

Course: Science, Technology and Society

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Week: 08 (Social Shaping of Technology I)

Lecture: 23 (Langdon Winner II)

After discussing certain transcendence of the simple categories of intended and unintended consequences of social action altogether, what we are going to do, I mean these are a few instances that you will find in which the very process of technical development is so thoroughly biased in a particular direction that it regularly produces results counted as wonderful breakthroughs by some social interests and crossing setbacks by others. there are two viewpoints, as in the case we have discussed in the context of Weber, in the context of Merton, in the context of Winner's, Langdon Winner's article, "Do artifacts of politics?" and that Mumford's characterization of or classification of technologies in terms of authoritarian and democratic. Thereby we try to give you the example of Robert Moses, McCormick and so on.

□ These are instances in which the very process of technical development is so thoroughly biased in a particular direction that it regularly produces results counted as wonderful breakthroughs by some social interests and crushing setbacks by others. In such cases it is neither correct nor insightful to say, "Someone intended to do somebody else harm." Rather, one must say that the technological deck has been stacked long in advance to favor certain social interests, and that some people were bound to receive a better hand than others.

And in such cases it is neither correct nor insightful to say, let me quote here Langdon Winner, someone intended to do somebody else harm. That is why whenever we talk about technology, we must talk about technology in the context of the way it is designed and controlled. Rather one must say that the technological deck has been stacked long in advance

to favor certain social interests, certain political interests, certain economic interests, even certain cultural interests, it is very important. That is why we tried to discuss the way cultural sciences are different from natural sciences as envisaged in the writings of Weberian theory and methodology. And that some people were bound to receive a better hand than others. Then social interests, political interests, economic interests, market interests, state interests, cultural interests, they differ from one group to the other.

The mechanical tomato harvester, a remarkable device perfected by researchers at the University of California from the late 1940s to the present, offers an illustrative tale. The machine is able to harvest tomatoes in a single pass through a row, cutting the plants from the ground, shaking the fruit loose, and in the newest models sorting the tomatoes electronically into large plastic gondolas that hold up to twenty-five tons of produce headed for canning. To accommodate the rough motion of these "factories in the field," agricultural researchers have bred new varieties of tomatoes that are harder, sturdier, and less tasty.

The mechanical, , if you closely read, “Do artifacts of politics?” by Langdon Winner, you will find that the way he was trying to give, provide examples that the mechanical tomato harvester, a remarkable device perfected by researchers at the University of California from the late 1940s till the present offers an illustrative tale. The machine is able to harvest tomatoes in a single pass through a row, cutting the plants from the ground, shaking the fruit loose and in the newest model sorting the tomatoes electronically into large plastic gondolas that hold up to 25 tons of produce headed for caning. To accommodate the rough motion of these “factories in the field”, agricultural researchers have bred new varieties of tomatoes that are, that are harder, sturdier and less tasty.

□ The harvesters replace the system of handpicking, in which crews of farmworkers would pass through the fields three or four times putting ripe tomatoes in lug boxes and saving immature fruit for later harvest. Studies in California indicate that the machine reduces costs by approximately five to seven dollars per ton as compared to hand-harvesting. But the benefits are by no means equally divided in the agricultural economy. In fact, the machine in the garden has in this instance been the occasion for a thorough reshaping of social relationships of tomato production in rural California.

I mean politics of food, politics of taste, politics of consumption, politics of production, politics of social groups must be understood at length and in detail. The harvesters replace the system of hand picking in which crews of farm workers would pass through the fields three or four times putting ripe tomatoes in large boxes and saving immature fruit for later harvest. Studies in California indicate that the machine reduces , costs by, by approximately 5 to 7 dollars per ton as compared to hand harvesting, but the benefits are by no means equally divided in the agricultural economy.

In fact, the machine in the garden has in the, in this instance been the occasion for a thorough reshaping of social relationships of tomato production in rural California. That is why I, reiterate the point that of politics of food, politics of taste, politics of consumption, politics of production and the politics of social relationships which are forced over a period of time in the context of the production of a particular crop. By their very size and cost more than 50,000 US dollars each to purchase, the machines are compatible only with a highly concentrated form of tomato growing.

□ By their very size and cost, more than \$50,000 each to purchase, the machines are compatible only with a highly concentrated form of tomato growing. With the introduction of this new method of harvesting, the number of tomato growers declined from approximately four thousand in the early 1960s to about six hundred in 1973, yet with a substantial increase in tons of tomatoes produced. By the late 1970s an estimated thirty-two thousand jobs in the tomato industry had been eliminated as a direct consequence of mechanization. Thus, a jump in productivity to the benefit of very large growers has occurred at a sacrifice to other rural agricultural communities.

