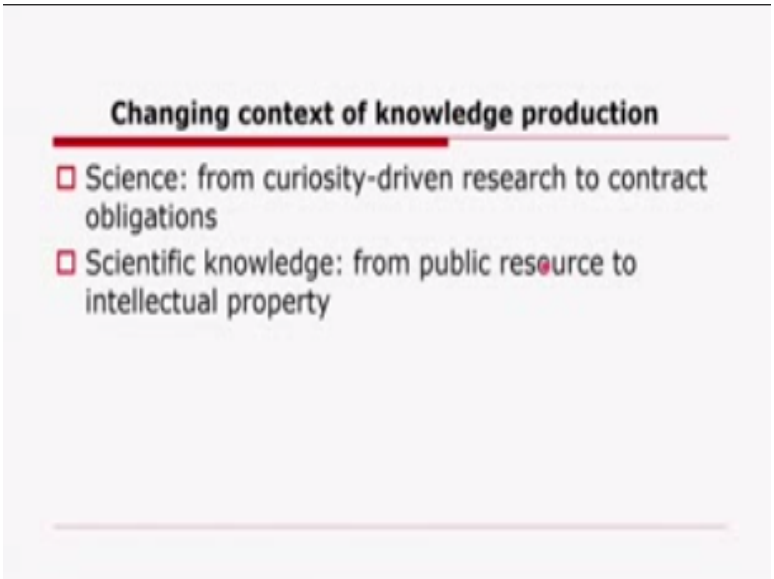
If technology is very much politically designed okay it has then it will have implications on our political economy, labor, agriculture, health environment.

(Refer Slide Time: 13:05)



And so on okay now the implications that we have we are trying to discuss that they can be seen at the level of cognitive and political scenario okay and such cognitive and political changes include political economy labor agriculture, health and environment okay, that is how science.

(Refer Slide Time: 13:46)



Which was once considered a curiosity driven research has been translated into contract obligations I mean scientific which has to been considered under public resource has considered a public resource has been translated into an intellectual property this such transition have taken place okay. Now what we have discussed till now, what we have discussed we started with technology we started with science and the relationship between technology and science.

And then the relationship of science and technology on the one hand and society on the other and then we provide it three models of the relationship between science, technology and society namely the linear model the interaction list model and the embedded model.

And from linear model and the interaction list model what we observe that they account for the internalist characterization of science and technology where are the embedded model accounts for the externalist characterization science, who is the main proponent of the internalist characterization of science and technology it is Karen Maine. Karen Maine suggested that all knowledge except scientific knowledge is socially culturally conditioned.

As against to these the embedded model guided by the externalist characterization of science and technology suggest that no, both science and technology the two forces are production that very much a part of society for this Bluiet said all knowledge including scientific knowledge is socially caused, Chum said science must be sealed in terms of its historical interiority, how science and technology have involved over time and across space and then we try to provide how science and technology are inherently political.

As if it is as a inherently political we can also discuss how a particular technology may be neutral may not be neutral such universalistic Nosel about science was challenged by H.T Scotches. In this context what we generally find is that there are two views which have become very prominent one is technological terminology and the other social terminology, the first one suggests that no everything is determined by technology the other one suggests no everything is determined by social pharmacy.

But we want to mediate the two, in this context both two interventions are important that no we have to go beyond such dichotomous, okay. Perhaps for this reason what we are trying to do that let we are trying to give such an example through which we can say that no, technology is not neutral that is why we discussed the example of the construction of the New York bridge by Robert Moses, how the construction of the New York bridge reflects rasal predision, class bios again when we look at the design of public roads in India how it is. how public roads or the constructions of public roads is anti-predictions.

We have to look at the way a particular technology politically, socially, economically amplified. When if you look at the 1980's era you find, you will find that when computers were installed in India there are many stake holders who accepted computers, who rejected computers and a portion of the Indian people is where is also maintaining it is ambivalence towards this, that they did not know where it is good or bad ethically speaking.

