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Science, Technology and Society

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Staying on with the social setting of technology we are trying to locate or historically STS collars have been trying to locate technology as a byproduct of social economic cultural and political formation okay till now what we have discussed? We have discussed technology I mean poetical construal of technological systems do activates our politics I mean in the form of the construction of new York bridge that is how we also gave the examples from India that the way public roads are design in India they have become anti-pedestrian today.

We have also discussed lantern juniors technology has knowledge we also have discussed how Thomas Alwa Edison invented electric light electric bulb okay in a certain social and economic and political context cultural context okay. Now through the watts of Donald Mactengy and UD wart man reflects in shown technological determinism as well as social determine I mean whether technology is a neutral or not our social changes or always determined by the development of technology or not we are going to see okay. Let us start with technological determinism.

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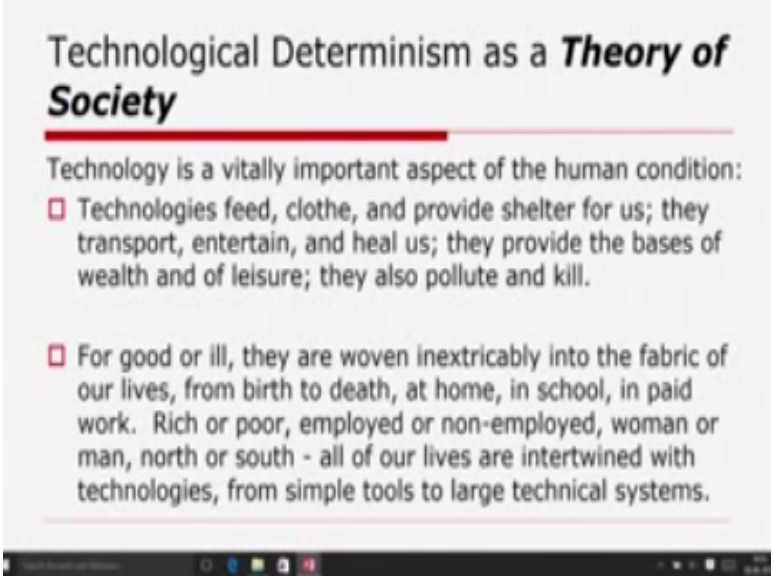

As a theory of society, and then we will also see whether technological determinism as a theory of technology we will also see that science of technology by providing different examples we will try to locate the evolution of technology okay in the context of social history optic I man by taking the queue from social history of technological systems. We all know that technology is a vitally important aspect of the human condition technology is feed, clothe, and provide shelter for all of us, they transport, entertain, and heal us they provide the basis of wealth and of leisure they also pollute and kill.

If you look at the way technology is have been used technology is have been used to increase agricultural production technology has been use to make our governments possible technology is have been used to which provides shelter for us technology is help us in transport and communication in entertainment in providing medicines technology is also provide us with the basis of wealth and also of leisure or entertainment.

But at the same time technology is also a responsible for the kind of pollution the kind of hard wars effects that we have okay, if you slightly recall the earlier lectures that we discussed the in the context of land on winners article on don artifacts of politics that we are not going to judge technology in terms of efficiency productivity or positive and negative environmental side effects but we are going to examine technology in the context of the ways a specific technology embodies power in authority.

The question of liberty the question of justice the question of equality they assume greater significant when we look at the political social economic cultural construal of technological premises. For good are apparel technology is often Owen in next suitably in to the fabric of our lives from birth to death at home, in school, in paid work, and so on. Rich or poor employed or non employed women or man north or south all of our lives are enter to indulge technologies from simple tools to large technical systems.

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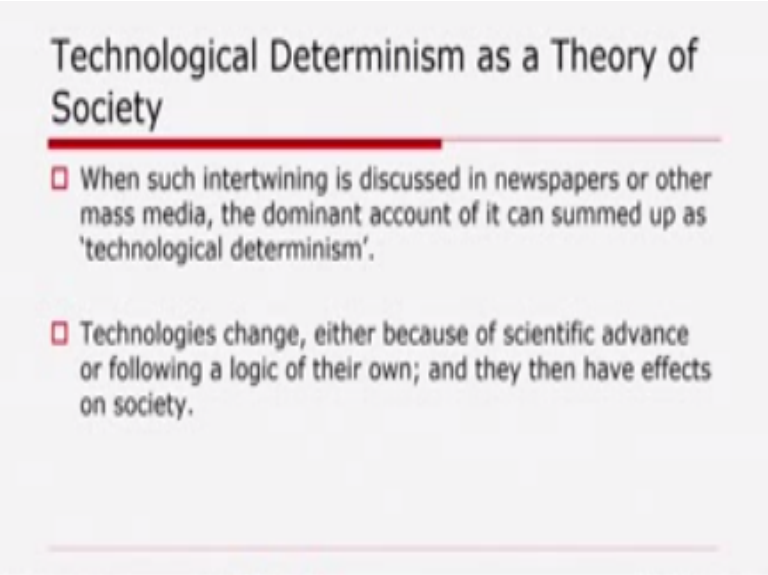

And when such inter twining is discussed in news papers or other mass media, the dominant account of it can be summed up as technological determinism. We have already discussed what technological determinism is and social political economic changes maybe can be attributed to the changes in technologies then technology changes our social formation economic formation political formation cultural formation ideological formation okay.

Technology I mean this is technological determinism technology is change either because of scientific advance or following the logic of their own and they can have and then they have the effects from society. Then if I say that technology is developed on their own, it is an internal logic of development of its own then it is the internalize account the development of the technology that is what we have discuss in the initial lectures.

But how it is it maybe conceived of being influence by external factors will be discussed in the lectures to follow we have started the discussion in fact I mean technology as a product of our social formation okay, if you look at this.