With the introduction of this new method of harvesting, the number of tomato growers declined from approximately 4000 in the early 1960s to about 600 in 1973, yet with a substantial increase in tons of tomatoes produced. By the late 1970s an estimated 32,000 jobs in the tomato industry had been eliminated as a direct consequence of mechanization. Thus, a jump in productivity to the benefit of large growers has occurred at a sacrifice to their rural agricultural communities which can also be traced in the context of agriculture in India, in the context of industrial production in India and so on.

Even if you, if you look at the situation of India, you will find that even if our production and productivity, production , when I say I mean volume of production, when I say productivity I mean rate of production. Even if the agricultural production and productivity have increased over a period of time, , what we generally find that such a, such a jump in productivity to the, , to the benefit of very large number of growers has occurred at the sacrifice to other rural agricultural communities. You can look at any agricultural crop in India and you will find the same situation.

, you may take the example of rice, you may take the example of brinjal, you may take the example of tomato, overall production has increased, pulses, overall the production has

increased, but at the same time , it has adversely affected the rural agricultural communities because of these external factors.

- The University of California's research and development on agricultural machines like the tomato harvester is at this time the subject of a law suit filed by attorneys for California Rural Legal Assistance, an organization representing a group of farmworkers and other interested parties. The suit charges that University officials are spending tax monies on projects that benefit a handful of private interests to the detriment of farmworkers, small farmers, consumers, and rural California generally, and asks for a court injunction to stop the practice. The University has denied these charges, arguing that to accept them "would require elimination of all research with any potential practical application."

In this context, Landon Winner tried to look at the University of California's research and development on agricultural machines like the tomato harvester is at this time the subject of a law suit filed by attorneys for California rural legal assistance , which is an organization representing a group of farm workers and other interested parties. , the suit charges that university officials are spending tax money on projects that benefit a handful of private interests to the detriment of farm workers, small farmers, consumers and rural California generally and asks for a court injunction to stop the practice. The university has denied these charges arguing that to accept them would require elimination of all research with any potential practical application. The similar practice we can also witness in the context of BT seeds, , in the context of Indian agriculture, where you will find plant varieties and farmers rights act of 2000, 2001, you will find that they are representing agricultural cultivators and they are trying to interrogate the imposition of *Bacillus thuringiensis* form of seeds, BT seeds on rural agricultural communities in particular and Indian population in general.

□ As far as I know, no one has argued that the development of the tomato harvester was the result of a plot. Two students of the controversy, William Friedland and Amy Barton, specifically exonerate both the original developers of the machine and the hard tomato from any desire to facilitate economic concentration in that industry.¹⁵ What we see here instead is an ongoing social process in which scientific knowledge, technological invention, and corporate profit reinforce each other in deeply entrenched patterns that bear the unmistakable stamp of political and economic power.

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Winner tried to elaborate on this, two students of the controversy William Friedland and Amy Barton specifically exonerate both the original developers of the machine and the hard tomato from any desire to facilitate economic concentration in that industry. What we see here instead is an ongoing social process in which scientific knowledge, technological invention and corporate profit reinforce each other in deeply entrenched patterns that bear the unmistakable stamp of political and economic power. That is what matters is not technology itself, but the social or economic system in which it is embedded. That is why I repeat that what we see here instead is an ongoing social process in which scientific knowledge one, technological invention two and corporate profit three, reinforce each other in deeply entrenched patterns that bear the unmistakable stamp of political and economic power.

Over many decades agricultural research and development in American land grant colleges and universities has tended to favor the interests of large agribusiness concerns. It is in the face of such subtly ingrained patterns that opponents of innovations like the tomato harvester are made to seem "antitechnology" or "antiprogress." For the harvester is not merely the symbol of a social order that rewards some while punishing others; it is in a true sense an embodiment of that order.

Over many decades agricultural research and development in American land grant colleges and universities has tended to favor the interests of large agribusiness concerns. It is in the face of such subtly ingrained patterns that opponents of innovations like the tomato harvester are made to seem anti- technology or anti progress. For the harvester is not merely the symbol of a social order that rewards some while punishing others . It is in a true sense an embodiment of that order. Then whoever supports technology becomes the voice of the state and whoever interrogates specific technology is projected as, anti-state, anti-technology, anti-progress, I think we must go beyond these extremes. That is why for the harvester is not merely the symbol of a social order that rewards some while punishing others. It is in a true sense an embodiment of that social, political, economic order, cultural order.

- Within a given category of technological change there are, roughly speaking, two kinds of choices that can affect the relative distribution of power, authority, and privilege in a community. Often the crucial decision is a simple "yes or no" choice - are we going to develop and adopt the thing or not? In recent years many local, national, and international disputes about technology have centered on "yes or no" judgments about such things as food additives, pesticides, the building of highways, nuclear reactors, and dam projects. The fundamental choice about an ABM or an SST is whether or not the thing is going to join society as a piece of its operating equipment. Reasons for and against are frequently as important as those concerning the adoption of an important new law.