Because when computers are installed so people also lost jobs, but can you, can we think of life without computers that is why technology but at the same time those who rejected it at that time in the 1980's rejected the installation of computers can also not be nullified precisely because of the time and space that we are talking about, okay we must mediate, we must be able to mediate human action with technology okay.

I repeat what is this kind of technology, technology is the medium through which we are trying to interact with nature, we are trying to establish social, political relationships okay. In this scene we have discussed technologies have political properties, technologies are not neutral okay, precisely because of the waged technologies have involved over time, technology also has evolved by keeping some objective in mind. If you look at the invention of electric bulb why we say it that it is a curiosity driven science, where is a curiosity driven research.

Electric bulb was invented by Edison, when what was the objective of creating electric bulb he wanted to ensure that the city life should not be at the level of darkness, said should not be at the real muff darkness it should always have light there cannot be any night the distension between and day and night must be past upon the such distension must be removed okay. Now let us look at such curiosity drive-in research how they have become a part of contract duplicates you will find that such curiosity driven research.

Now there are more funding bodies they fund our research it has become a part of contract that you want to develop a seed or you want to develop a medicine for this contract you enter some kind of agreement if you succeed in providing that particular output then the contract remain valid or else you have to dismiss that contract okay.

It has become a part of contract obey the sense okay they way we discussed it science is a public resource now it has become a part of intellectual property okay if you look at this we also look at this phenomenal as a part of contract obligations. Now the way scientific knowledge and the associated technological artifacts where owned by the community where owned by the state where owned by the collective now it has become a part of individuals or groups intellectual property.

The others do not get access to use that they can sue that only up to the payment of royalty okay. Will discuss in detail about these things we will discuss these things in detail towards the last modules of this course okay. a very warm welcome to the CSS move course on science technology and society, what we have discussed till now very quickly I will try to recapitulate whatever we have discussed till now for almost one hour.

What we have discussed we started with the way technology science and the relationship between these two forces are production namely technology and science and the relationship of technology and science with society have been conceptualized over a period of time historically and then we started discussing three different perspective on the relationship between science technology and society namely the linear model the inter externalist model and the embedded model.

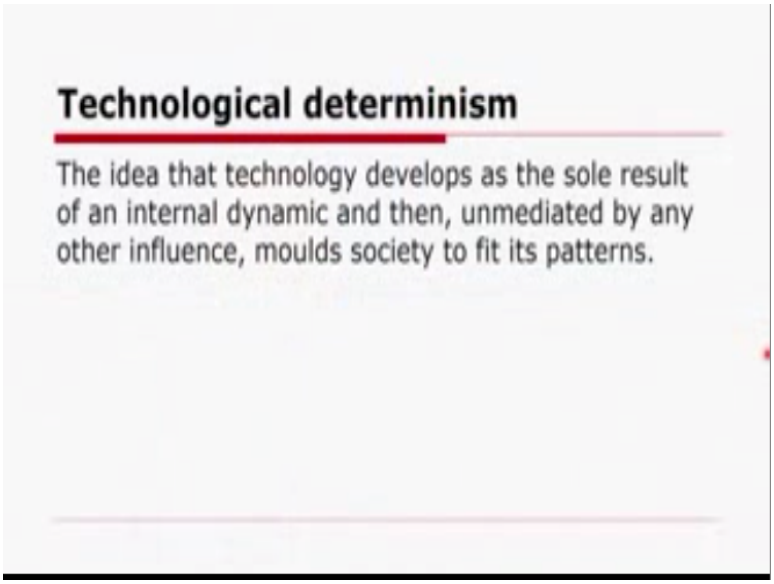
Whereas on the one hand you find the linear and the inter externalist models depict the internalize characterization of science the embedded model indicates the externalist account of

science that is why the embedded module suggest that the relationship between science technology and society is symbiotic in nature unlike the linear and the inter externalist module which suggested that or which treated science technology and society as separated it is as distingue state it is.

Whereas the embedded module suggests that no they are not separate or distingue entities rather they are both science and technology are very much a part of the social formalism okay. This is from there we have discussed the debate between internal legume and external legume within it is by taking three disciplines in mind philosophy of science history of science and sociology of science and there is lies certain epistemological questions which for a long time if note the aspects of ethical considerations.