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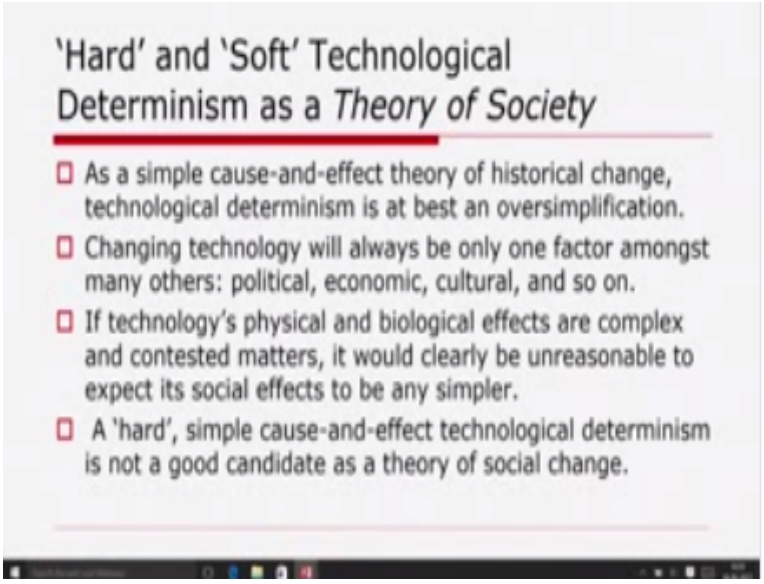

I mean suppose if you look at this the development of computer technology for example, is often seen as following a logic I mean the development of computer technology for example is often seen as following trajectories that are close to natural laws the most famous being modes law describing what is modes law okay? Which describes how the number of components on a state of the art micro chip double sin a fixed predictable period of time originally and year now people think that no it is I mean we conceptualize it in a period of 18 March one and a half years.

This key technical under pinning of modernity fuels and information and communication technology revolution that numerous experts tell or numerous pundits tell is changing and will change the way we leave okay, this is important. I mean when we look at these that here one thing is technological determinism that technology changes our economic social political cultural formation or it determines our society and one more thing we are also talking about modernity okay modernity is the part of I mean what are the constituent what maybe the constituents of modernity I mean a holism or totality, reflexivity, recinorlity and social movements.

We have already discussed this okay, and whenever we are talking about modernity our mind always takes us to European modernity okay, that is the kind of modernity we have leave in a

world of multiple modernity's alternative modernity's okay when we look at these the technological determinism as a theory of society there are hard and soft technological determinism as a theory of society.

Technological determinism contains a partial truth technology matters no doubt about it, it matters not just to the material condition of our lives and to our bio logical and physical environment that much is obvious but to the way we leave together socially, Lin Wite articles I mean Lin Wite we have already discussed I mean he is the historian of technology I mean the way he Wite pointed out, he famously attributed the coming about of fuddle society or society he dominated by an aristocracy of warriors end out with land to the invention and diffuse in to western.

And such ownership and control over land to the invention and diffuse in to Western Europe prior to that okay, fighting on horseback was limited by the risk of falling off okay. I mean we can go on I mean the Wits count his better rid as parable than as really true, among the franks the star of may have caused feudalizing but it had no such effect say Anglesey in England prior to the Norman comeliest we can go on I mean if you look at history of technology as such okay.

Changing technological determinism I mean changing technology will always be one factor among many others political economic cultural and so on I just simple cause and effect theory of historical change technological determinism is at based and over simplification, if I say not technology is the cause social change is the effect political change economic change is the effect I think it along to over simplification changing technology will always be only one factor amongst many others maybe political economic cultural and so on.

If technology is physical and biological effects are complex in contested matters it would clearly be un-reasonable to expect its social effects to be any simpler, okay. Now let us see how what we mean by hard and soft technological determinism as a theory of social. A hard simple cause and effect technological determinism is not a good candidate as a theory of social change, okay.

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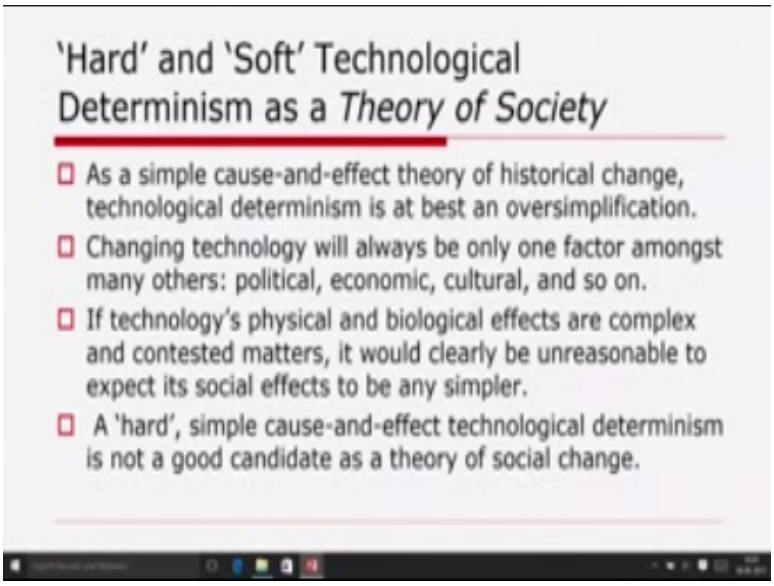

I mean technology is social effects are complex and contingent in not to say that has no social effects, we are not saying that no technologies do not have any social effect, but the failure of a hard technological determinism does not rule out a soft determinism. For example Langdon Winner undermines the notion that technologies are in themselves neutral, okay.