Within a given category of technological change there are roughly speaking two kinds of choices that can affect the relative distribution of power, authority and privilege in a community. I mean one power, second authority, third privilege in a community. Often the crucial decision in a simple yes or no choice, are we going to develop and adopt the thing or not? In recent years many local national and international disputes about technology have centered on yes or no judgments about such things as good additives, pesticides, the building of highways, nuclear reactors and dam projects. The fundamental choice between yes or no is whether or not the thing is going to join society as a piece of its operating equipment. Winner was trying to look at ABM and SST and reasons for and against such construal are frequently as important as those concerning the adoption of an important new law.

- A second range of choices, equally critical in many instances, has to do with specific features in the design or arrangement of a technical system after the decision to go ahead with it has already been made. Even after a utility company wins permission to build a large electric power line, important controversies can remain with respect to the placement of its route and the design of its towers; even after an organization has decided to institute a system of computers, controversies can still arise with regard to the kinds of components, programs, modes of access, and other specific features the system will include.

A second range of choices equally critical in many instances has to do with specific features in the design or arrangement or control of a technical system after the decision to go ahead with it has already been made even after a utility company wins permission to build a large electric power line important controversies can remain with respect to the placement of its route and the design of its towers. Even after an organization has decided to institute a system of computers, controversies can still arise with regard to the kinds of components programs modes of access and other specific features the system will include. if you go back to Kuhnian normal science this is a tradition that we are trying to face, that we are confronted with.

We have already discussed Kuhn's normal science, Kuhn's paradigmatic shifts within normal science. Perhaps these are certain anomalies which were not anticipated, which were not intended, which were not expected. Then in the context then with the passage of time with the progress of civilization what we encounter today that people may say that anomalies, but also we are in a crisis perhaps let me put it this way that perhaps we are in in the stage of post normal science which includes anomalies as well as crisis at the same time.

Once the mechanical tomato harvester had been developed in its basic form, design alteration of critical social significance - the addition of electronic sorters, for example - changed the character of the machine's effects on the balance of wealth and power in California agriculture. Some of the most interesting research on technology and politics at present focuses on the attempt to demonstrate in a detailed, concrete fashion how seemingly innocuous design features in mass transit systems, water projects, industrial machinery, and other technologies actually mask social choices of profound significance.

Does not imply that only anomalies will lead to crisis you may encounter crisis first and then you can shift to another paradigm mediated by revolutionary science. Once the mechanical tomato harvester had been developed in its basic form design alteration of critical social significance the addition of electronic sorters for example, changed the character of the machine's effects on the balance of wealth and power in California agriculture. Some of the

most interesting research on technology and politics at present focuses on the attempt to demonstrate in a detailed concrete fashion how seemingly innocuous design features in mass transit systems water projects industrial machinery and other technologies actually mask social choices of profound significance.

This is important, I repeat, once the mechanical tomato harvester had been developed in its basic form design alteration of critical social significance changed the character of the machine's effects on the balance of wealth and power in the agriculture of California. And India is no exception to this, some of the most interesting research on technology and politics at present focuses on the attempt to demonstrate in a detailed concrete fashion how seemingly innocuous design features in mass transit systems, water projects, industrial machinery and other technologies actually mask social choices of profound significance. That is why we have already discussed what kind of choices that we make, what kind of selection that we make that is why Weber said selection is based on cultural relevance. That is why social choices that we make they are culturally mediated.

□ Historian David Noble is now studying two kinds of automated machine tool systems that have different implications for the relative power of management and labor in the industries that might employ them. He is able to show that, although the basic electronic and mechanical components of the record/playback and numerical control systems are similar, the choice of one design over another has crucial consequences for social struggles on the shop floor. To see the matter solely in terms of cost cutting, efficiency, or the modernization of equipment is to miss a decisive element in the story.

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To see the matter solely in terms of a cost cutting efficiency or the modernization of equipment is to miss a decisive element in the story. On what count we select we come to a particular decision is also a matter of consensus on what basis we build consensus? What is the basis of building a consensus? That is why technology is inherently political technology has inherent political properties qualities to arrive at a consensus.

When we arrive at a consensus, it is not a linear model rather it does not have a linear process rather the process is very much dialectical in nature rather you will find the process is very much embedded in the way we view our economy, culture and polity, the state. Under what circumstances we came to a consensus that we must build Subansiri dam in the context of north east India? Under what circumstances we came to a consensus that India must go ahead with nuclear tests first in the 70s then in the 90s and also in the 21st century?

That is why the process to arrive at a particular consensus involves certain political processes, involves certain ideological processes. This is very important to understand that under what circumstances we tend to arrive at a particular consensus. Many people may say that no it is not possible to arrive at a particular consensus, but let me put it the other way I will say that no it is possible to it may be possible to arrive at a particular consensus, but whether it is desirable to arrive at a particular consensus is a matter of question. Because to arrive at a consensus we very often manipulate manufacture certain facts certain elements which go into the making of any kind of consent. And such dialectical process must be kept in mind when we discuss the political nature of any technological system.