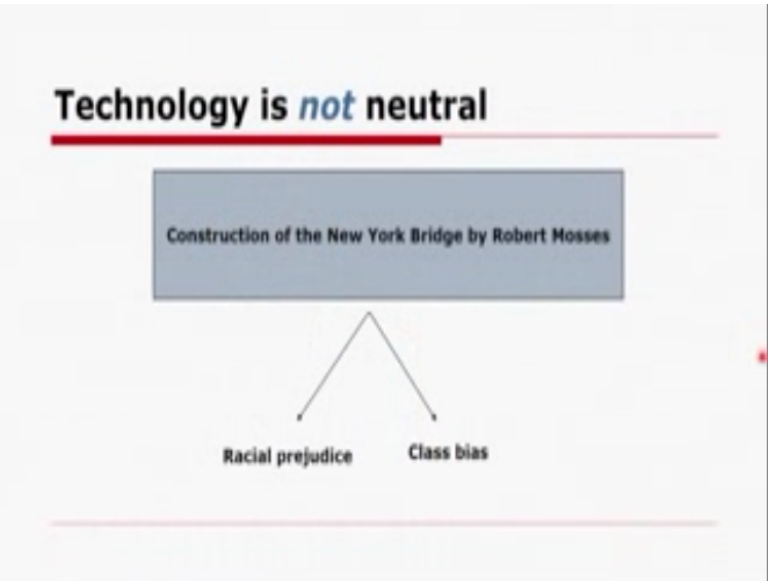
But when scholars drawn from philosophy of science history of science and sociology of science they try to combine epistemology with ethics we tend to see the challenge for the demark in an autonomy and cognitive authority of science okay, will come to this point when will discuss methods of science okay, but before we discussing methods of science we also discusses how technological artifacts involve political properties that why we discussed technological determinism which suggest the idea that technology develops as the whole result of an internal dynamic.

(Refer Slide Time: 27:03)



And then unmediated by any other influence moulds society to fit its patterns but then we also discussed how this erroneous version of technological determinism has deeper implicances for the way we conceive of our economy cultural point okay.

(Refer Slide Time: 27:56)



That is why whether a technology neutral or not it depends on the way a specific technology is designed and that particular technology has been controlled that is why we gave the example of the construction of New York Bridge by Robert Moses where we find that the construction of New York Bridge reflects racial prejudice and class bias.

Because it ignore the two important social classes namely the blacks and the poor okay from this what we came to know that miss in structures and systems of modern material culture they do not reflect or they should not be examined only in terms of efficiency and productivity or

positive and negative environmental side effects but the way they embedded power and environment.

(Refer Slide Time: 29:03)

What matters is not technology itself I repeat what matters is not technology itself but the source economic or cultural system in bridge it is embedded this is how we encounter two technologies two types of technologies which are recurrently existed side by side and referring to Mumford one is authoritarian and the two democratic when I when Mumford of about authoritarian technology it he refer to the system centered immensely powerful.

But inherently unstable technologies and when we talk about democratic technologies it implies that it much women centered relatively weak but resourceful and durable and hence sustainable let me give you an example you talk large radix okay even he spoke about large radix he said dams are temples of model Indian he was referring to dams in a different political conflicts.

He was referring to such technological intervenes in different political real but when you look at the way this emerginous of technology, the emerginous of technology, emerginous of the country

say India only in terms of technology has deeper implicates for the way it can envision on future okay.

For it does not implies that large dams do not have any have an merit I mean the responsible for hydro electric power generous still when you looked at the way it has cost evoke in the forms of displacement in the form of taking a life of an indigenous communities I think we must examined it examine the construction of such large dams fraises oaky.

Perhaps for this vision we need to include the concerns of different stake holders well designing a technology while controlling the technology that is why we need we have an urgent need for democratic, democratic technologies may sound relatively weak but their immense we resourceful durable and hence sustainable.