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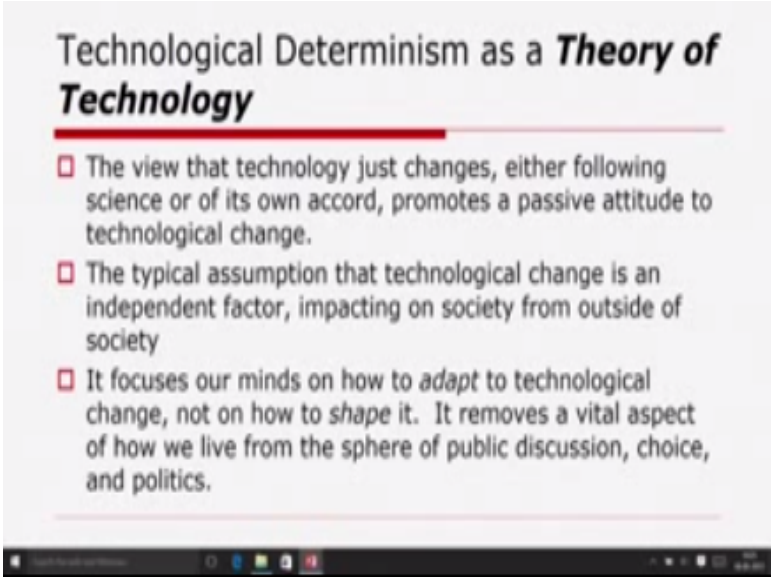

Then there is a soft technological determine, I mean the I mean when you, when we I meant Langdon Winner if you look at that okay, Langdon Winner I mean his reflections are one of the most thoughtful attempt to undermine the notion the technologies are in themselves neutral that all that matters is the way societies choose to use them, technologies he I mean the way Winner argues the technologies can be inherently political we have already discussed this, this is so Winner says in two senses we have already discussed.

First technologies can be designed concisely or un-concisely to open certain social options and close others thus Winner claims I mean newer builder and Robert Moses designed road system to facilitate the travel of certain types of people into hinder that of others, I mean because against New York bridges constructed by keeping the non-entry of or non-entry the blacks and the poor I mean it reflects deep rotate russell bridges and class bios on the part of the designer himself Robert Moses himself.

And secondly Winner are they use that not only can particular design features of technologies be political but sun technologies in their integrity are political. Even if it is mistaken to see technologies are as requiring particular pattern of social relations to go along with them some technologies are in given social circumstances more compactable with some social relation then with others, hence Winner argues that on the basis of energy supply around nuclear technology that requires Plutonium may enhance pressure for stronger states or violence to prevent it stuff.

And thus he wrote traditional civil liberties, okay that is why whenever we examine in way try to examine in technology we have not, we should not try to examine technology only in terms of efficiency and productivity and positive and negative environmental side effects but the way of specific technology embodies power and authority and within that the way power and authority are deeply embedded in development of technology or technological system we must look at the way civil liberties are cyber touched, okay.

This particular claim may be wrong, okay natural uranium source no claim of running out as it appeared at it might when Winner wrote this article and the relativity modest recycling of spend well has to date lead to more restrictions on civil liberties but the general form the argument demands attentive in adapting a technology we may be obtain for far more economically, politically even culturally as well as technically.

Then appears at first sight, because hard technological determinism is an over simplified theory of technological change and as a consequence of each social change okay, discovering in odd ones what the more might be is very difficult and the perditions are in consequence of being but the difficulty of the task is not reason for avoiding it.

I mean it is challenging whether to go ahead with such kind of notion or whether to challenge even if the challenge is difficult except sight I mean it must not avoid challenging it, we must not avoid making an exercise of it. When we have then what we have discussed I mean technological determining him as a theory of society and then hard and soft technological determinism as a theory of society and now technological determinism as a theory of technology that is why you will find even today, even today and at least some part of I mean some engineers, scientists even social scientists do not know I mean if you look at that, you will find that they have think that no technology develops some its own.

And the view I mean as a theory of society, technological determinism is asking a good question Albert often providing and over simply the answer. Where we part company within it more decisively.

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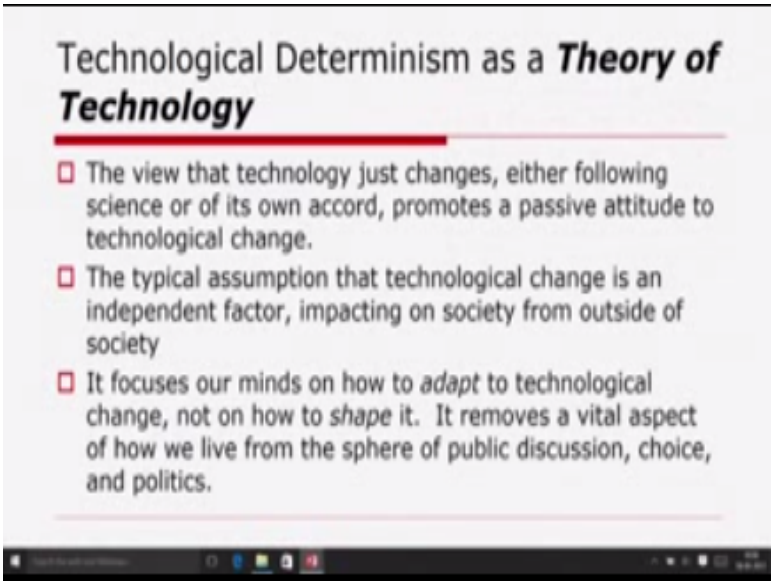

Is in it is aspect as a theory of technology in it is typical assumption that okay, that technological change is an independent factor impacting on society from outside of society then we are going back to the linear model of the relationship between science technology and society where we

said you know science leads to the development of technology, technology level leads to the development of society, okay and this is a very common way of thinking but to our minds a mistaken one.