□ From such examples I would offer the following general conclusions. The things we call "technologies" are ways of building order in our world. Many technical devices and systems important in everyday life contain possibilities for many different ways of ordering human activity. Consciously or not, deliberately or inadvertently, societies choose structures for technologies that influence how people are going to work, communicate, travel, consume, and so forth over a very long time. In the processes by which structuring decisions are made, different people are differently situated and possess unequal degrees of power as well as unequal levels of awareness.

From such examples what Langdon Winner offered, certain general conclusions the things, from the very beginning we started with the things.

We also gave the example of Husserl in the things-in-themselves to the things-in-themselves Edmund Husserl. The things that we call "technologies" are ways of building order in our world and many technical devices and systems important in our day to day life contain possibilities for many different ways of ordering human activity. Consciously or not, deliberately or not, deliberately or inadvertently societies tend to select structures for technologies that influence how people are going to work, communicate, travel, consume and so on over a very long period of time.

in the processes by which structuring decisions are made, different people are differently situated and possess unequal degree. I repeat, different people are differently situated and possess unequal degrees of power as well as unequal levels of awareness. If we make certain decisions and the powers that be it imposes those decisions on the rest of the population and those people are differently located, differently situated and they possess unequal degrees of power, they possess unequal degrees of accessibility, they possess unequal degrees of levels of awareness.

Then how does a technology which is claimed or which has been assigned universality by the state be equal to different people who are differently situated possessing unequal degrees of power as well as unequal levels of awareness. This is very important one must

interrogate. By far, the greatest latitude of choice exists the very first time a particular instrument system or technique is introduced.

□ By far the greatest latitude of choice exists the very first time a particular instrument, system, or technique is introduced. Because choices tend to become strongly fixed in material equipment, economic investment, and social habit, the original flexibility vanishes for all practical purposes once the initial commitments are made. In that sense technological innovations are similar to legislative acts or political foundings that establish a framework for public order that will endure over many generations.

The greatest latitude of choice exists the very first time a particular instrument system or technique is introduced because choices tend to become strongly fixed in material equipment, economic investment and social habit. The original flexibility vanishes disappears for all practical purposes once the initial commitments are made. In that sense technological innovations are similar to legislative acts or political foundings that establish a framework for public order that will endure over many generations. Then the way we make selection, the way we make choices it is contingent upon material equipment, economic investment, social habit and so on. Because our habits are also not very personal our habits are also socially conditioned, our customs are socially conditioned, our economic investment is also conditioned, our material equipments are conditioned, our material possessions are very much conditioned. I mean they are they are social construct

□ For that reason, the same careful attention one would give to the rules, roles, and relationships of politics must also be given to such things as the building of highways, the creation of television networks, and the tailoring of seemingly insignificant features on new machines. The issues that divide or unite people in society are settled not only in the institutions and practices of politics proper, but also, and less obviously, in tangible arrangements of steel and concrete, wires and transistors, nuts and bolts.

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Inherently Political Technologies

□ None of the arguments and examples considered thus far address a stronger, more troubling claim often made in writings about technology and society - the belief that some technologies are by their very nature political in a specific way. According to this view, the adoption of a given technical system unavoidably brings with it conditions for human relationships that have a distinctive political cast - for example, centralized or decentralized, egalitarian or inegalitarian, repressive or liberating. This is ultimately what is at stake in assertions like those of Lewis Mumford that two traditions of technology, one authoritarian, the other democratic, exist side by side in Western history.

We must pay heed to the norms, the values, the rules, the roles, the statuses and the relationships the social, economic, political, cultural relationships, institutional relationships , ethical relationships, legal relationships of politics which must also be given to such things at

the material realm it is very important. The issues that either divide or unite people in society are settled not only in the institutions and practices of politics proper, but also and less obviously in tangible arrangements of steel and concrete wires and transistors nuts and bolts and so on. Then, when we come to inherently political technologies what we have discussed here ? we have discussed technical arrangements as forms of order.

Then we are going to discuss Langdon Winner's reflection on inherently political technologies. None of the arguments and examples considered thus far address a stronger more troubling claim often made in writings about technology and society about the relationship between technology and society. That is the belief that some technologies are by their very nature political in a specific way. According to this view, the adoption of a given technical system unavoidably brings with it conditions for human relationships that have a distinctive political cost. For example, centralized or decentralized, egalitarian or inegalitarian, repressive or liberating. This is ultimately what is at stake in a sense like those of Lewis Mumford that two traditions of technology one authoritarian the other democratic exist side by side in western history.

Then, if I say authoritarian technologies are centralized technologies, inegalitarian technologies, repressive technologies then democratic technologies are decentralized technologies, egalitarian technologies and liberating forces of production.