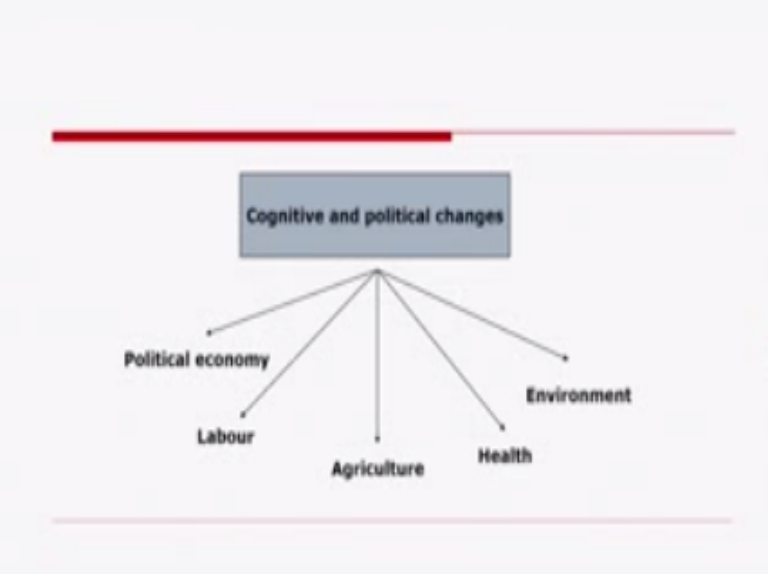
We can go back to, we can go back to gandhiji Suraj we can go back to E.F.Sumakers dealing in of small as beautiful which improve of course the follow this dam from cope but if we you look at these, these perception of I mean the way Gandhi visualized a nation or colonized nation okay these are the appropriate technologies if you look at sumakers dealing in of appropriate technologies then what we find especially Gandhi was writing it was back drop of anti colonial struggles okay.

That is why you were in favor of Kathy I mean home for cloths he was in favor of charka system you was in favor self employment by incorporating different appropriate technological systems. When we that is why Gandhi wrote in swaraj that let us not copy England, that is why he said if India copies England it is my form conviction that will be ruined. That is why when we develop a specific technology we must develop a specific technology in our own context.

We should not copy or apt others for the development of technology, we must design our own technology capping our interest in mind, capping our own citizens in mind, capping our farming communities in mind and so on okay. I mean capping the vulnerable section of societies, capping the marginalized section of the societies. In this sense we are discussing these 2 technolgies okay. And we have discussed earlier that, such transition which has taken place in the form of knowledge production okay.

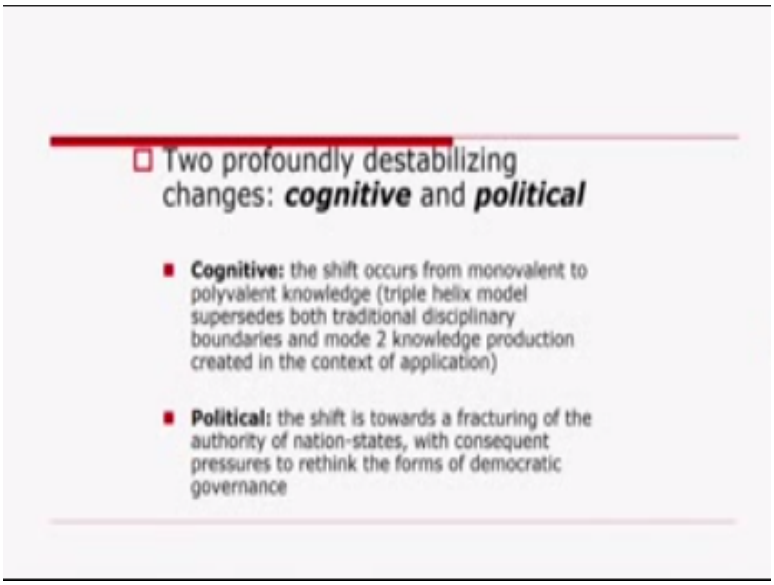
That the transition from curiosity driven in research to contract obligations from public to intellectual properties and so on.