The view that technology just changes either following science or of its accord promotes a passive attitude to technological change if I, if somebody if the proponent of linear model of the relationship between science, technology and society suggest that no technology changes because of changes in science or technology changes just because of its own internal dynamic it promotes such conceptions, such views promote a passive attitude to technological change.

It focuses out minds on how to I mean such typical assumption that technological change is an independent factoring impacting on society from outside of society then it focuses our minds on how to adapt to technological change not on how to shape it. Then whenever some change occurs we always say that let us adapt to such certain technological changes, but ST scholars we always try to do as a student of STS I must say that we always try to shape a particular technology to suit our needs, to suit our demands, okay.

Not to adapt to that technological change, okay that is why both are important okay, when it focuses our minds on how to adapt to technological change not on how to shape it, it removes a wide on aspect of how we live from this fear of public discussion choice I mean selection and politics that is why I said earlier that selection is based on cultural religions okay, when we choose it we try to I mean when we go ahead with public discussion choice or selection and political information okay, many often people think that know let us adapt to technological changes but it is also it is equally important how to shape a specific technology to suit our demands.

Then if you look at this then what we find the precisely because technological determinism is partly right as a theory of society I mean when I say this, I mean technology matters not just physically and biologically but also to our human relations to each other it is deficiency as a theory of technology improbably says the political life of our societies. In one of the most influence recent works of social theory for example will be beg both diagnosis and calls for reflective modernization I mean this, I mean which apparently opaque I mean this apparently opaque page encodes several linked notions but in, but the one that is crucial here is the idea that instead of modernization or progress okay, being the modernization and or progress okay.

Being a process that just happens to societies it should become a process that id actively and democratically shaped. Begs works resonates with the remarkably successful attempt of the German green imported to bring into the heart of the political process the activities and goals of citizens initiatives of investigating journalists, investigative journalists of ridicule engineers and of the environmentalist we mention his movements.

I mean environmental movements, human rights movements, women's movement and so, as a widely important part of progress technological change is a key aspect of what out societies need actively to shape rather than passively to respond to, I mean if we always try to adapt to technological change we passively respond to that technological. If we try to shape a particular technology then what we do we try to or rather our societies need actively shape it, okay then it becomes then the way technology is shaped to suit our demand, suit our needs and it will then it will be more inclusive in the context of public discussion the way we are going to choose or select and in the context of political formation.

Often effects to develop a particular I mean often effects to develop a politics of technology are seen as anti-technology as an attempt to impose often technology regret, negative political controls the prevalence of that misconnects and this is the misconception that it will thing that know if you talk about the politics of the technology it is essentially anti technological it is the negative start okay and too much of political controls we do not want in the context of technological development.

But that prevalence of that misconception is our reason for including here and extract from the work of I mean we are going to discuss do know how away work on this, this kind of misconception who has become perhaps the most influence feminist on science and technology per day playful politic and occasionally oblique approach is sometimes misunderstood as an attack on science and technology.

But we see in a different light see it is critical of those who reset technology in favor of returned to natural state and see argue instead for an embracing from the positive potential for science and technology when we try to being about the critic technology and our intentionally is our purpose is not to go back to those that theoretical stage or metaphgical stage is the as recently as been seen in the context of fundamentally across continuous.

But it is all but we are not trying to go to the go back to those mythical world okay or mythical natural state but what do not know how away try to do what is the argues that instead for an I mean we must embrace the project for science and technology of course there is much in those fears she should see to change but see excuse tan equal feminist celebration of women spiritual enclose to unpolluted natural.

Do not know how away I mean she is trying to old reface an old theme the liberator potential the kind of potential to achieve liberty oaky of science and technology in the passes from war we that Mackenzie Wajcman tried to select okay let see notes that great power of science and technology to create new meaning new entities to make new worlds while critical of many aspects of way this is happen such as the whole extending private property.

That is pretending to life forms pretends we are going to discuss this in upon text of science policy in India I mean what are the criteria of attaining pretends one normality second non obviousness third utility I mean industrial utility that is how we try to make a shift from invention and to innovation.

That is what we have already discussed in the context of science and technology I mean the way in the context of Edison electric light and mean the way Edison encloses it tries to make shift from invention to innovation I mean innovation is involves market commercial industrial utility okay I mean do not know how away while critical of many aspects of the way that this happens such as the whole sell extending the private property that is petting to life.

I mean in the context of the agriculture in the context of medicine see wants that any rejections of the unnatural hybrid produced by bio technology admitting at one point her frank lisper introduction into tomatoes of an gene from the switch leaving cold sees that enables the tomato t produce the protein that solids that slows freeze see rebels in every difficulty of producing what technologies effects will be the lively unfixed and unfixing practices of science and technology produces surprises which just might be good ones.

That is what see try to reflect on okay now what we have discussed till now we have discussed technological determining as a theory of society hard and soft technological determinism as a theory of society and technological determinism as a theory of technology okay I mean

technology leads to technology changes just because of hither changes in science or technlgy changes because of uninternal dimension okay.