□ In all the cases I cited above the technologies are relatively flexible in design and arrangement, and variable in their effects. Although one can recognize a particular result produced in a particular setting, one can also easily imagine how a roughly similar device or system might have been built or situated with very much different political consequences. The idea we must now examine and evaluate is that certain kinds of technology do not allow such flexibility, and that to choose them is to choose a particular form of political life.

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Although one can recognize a particular result produced in a particular setting. One can also easily imagine how a roughly similar device or system might have been built or situated with very much different political consequences. The idea we must now examine and evaluate is that certain kinds of technology do not allow such flexibility and that to choose them is to choose a particular form of political life and that choice is politically, socially and economically determined. A remarkably forceful statement of one version of this argument appeared in Engels little essay “On Authority” written in 1872, long back almost 150 years back.

□ A remarkably forceful statement of one version of this argument appears in Friedrich Engels's little essay "On Authority" written in 1872. Answering anarchists who believed that authority is an evil that ought to be abolished altogether, Engels launches into a panegyric for authoritarianism, maintaining, among other things, that strong authority is a necessary condition in modern industry. To advance his case in the strongest possible way, he asks his readers to imagine that the revolution has already occurred.

Answering anarchists who believe that authority is an evil that ought to be abolished altogether Engels launches into a panegyric for authoritarianism maintaining among other things that strong authority is a necessary condition in modern industry. To advance his case in the strongest possible way, he asks his readers to imagine that the revolution has already occurred.

□ "Supposing a social revolution dethroned the capitalists, who now exercise their authority over the production and circulation of wealth. Supposing, to adopt entirely the point of view of the anti-authoritarians, that the land and the instruments of labour had become the collective property of the workers who use them. Will authority have disappeared or will it have only changed its form?"

Supposing let me let me quote Frederick Engels here from his work on “On Authority” supposing a social revolution dethroned the capitalists who now exercise their authority over the production and circulation of wealth. Supposing to adopt entirely the point of view of the anti-authoritarians, that the land and the instruments of labor had become the collective property of the workers who use them. Will authority have disappeared or will it have only changed its form/ will it have only changed its hands/

□ His answer draws upon lessons from three socio-technical systems of his day, cotton-spinning mills, railways, and ships at sea. He observes that, on its way to becoming finished thread, cotton moves through a number of different operations at different locations in the factory. The workers perform a wide variety of tasks, from running the steam engine to carrying the products from one room to another. Because these tasks must be coordinated, and because the timing of the work is "fixed by the authority of the steam," laborers must learn to accept a rigid discipline.

His answer draws upon lessons from three socio technical systems of his day number one, cotton spinning mills, two, railways and three, ships at sea. Engels observes that on its way to becoming finished thread cotton moves through a number of different operations at

different locations in the factory. I am not going to discuss how cotton also moves across the continents, it was done by the merchants of colonialism that is a different story altogether. But how on its way to becoming a finished thread cotton moves through a number of different operations at different locations in the factory . The workers perform a wide variety of tasks from running the steam engine to carrying the products from one room to another. Because these tasks must be coordinated and because the timing of the work is “fixed by the authority of the steam” laborers must learn to accept a rigid discipline. That was the argument.

- They must, according to Engels, work at regular hours and agree to subordinate their individual wills to the persons in charge of factory operations. If they fail to do so, they risk the horrifying possibility that production will come to a grinding halt. Engels pulls no punches. “The automatic machinery of a big factory,” he writes, “is much more despotic than the small capitalists who employ workers ever have been.” Similar lessons are adduced in Engels’s analysis of the necessary operating conditions for railways and ships at sea. Both require the subordination of workers to an “imperious authority” that sees to it that things run according to plan.

here Engels was trying to build the go beyond the conventional notion of authority. Then what the laborers must do? The laborers must learn to accept a rigid discipline. In other words, the laborers must work at regular hours and agree to subordinate their individual wills to the persons in charge of factory operations. If they fail to do so they risk the horrifying possibility that production will come to a grinding halt. Engels pulls no punches again he goes on to say that “the automatic machinery of a big factory” he writes “is much more despotic than the small capitalists who employ workers ever had been.”

Similar lessons are adduced in Engels analysis of the necessary operating conditions for railways and ships at sea. Both require the subordination of workers to an imperious authority that sees to it that things run according to plan. Engels finds that far from being an idiosyncrasy of capitalist social organization relationships of authority and subordination

arise independently of all social organization and are imposed upon us together with the material conditions under which we produce and make products circulate.

That is what colonialism did for a pretty long period of time at least in the Indian context colonialism did it for 200 years and now also imperialism is doing the same thing even after 70 years of independence. Again Engels intends this to be stern advice to the anarchists who according to Engels thought it possible simply to eradicate subordination and superordination at a single stroke.

□ All such schemes are nonsense. The roots of unavoidable authoritarianism are, he argues, deeply implanted in the human involvement with science and technology. "If man, by dint of his knowledge and inventive genius, has subdued the forces of nature, the latter avenge themselves upon him by subjecting him, insofar as he employs them, to a veritable despotism independent of all social organization."