(Refer Slide Time: 34:37)



Okay such cognitive and political changes we have discussed how they have dippers implications on our political economy, the components of labor, agriculture health, environment and so on okay. We can give example I mean if you look at this cognitive and political changes okay when I say there two profoundly destabilizing changes in the form of cognitive and political changes.

(Refer Slide Time: 35:10)



When I say cognitive change it refers to the shift that occurs from mono valent to polyvalent knowledge, I mean the triple helix model supersedes both traditional disciplinary boundaries and knowledge production created in the context of application. What I mean here is that if you try to understand such cognitive shift okay, cognitive change. That earlier lesson was that, only will be academia will be engaged in teaching.

I mean universities will be engaged in teaching, industrial will be carrying out research that was sometime for mono valent knowledge production. One should not enter the territorial; universities should not enter the territorial the industry. So also industry should not enter the territorial universities. But then not only one found in 1918 onward at least in India, that universities and industries they started entering into collaboration, collaborating practices. Now complementary of expertise drawn from both universities and industries they became the hall mark of, what we say more to knowledge production.

What I mean triple helix model of innovation, I mean when government also takes of it, government which remain non active participant has become a active participant in the triple helix model okay. But government the state which was the sole sponsor of scientific research, till 1990 in India, is no longer the sole sponsor of scientific research today, at least in India. In this context the nature of the state assumes later significances.

What kind of shift that we have seen in the nature of the state, which takes us to the discussion on the political changes, which we witnessed today. When I say political change and the shift

towards the factoring of the authority of nelson sates which consecutive pressure to rethink the forms of democratic governors, it requires a certain skills. Triple helix model of innovation suggests that you take government academia and industrial private are in institutions into consideration.

But one more triple helix is missing out, now what is the role of the citizens? How are citizens going to be taken into consideration? How is public going to be taken into consideration? Perhaps this is the missing link which perhaps the world of science and practitioners must take into consideration and there is lies the job of calls science technology and society studies call okay the political change is indicate or raise the questions of citizens raise the questions of law raise the questions of mission state and so in these context.

We must keep in mind that what is and what are to be what is important what is the philosical debate that ontological questions I mean debating the ontological ii mean what is it reality what is real what is existing what is blink from there on what we how we move forward then what should be what are to be then the normality frame work gets four drowned.

But to bring about that prescriptive frame work that normality frame work the normality institutional frame work we must look at the ontological accept I mean we must look at the reality having done with the ontological accepts how technologies designed how technology is controlled that why I gave you the example that the way the public roads in India the way the public roads in India are designed they have become anti predict okay.

Then but if you look at several other country okay who have got the fast write over the road or streets many countries also have thought us that the predicts must have the fast ride they must get the top priority. So far as excess to public road circles is that circle but in many under developed countries but in many developing country what we find that access to public roads or public streets okay this I mean the way public roads have designed it has been designed in such manner the pedestal find it difficult to now cope with such design okay then what auto be in the world of science and its practitioners okay takes us to the formulation of the normality structure of science normality frame work of science are founded by Robert Martin okay his normality structure of science when we look at okay Martin was writing after the second world war.

Let me give you brief overview about matter was a structural factionist I mean you functionalist within the discipline of social functionally believes in the way society is cognitive on the bases

of the complementary reciprocity of roles I repeat functionally gene is based on the ideal or based on the wage in which society is constituted on the bases of complementary.

And reciprocity of roles okay I mean there are also counter perspectives to functionalizing say approaches functionalizing marketing suggests that no society is constituted not on the bases of complementarily and reciprocity of roles rather the history of all extension society is the history of class that was a segment which marks made in the manufactured of community party of 18148 okay I mean there is different perspectives so for as history I mean the formalities structure of science of science is consent let us discuss matter.

Centre for Educational Technology
IIT Guwahati
Production

HEAD CET
Prof. Sunil K. Khijwania

Officer- in- Charge, CET
Dr. Subhajit Choudhury

CET Production Team
Bikash Jyoti Nath
CS Bhaskar Bora
Dibyajyoti Lahkar
Kallal Barua
Kaushik Kr. Sarma
Queen Barman
Rekha Hazarika

CET Administrative staff
Arabinda Dewry
Swapan Debnath