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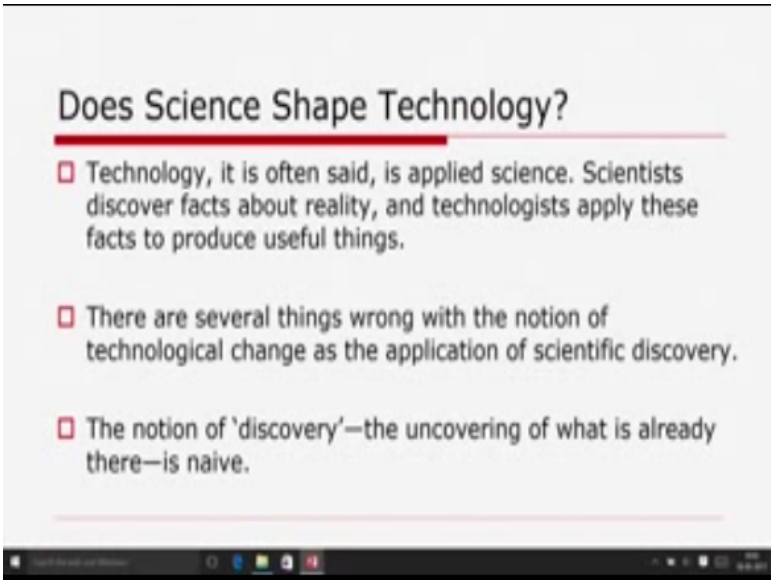

I mean how then, then if we say that technology cahnge3s because of changes in science then let us see does science shape technology clearly in politics of technology any systematic attempt to ensured that surprise her indeed good ones needs and understanding of technological change let us begin stage and outline of such an understanding by tackling the most obvious course setting technology.

That is scientific change technologies often said it is often said technology applied science oaky scientist discovered facts about reality and technologists arte applied with these facts to produce useful things okay is extended notion about the relationship between science and technology I mean scientists discovered facts about reality and technologists apply these fact to produce useful things.

And as we already discussed that this view of the technological change under the popular forms of technological determinism okay there are several things round with the notion of the technological change as the application of scientific discover that if I say that technology changes because of changes in science this is also many, many times if you lo0ok at the history of science and technology okay.

First I mean, I mean there are several if I say there are several round with the notion of technological change as the applications of scientific discovery then first the notion of discovery itself okay the uncovering of what is already there, there is naïve.

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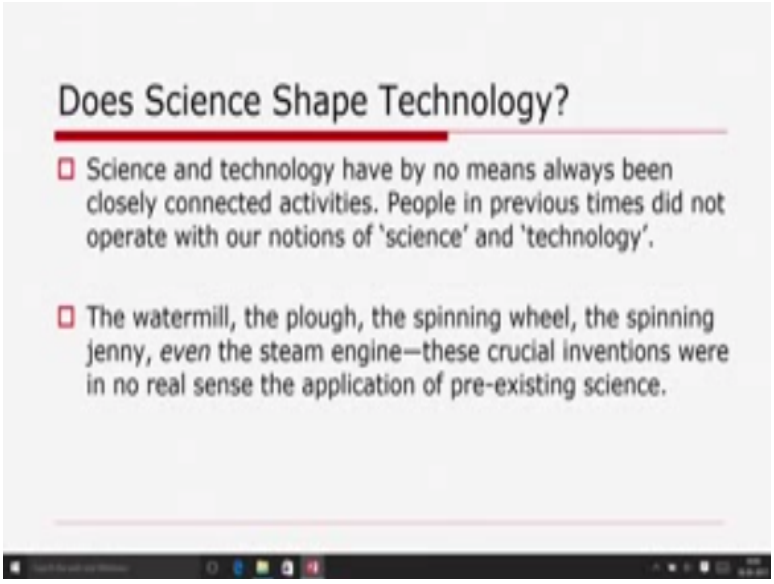

Scientists are of course constant intimate dialogue with the real material volt but their active participants in that dialogue bringing it to bringing to it conceptual schemas experimental traditions intellectual investments wage of understanding the volt models and metaphors some drawn from the wider society and so on further more science and technology have by knowing always been closely connected activities oaky.

Looking backwards historical because people in previous times did not operate with our notions of science and technology as 1976 imported and there is some controversy among historian through the studies oaky but it can be concluded that before the alter part of the 19th century the contribution of activities we would now think of as science to what we could called technology was often margin line okay.

Then when people in previous times did not operate with notions of science and technology okay suppose the watermill the plough the spinning wheel the spinning jenny even the steam engine theses crucial inventions were in no real sense the application of pre-existing science that is why I mean if you look at the steam engine for example I mean steam engine is the part of technological system.

But steam engine was first invented and then we came to understand the large of thermo dynamics this is very important that is why technology also detect I mean technology also changes the direction of basic research I mean science okay if we say that no technologies always applied science, science also can be applied technology okay there is the relationship between science and technology directs in the nature.

That is why we always when we started these lectures I said technology always predicts model science okay, okay that is the political economy approach that is the historical sociological perspective that is the philosophical perception that is the relationship between science and technology okay that is the materialist view about science and okay people very often say that science is prior.

But, but the history of science and technology suggest that no technology always predicts model science okay that is why when we say large of thermo dynamics large of thermo dynamics never laid to the steam engine rather than the invention of steam engine laid us to the our understanding of the always of thermo dynamics okay that is why the relationship between science and technology is dialectical in nature such hierarchy relationship with hierarchy relationship with linear relationship between science and technology is not sustainable to it okay.