All such schemes for according to Winner are nonsense they do not make sense even for Engels all such schemes are assumed no significance.

The roots of unavoidable authoritarianism are, as Engels argues, deeply implanted in the human involvement with science and technology. If human being if an individual by dint of her or his knowledge and inventive genius has subdued the forces of nature then the latter avenge themselves upon her or him by subjecting her or him in so far as she or he employs them to a veritable despotism independent of all social organization. It is very important, if man by dint of his knowledge and inventive genius has subdued the forces of nature ,the latter avenge themselves upon him by subjecting him insofar as he employs them, to a veritable despotism independent of all social organization.

□ Attempts to justify strong authority on the basis of supposedly necessary conditions of technical practice have an ancient history. A pivotal theme in the Republic is Plato's quest to borrow the authority of 'technē' and employ it by analogy to buttress his argument in favor of authority in the state. Among the illustrations he chooses, like Engels, is that of a ship on the high seas. Because large sailing vessels by their very nature need to be steered with a firm hand, sailors must yield to their captain's commands; no reasonable person believes that ships can be run democratically.

Attempts to justify strong authority on the basis of supposedly necessary conditions of technical practice have an ancient history. A pivotal theme in the Republic is Plato's quest to borrow the authority of technique and employ it by analogy to strengthen his argument to buttress his argument in favor of authority in the state. Among the illustrations he chooses like Engels is that of a ship on the high seas because large sailing vessels by their very nature need to be steered with a firm hand sailors must yield to their captains commands no reasonable person believes that ships can be run democratically.

□ Plato goes on to suggest that governing a state is rather like being captain of a ship or like practicing medicine as a physician. Much the same conditions that require central rule and decisive action in organized technical activity also create this need in government. In Engels's argument, and arguments like it, the justification for authority is no longer made by Plato's classic analogy, but rather directly with reference to technology itself. If the basic case is as compelling as Engels believed it to be, one would expect that, as a society adopted increasingly complicated technical systems as its material basis, the prospects for authoritarian ways of life would be greatly enhanced.

Plato goes on to suggest that governing a state is rather like being captain of a ship or like practicing medicine as a physician. Much the same conditions that require central rule and decisive action in organized technical activity also create this need in government or state. In Engels argument and arguments such as this, the justification for authority is no longer made by Plato's classic analogy, but rather directly with reference to technology itself. If the basic case is as compelling as Engels believed it to be, one would expect that, as a solely adopted increasingly complicated technical systems as its material basis, the prospects for authoritarian ways of life would be greatly enhanced.

Central control by knowledgeable people acting at the top of a rigid social hierarchy would seem increasingly prudent. In this respect, Engels stand in "On Authority" appears to be at variance with Marx's position in volume one of Capital. Marx tries to show that increasing mechanization will render obsolete the hierarchical division of labor and the relationships of subordination that in his view were necessary during the early stages of modern manufacturing. The modern industry Marx writes sweeps away by technical means the manufacturing division of labor under which each man is bound hand and foot for life to a single detailed operation.

□ At the same time, the capitalistic form of that industry reproduces this same division of labour in a still more monstrous shape; in the factory proper, by converting the workman into a living appendage of the machine. . . ." In Marx's view, the conditions that will eventually dissolve the capitalist division of labor and facilitate proletarian revolution are conditions latent in industrial technology itself. The differences between Marx's position in Capital and Engels's in his essay raise an important question for socialism: What, after all, does modern technology make possible or necessary in political life? The theoretical tension we see here mirrors many troubles in the practice of freedom and authority that have muddled the tracks of socialist revolution.

At the same time the capitalistic form of that industry reproduces this same division of labor in a still more monstrous; shape in the factory proper by converting the workman into a living appendage of that of the machine. In Marx's view, the conditions that will eventually dissolve the capitalist division of labor and facilitate proletarian revolution are conditions latent in industrial technology itself. The differences between Marx's position in Capital and Engels in his essay "On Authority" raise an important question for socialism that is let me quote Winner here that "what after all does modern technology make possible or necessary in political life? What after all does modern technology make possible or necessary or imperative in political life? The theoretical tension that we see here mirrors many troubles in the practice of freedom and authority that have muddled the tracks of socialist revolutions."

- Arguments to the effect that technologies are in some sense inherently political have been advanced in a wide variety of contexts, far too many to summarize here. In my reading of such notions, however, there are two basic ways of stating the case. One version claims that the adoption of a given technical system actually requires the creation and maintenance of a particular set of social conditions as the operating environment of that system. Engels's position is of this kind. A similar view is offered by a contemporary writer who holds that "if you accept nuclear power plants, you also accept a techno-scientific-industrial military elite. Without these people in charge, you could not have nuclear power."