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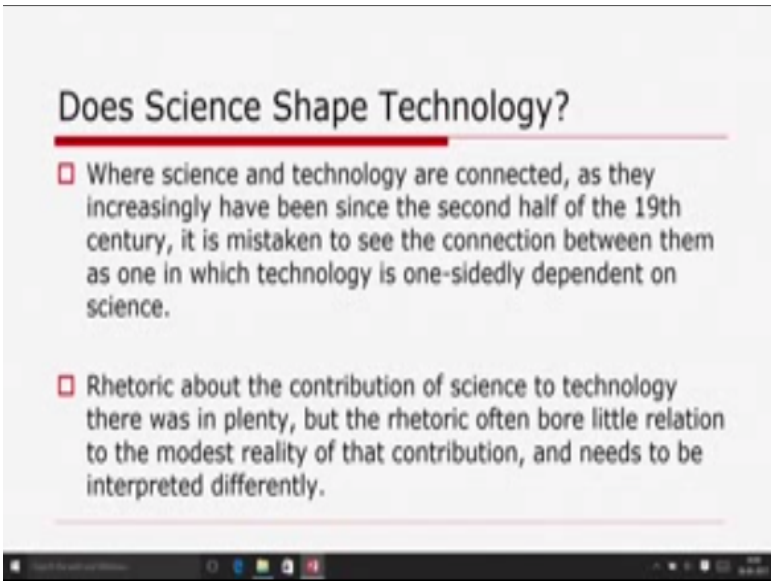

Then I mean if you look at this things for examples steam engine such crucial invention was in no real sense application of pre excising science I mean rhetoric about the contribution of science to technology there was in plenty but the rhetoric often bore little relation to the modest reality of that contribution and needs to be interpreted differently if you look at Stephen you will find out I mean internally and externally debate within it is importance science and technology.

Where science and technology are connected the increasingly has been since the second half of 19th century it is mistaken to see the connection between them as one which technology is one sided dependent on science. Technology has merely contributed.

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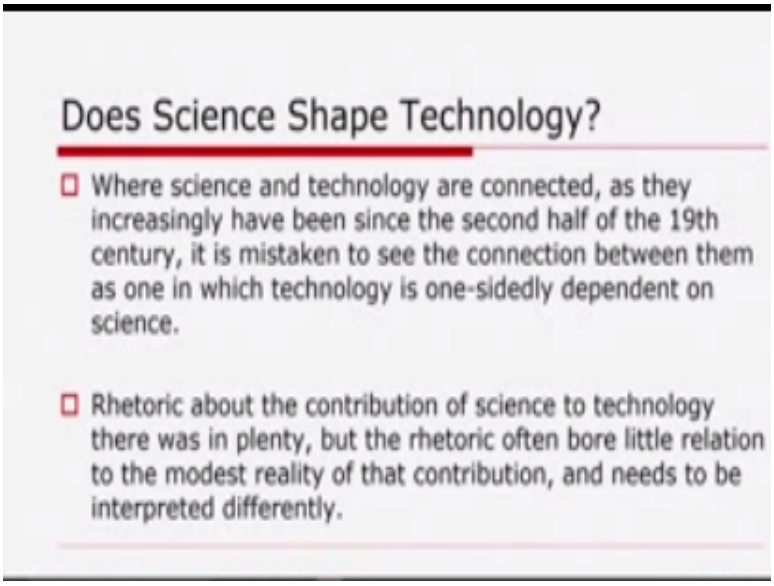

As much to science okay as science also has contributed as much to technology okay think of the grade dependence of science on the computer without any modern scientific specialties could scarcely have come into exists. Most recently where technology draws on science the nature of that relation is not of the technologist deducing the implication of a scientific. Technology as the world reminds us is knowledge as well as artifacts and the knowledge deployed by engineers is far from just applied science or engineer turn historian.

1990 he said that do not think that technology is just applied science okay, technology is a combination of both knowledge as well as artifacts, that is why we discussed not only technology as a part of artifacts but also this is the part of the knowledge in the context of both land as well as junior. Engineer use science, they seek from science resources to help them to solve the problems they have to achieve the goals towards which they are working.

These problems are at least as important in explaining what they do as the science that is available for them to use.

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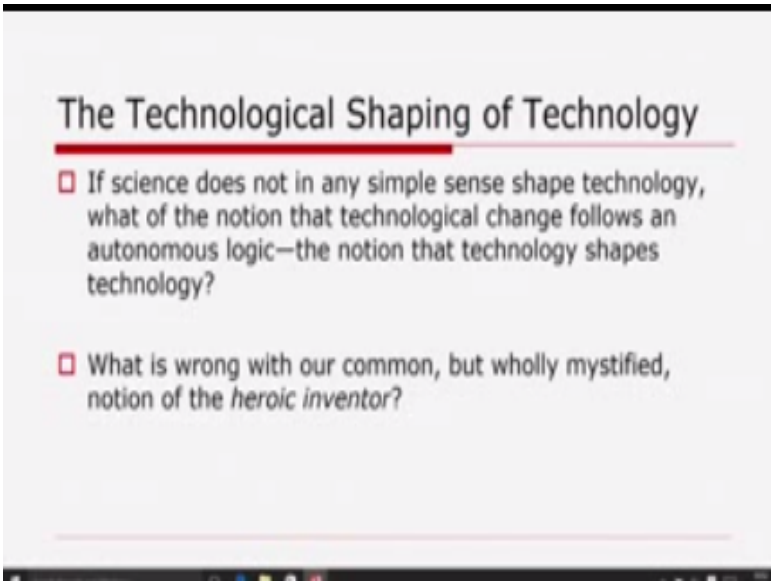

Now let us come to the technology shaping of technology, we have 1st discussed the we have already discussed that technological determinism as a theory of the society, first we started with this technological determination, the theory of society, than hard and soft technology determinism as a theory of the society, technology determinism as a theory of the technology, than technological shaping of technology.

If science does not in any simple sense set technology change follows and autonomous logic, technology shapes the technology okay. To understand the force this argument it is necessary to see what is wrong with common, but wholly mystified notion of the heroic inventor. According to that notion great inventions.