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□ At the same time, the capitalistic form of that industry reproduces this same division of labour in a still more monstrous shape; in the factory proper, by converting the workman into a living appendage of the machine. . . ." In Marx's view, the conditions that will eventually dissolve the capitalist division of labor and facilitate proletarian revolution are conditions latent in industrial technology itself. The differences between Marx's position in Capital and Engels's in his essay raise an important question for socialism: What, after all, does modern technology make possible or necessary in political life? The theoretical tension we see here mirrors many troubles in the practice of freedom and authority that have muddled the tracks of socialist revolution.

This is another frame of reference. Staying on with such dissimilarity that we find between Engels and Marx ,that we just now discussed, how the differences between Marx's position in Capital volume one and Engels in his essay on "On Authority" raise an important question for socialism, that what after all does modern technology make possible for possible or necessary or imperative in political life?

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□ In this conception, some kinds of technology require their social environments to be structured in a particular way in much the same sense that an automobile requires wheels in order to run. The thing could not exist as an effective operating entity unless certain social as well as material conditions were met. The meaning of "required" here is that of practical (rather than logical) necessity. Thus, Plato thought it a practical necessity that a ship at sea have one captain and an unquestioningly obedient crew.

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- A second, somewhat weaker, version of the argument holds that a given kind of technology is strongly compatible with, but does not strictly require, social and political relationships of a particular stripe. Many advocates of solar energy now hold that technologies of that variety are more compatible with a democratic, egalitarian society than energy systems based on coal, oil, and nuclear power; at the same time they do not maintain that anything about solar energy requires democracy.

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- Their case is, briefly, that solar energy is decentralizing in both a technical and political sense: technically speaking, it is vastly more reasonable to build solar systems in a disaggregated, widely distributed manner than in large-scale centralized plants; politically speaking, solar energy accommodates the attempts of individuals and local communities to manage their affairs effectively because they are dealing with systems that are more accessible, comprehensible, and controllable than huge centralized sources. In this view, solar energy is desirable not only for its economic and environmental benefits, but also for the salutary institutions it is likely to permit in other areas of public life.

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- Within both versions of the argument there is a further distinction to be made between conditions that are internal to the workings of a given technical system and those that are external to it. Engels's thesis concerns internal social relations said to be required within cotton factories and railways, for example; what such relationships mean for the condition of society at large is for him a separate question. In contrast, the solar advocate's belief that solar technologies are compatible with democracy pertains to the way they complement aspects of society removed from the organization of those technologies as such.

Within both versions of the argument there is a further distinction to be made between conditions that are internal to the workings of a given technical system and those that are external to the given technical system. Engels's thesis concerns internal social relations said to be required within cotton factories and railways. For example, what such relationships mean for the condition of society at large is for him a separate question.

In contrast, the solar advocates believe that solar technologies are compatible with democracy pertains to the way they complement aspects of society removed from the organization of those technologies as such. This is a classic, demonstration of internal to the workings of a given technical system as well as external to the workings of a given technical system.

□ There are, then, several different directions that arguments of this kind can follow. Are the social conditions predicated said to be required by, or compatible with, the workings of a given technical system? Are those conditions internal to that system or external to it (or both)? Although writings that address such questions are often unclear about what is being asserted, arguments in this general category do have an important presence in modern political discourse. They enter into many attempts to explain how changes in social life take place in the wake of technological innovation. More importantly, they are often used to buttress attempts to justify or criticize proposed courses of action involving new technology.

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Are the social conditions predicated said to be required by or compatible with the workings of a given technical system? Are those conditions internal to that system or external to that system or both internal as well as external to those systems? Although writings that address such questions are often unclear about what is being asserted, arguments in this general category do have an important presence in modern political discourse. They enter into many attempts to explain how changes in social life take place in the wake of technological innovation. More importantly they are often used to strengthen buttress the attempts to justify or criticize proposed courses of action involving new technology.

□ By offering distinctly political reasons for or against the adoption of a particular technology, arguments of this kind stand apart from more commonly employed, more easily quantifiable claims about economic costs and benefits, environmental impacts, and possible risks to public health and safety that technical systems may involve. The issue here does not concern how many jobs will be created, how much income generated, how many pollutants added, or how many cancers produced. Rather, the issue has to do with ways in which choices about technology have important consequences for the form and quality of human associations.

By offering distinctly political reasons for or against the adoption of a particular technology, arguments of this kind stand apart from more commonly employed, more easily quantifiable claims about economic costs and benefits, environmental impacts and possible risks to public health and safety that technical systems may involve. Such binary positions must be done away with, such binary positions are inherently political in nature, inherently whimsical in nature, even beyond whimsical in nature. Suppose in the context of 9 11 situation, the then president of the United States of America said either you are with us or with terrorists.

Such binary positions must be done away with, must be got rid of. In the in the context of technology which is inherently political, we cannot have such binary positions. That is why by offering ,by providing such distinctly political reasons for or against the adoption of a particular technology, arguments of this kind stand apart from more commonly employed more easily quantifiable claims about economic costs and benefits, environmental impacts and possible risks to public health and safety that technical systems may involve.