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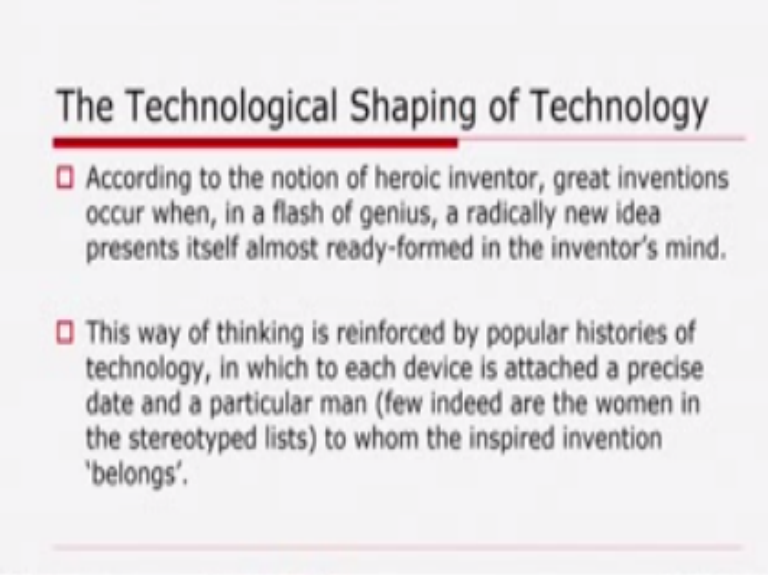

According notion of the heroic inventor okay great inventions occurred when in a flash of genius, a radically new idea presents itself almost ready formed in the inventors mind okay. This way of thinking is reinforced by popular histories of technology in which to each devices are attached a precise date and a particular man few indeed are the woman in the stereotyped lists to whom the inspired invention belongs.

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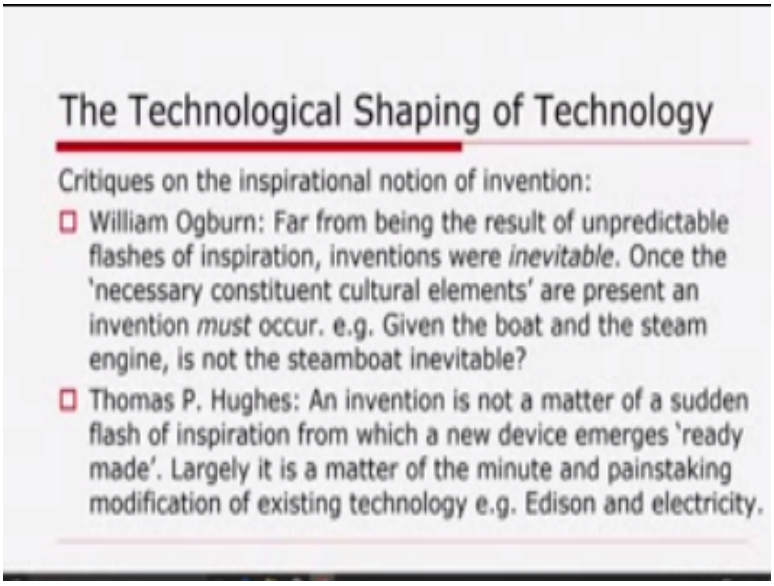

Attack on this okay I mean there are critics to such inspirational notion of invention okay, one important attack on this inspirational notion of inventions was mounted by the group of American writers William Ogburn who from 1920 onwards set themselves the task of constructing associating the technology. In 1922 Ogburn and Thomas are viewed the par from being the result of unpredictable flashes of inspiration inventions were inventible.

Once the necessary culture elements are present and invented must occurred such as given the boat and the steal engine is not the steam boat inventible okay, this is very important. Even ogburn and Thomas okay they regarded it as crucial evidence for the inventible of invention that were in fact made independently by more than one person. That is why we looked at Addison and it is close associates.

Not the list of the difficulties of this position is that apparently inventions of the same thing turn out on closer inspection to be of importantly different things. Inspirational notion of invention can however be constructed directly drawing on the work of writers such as orgburn and more. Huge works of a particular relevance because much of it focuses on classical inventor great inventor figures such as Thomas Edison credited with the invention of other things.

The gramophone and the electric light bulb and for him work on the narrow compass and the marine and aircraft automatic packet. Hughes says as no interest in the achievements of those he writes about indeed him as the greatest respect for them. But his works demonstrate that

invention is not a matter of sudden flash of inspiration from which a new device emerges. Largely it is the matter of the minute and pain modification of existing technology.

No it 99% what is an invention and one person inspirational okay this is important, I mean when an invention occurs it occurs in a particular in a specific social context okay. largely it is matter of the minute the modification of existing technology, it is the creative and the emerging process but the imagination lies above all in seen ways in which existing devices can be improved and in extending this scope of techniques.

Success in one area into new area then vitally important technical change all together our conventional notion of invention, technical change is a often a aggression of probably having neither beginning completion nor definable limits saw at work in the gradual evolution of the seek. I am this process is enormous certainly not heroic inventor figures and often spilled carft workers without formal technical.

That is why whenever we talk about science should not individual or that is why we always try to bring about a critic to patents that science must be kept at the public domain okay. learning by doing by making things in what call learning by easily a feedback from experience of both the design and way of operating things are both of the extreme practically importance. Small changes may add up to eventually in design productivity and effectiveness.

New technology typically emerges not from the flashes but from existing technology by a process of gradually change to and new combination of that existing technology. Even what we might with some justification want to call revolution in technology often turn out to have long in the making, constants important study how he wrote of the change in aircraft from the popular to jets.

Revolutionary as it was in the context of aircraft they build up on long tradition of what on water and gas turbines; existing technology is an important pre condition of new technology that is why whenever we talk about new technology we just cannot say that it is apparel prior to experience. We have discussed in the context of the nature of the science that if we say that something is prior to experience okay.

That new technology is not like that, new technology is an important pre conditioned I mean rather new technology is conditioned by an existing technology. That is why existing technology

is an important pre conditioned of new technology. Existing technology provides the basis of devices and techniques to be modified and at the rich set of intellectual resources available for emerging new settings but is the only force setting new technology no it cannot we would say that it is not and would argue that this can be seen by examining.

The two most legible attains to claim that existing technology is more than just a frequently set of new technology but it is an active stepping force in its development these attempts focus around the ideas of technological paradigm and technological system the idea of technological paradigm is an important existing of Boolean idea of scientific paradigm okay if you slightly recall Boolean paradigmatic seats in the context of scientist revolutions.

Okay I mean you were trying to extend Boolean model of paradigmatic shifts okay in the context of scientific revolutions to technological paradigm okay in Kuhn's work paradigms has two minutes two main minutes which are interrelated but distinguisher in the more basic sense the paradigm is an example of a particular Scientifics program solution that is accepted as successful and which becomes the basis for future work thus Newton's explanations of reflection of light in terms of forces acting on the particular believed light to consist from the paradigm for much subsequent work in optics researchers sort.

To produce similar explanations for other optical phenomena the paradigms in this first sense of example plays a crucial part in the paradigms in the second more famous wider sense of the entire construal's of believes values, techniques and so on shared by the members of the given scientific comment the discussion on paradigms in technology we have Kuhn discussed scientific paradigms with its okay now we are trying to extend that to capture technological paradigms the discussion on paradigms in technology has been less performed than it might have been because it has tended to focus on the second minimum paradigm what was the second meaning I mean the entire conceptual a billion values, techniques.

And so on shared by the members of a given scientific community okay that is why Kuhn was mentioned and consensus scientifically okay then if I say the discussion on a paradigms in technology has been less profound then it might have been because it is indicate to focus on the second meaning on the paradigms I mean entire constituent off believes values, techniques and so on shared by the members of a given scientific community okay that the second meaning of paradigm despite Kuhn explicit statement.

That the first meaning is physically deeper okay that the paradigms is example of a particular scientific problem solution that is accepted as a successful a successful which becomes the basics for future okay but there is no doubt that the concept of paradigm applied to technological change does point us towards important phenomena particular technique achievements are played a crucial role as exemplars as modules for further development in the field of miss technology.

For example the German week 2 mescal played this role in earlier coast of American and so we decide the development because technological knowledge cannot always be reduced to set of verbal rules the present of a concrete exemplar I a widely resources for that the Americans for this actual German build week 2 as well as most of the design so we constructed with help from some of the designers replicable of the original and I am just coating from in 1979 hardware to significant extension the week 2 form the module which for the we are derived with by consensus modifications.

If we find technologies operating with a paradigm taking one technical achievement in modeling future work on that achievement it become tempting to treat this as some of self explaining and discuss with in terms of mechanical analogies such a following the technical project this is what pointed out in 1992 but to do this would be to miss perhaps the most fundamental points of Kuhn concept of paradigm what was that now the paradigms is not the rule that can be flowed mechanically but a resources to be used it is not a methodological cannon which should be followed mechanically but it is a resources induced to be utilized then always the more than one way of using a resources of developing the paradigm indeed groups of technologies in different circumstances often developed.

The same paradigm differently American and foreign missile designers for example developed significantly different missiles despite they are said use of week2 as a departure point when this does not happen where there is in the development existence of paradigm this instances equally in need of some kind of explains just how much can be huddle for by considering the further development of a paradigms a simply technological tragedy following when internal logic emerges from other study by human in 1969 here the tragedy been considered is that of successive process for synthesizing chemicals by hydro synthesis combination with hydrogen at

high temperatures and presents over categories Hughes examines the tragedy of this work in the German chemical form Hughes for bin.

And it pretences beginning with the paradigms instance of the have boss process for the synthesis of ammonia the component moved down to the synthesis of old alcohol and finally of gasterian from port and natural stagey in deep but one that outside the form including the most consequences the German states of German state lead for what time independent s from external sources of raw materials in America the chemical agent adopted synthetic process for the production of ammonia and wood alcohol.

But did not in that very different environment find the stapes to the synthesis of gasoline naturally in germane moving to gasoline synthesis involved greater and greater links between forbidden and the magistrate links which went to relate 23 executives of for bin to the dog in the Nuremburg what trying to be in this okay if you look in this second world war situation you will find the idea of technological system has been used in the history of technology more widely than that of technological paradigms and thus the characteristics of explanations framed in its terms are more evident.

Now let us fallow its uses by Thomas p. Hughes who makes it in many ways the central theme of his studies of technology typically and increasingly technology come not in the form of separate isolated devices but as part of whole as part of a system and automatic and washing machine say can work only if in grated into the systems of electricity supply water supply and drainage a missile to take another example is itself an ordered system of countered parts go ahead guidance control proportion and also part of a wider system of laugh quotient and comment.

And control the need for the part to integrate into the whole impose the major constraints on how that part should be designed that is what we have discussed in the context of Edison and electric light in the invention of light the integration of technologies into systems gives rise to a particular pattern of invention okay and focusing of innovation on perceived reversely reserve is your phenomena of late generality okay what this is an important while this is an important way in which technology or technological system sets technology does it implies that only technology okay cubes answers is no.

And that reason for that answer is of considerable importance a technological system like an electric light and power network is never nearly technical it is real world function has technical economic organizational political and even cultural aspects of these aspects the most important one is economy and perhaps for this reason what Donald Mackenzie Judy watchman suggest that no the economics stepping of technology I mean the economy stepping is social stepping in the lectures to follow we are going to discuss okay thank you

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