The issue here does not concern how many jobs will be created, how much income generated, how many pollutants added or how many cancers produced. Rather the issue has to do with ways in which choices about technology have important consequences for the form and quality of human associations.

□ If we examine social patterns that comprise the environments of technical systems, we find certain devices and systems almost invariably linked to specific ways of organizing power and authority. The important question is: Does this state of affairs derive from an unavoidable social response to intractable proper ties in the things themselves, or is it instead a pattern imposed independently by a governing body, ruling class, or some other social or cultural institution to further its own purposes?

If we examine social patterns that comprise the environments of technical systems, we find certain devices and systems almost invariably linked to specific ways of organizing power and authority. The important question is, does this state of affairs derive from an unavoidable social response to intractable proper ties in the things themselves or is it instead of pattern imposed independently by a governing body, ruling class or some other social or cultural institution to further its own purposes? I repeat the question that, we find certain devices and systems almost invariably linked to specific ways of organizing power and authority. the question is does this state of affairs derive from the unavoidable social response to intractable proper ties in the things themselves, things I mean technological artifacts themselves or is it instead of pattern imposed independently by a governing body, ruling class or some other social or cultural institution to further its own agendas, purposes?

Taking the most obvious example- the atom bomb is an inherently political artifact. As long as it exists at all, its lethal properties demand that it be controlled by a centralized rigidly hierarchical chain of command close to all influences that might make its workings unpredictable. Look at the second world war when it happened.

A technological artifact was used in such a manner that the internal social system of the bomb must be authoritarian. There is no other way. The state of affairs stands as a practical necessity independent of any larger political system in which the bomb is embedded, independent of the kind of regime or character of its rulers.

Indeed, democratic states must try to find ways to ensure that the social structures and mentality that characterize the management of nuclear weapons do not "spin off" or "spill over" into the polity as a whole. The bomb is, of course, a special case. The reasons very rigid relationships of authority are necessary in its immediate presence should be clear to anyone. If, however, we look for other instances in which particular varieties of technology are widely perceived to need the maintenance of a special pattern of power and authority, modern technical history contains a wealth of examples.

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Alfred D. Chandler in *The Visible Hand*, a monumental study of modern business enterprise, presents impressive documentation to defend the hypothesis that the construction and day-to-day operation of many systems of production, transportation, and communication in the nineteenth and twentieth centuries require the development of a particular social form - a large-scale centralized, hierarchical organization administered by highly skilled managers. Typical of Chandler's reasoning is his analysis of the growth of the railroads.

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□ Technology made possible fast, all-weather transportation; but safe, regular, reliable movement of goods and passengers, as well as the continuing maintenance and repair of locomotives, rolling stock, and track, roadbed, stations, round houses, and other equipment, required the creation of a sizable administrative organization. It meant the employment of a set of managers to supervise these functional activities over an extensive geographical area; and the appointment of an administrative command of middle and top executives to monitor, evaluate, and coordinate the work of managers responsible for the day-to-day operations.

Let me quote Chandler here, he said that “technology made possible fast all weather transportation, but safe regular reliable movement of goods and passengers, as well as the continuing maintenance and repair of locomotives, rolling stock and track, road bed, stations, round houses and other equipment required the creation of a sizable administrative organization. It meant the employment of a set of managers to supervise these functional activities over an extensive geographical area and the appointment of an administrative command of middle and top executives to monitor, evaluate and coordinate the work of managers responsible for the day- to- day operations”.

□ Throughout his book Chandler points to ways in which technologies used in the production and distribution of electricity, chemicals, and a wide range of industrial goods "demanded" or "required" this form of human association. "Hence, the operational requirements of railroads demanded the creation of the first administrative hierarchies in American business." Were there other conceivable ways of organizing these aggregates of people and apparatus? Chandler shows that a previously dominant social form, the family firm, simply could not handle the task in most cases.

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Hence, the operational requirements of railroads demanded the creation of the first administrative hierarchies in American business. Were there other conceivable ways of organizing these aggregates of people and apparatuses? Chandler shows that a previously dominant social form, the family form, simply could not handle the task in most cases.

□ Although he does not speculate further, it is clear that he believes there is, to be realistic, very little latitude in the forms of power and authority appropriate within modern sociotechnical systems. The properties of many modern technologies - oil pipelines and refineries, for example - are such that overwhelmingly impressive economies of scale and speed are possible. If such systems are to work effectively, efficiently, quickly, and safely, certain requirements of internal social organization have to be fulfilled; the material possibilities that modern technologies make available could not be exploited otherwise.

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□ Chandler acknowledges that as one compares sociotechnical institutions of different nations, one sees "ways in which cultural attitudes, values, ideologies, political systems, and social structure affect these imperatives." But the weight of argument and empirical evidence in *The Visible Hand* suggests that any significant departure from the basic pattern would be, at best, highly unlikely.

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