Science, Technology and Society

Technological Visions - 1

- People outside of the scientific world influence the world of science
- This external influence does - settles a controversy and setting in place a paradigm for how experiments are to be done, intervening in the scientific practices and the experiments
- Are non-scientific actors bringing in or exposing biases and prejudices in the practice of science and attempting to reform it
- Non-scientific actors wanted to reform science, make it for rigorous, more accountable to patients and actors in society
- For science to be more accountable and acceptable it is important for you to realize the ethical concerns people are going to have
- Sanitization of politics and politicization of science
- Sanitization of politics - explicitly political debates now ask science to arbitrate ; scientific practice as an arbitrator ; bringing in science to make their political case for them
- Politicization of science - science becomes highly political ; pushing science in one direction or another ; science is allowed to a free run and immense pressure on scientific actors to produce evidence which is more in keeping with certain vested interests
- Policing/punishment is not associated with science
- 3 players - corporate bodies, state machinery and professional bodies
- All these bodies will together set up the agenda whilst trying to shape people's beliefs.
- Science enjoys legitimacy because of its methods - when there's a mess
- science is supposed to be objective/ derived from nature
- Science is supposed to follow a method and it enjoys legitimacy because of its method and scientific knowledge needs to be derived from nature ; it is supposed to be objective ; science retains its legitimacy when there is a messy situation, where different scientists are saying different things - this unnerves and confuses a lot of people and therefore the scientific community tends to try and come up with a unified voice because they realise undisputed scientific knowledge …
- Scientific community tied to come up with a unified voice - undisputed scientific knowledge is necessary towards creating legitimacy
- Forms of dissent - publications, public statement, teachings
- Suppression - reprimands, censorship, denial of access to research facilities, withdrawal of funds, complaints to seniors
- Rare - open censorship
- Methods of suppression - demotion, targeted
- Interests - corporations, associations or state
- Dissidents scientists start legitimizing
- Interests meet challenges from non-scientific actors
- Question of hierarchy within scientific institutions
- When different opinions in scientific community, the scientists need to delegitimize that opinion

- Forms of dissent -> forms of suppression (censorship)
- Direct and indirect forms of power exist to suppress/attack the dissidents
- Hierarchy within scientific institutions and hence the suppression by the scientific group itself

Technological Visions - 2

- Jacques Ellul represents a very important stream of thought in technological studies - technological determinism/ people don't have much charge over technology - it has a life of its own ; represents very important philosophical school of technological determinism - historian, sociologist, lay theologian (something who communication on religion [Protestant Christiianity specifically] frequently) ; he was influenced influenced by two people - Karl Marx (material reality -> ideas) and Jesus (ideas -> material reality) (common - class conscious, etc)
- Mumford - writer on technology - best known for Techniques and Civilizations, History of technology
- These two thinkers laid the foundation of technology
- Ellul - disturbing vision of technology
- Technique is autonomous/ outgrown human control/ uncontrollable therefore threatening human freedom ; idea od accountability, responsibility gone for a toss since humans no longer incharge
- Distinction between technology and technique
- Technique - in our technological society, technique is the **totality** of methods rationally arrived at and having **absolute efficiency** in every field of human activity
- Technique is not only the machine, not the tool to achieve something, not only one technology neither only a procedure for meeting a given end (organizational method) but is a ensemble/ totality of all these things
- Technique is about a manner of thinking, inherently mechanistic, how you think about the world and how you organize the world according to that thinking ; series of means to achieve an end ; focused on efficiency (output vs input) ; technique impacts everything (family, human relations, politics, etc) ; inherently political since so focused on efficiency
- Technique is about manner/mode of manipulating, observing and thinking about the world ; way you look at the world ; lens = efficiency
- Technique makes a lot of ideas/actions conscious and rational about what we do (our actions) , turns tacit/implicit knowledge into explicit knowledge, technique relies on the authority of specialists and calculations to find efficient and effective ways of functioning (leads to class of specialists on whom now you are conferring authority ; these class of specialists make calculations, tell what is efficient & efficient and what is not)
- Technology is just one part of technique but v.important
- Machine is part of technique represents the idea towards which technique strives ; technique wants to be a machine which works mechanically ; technique wants to move closer and closer to machine
- Machine - poor fit in society

- Technique creates social conditions for the society to adapt ; technique forces society to adapt ; technique is social change which forces adaption ; technique is constant multiplication of knowledge, machinery and so on ; is universal/ characteristic of universalism - leads to the spread of technique everywhere
- Characteristics of technique - rationality (rational organization of society/system) ; economic rationality (rationality of efficiency)
  - artificiality (technique is about control of nature)
  -automatism (automated systems ; technical means asserting themselves to mathematical standards of efficiency ; letting technology take over greater parts of process replacing human labor)
  -self-augmentation (nature of technique is such is like constant momentum/rolling stone ; attracts change to build itself to next change ; the process of technical advances, multiplying at a growing rate and building on each other while technicians also increase ; multiplier effect to technology)
  -wholeness (something really wholesome about human creations ; individual techniques also share common sense, come together beautifully)
  -universalism
  -autonomy (phenomenon of technique as a closed system “a reality in itself .. with its special laws and its own determinations”)
- Autonomous because technique elicits change/demands it/ force it causing social, political and economic change ; operates about moral and spiritual ; it allows no judgment, no limitation on its powers ; beyond limitation
- No political and economic rationale in automation - then why push for it? - since mere technical possibility was the impetus ; economic, political and moral considerations followed ; feeling that could do something was enough
- Societies, economics and politics are beholden to technique ; they will have to evolve
- “How socially, politically, morally and humanly shall we contrive to get there?” ; everyone is scrambling to evolve, to adapt to technology ; technology forcing this to happen
- Any radical technological change requires totalitarian dictatorship (of technologists, people controlling technology, etc)
- Techniques subsumes resistance within itself, that is, resistance to a particular technology is going to be circumcised by the limitations within the technology itself imposes ; resistance happens within the framework that the technology itself provides ; self-limited unknowingly
- Mumford (mainly, ecologist) - sharpest and clearest critic of the orthodoc American view of technology
- Worked in every field, contributed ideas which helped lay the foundation of the discipline of technology studies, fresh outlook on technology and culture, drew important connections between technology, culture, power and social organization
- Capable of seeing the big picture
- Central concern - use of power and how technology increases the power that a body can use, concerned about ecology and the effect of technology on environment
- Founded SHOT

- America during the time of development , development of commercialism - idea of utilitarianism and commercialism (for the greater good) are the founding ideas
- Mumford (rare) since critiquing instrumental valuation, valuation of the world, of everything around us - he's asking, “is it enough to maximize utility?”, concerns with maximum utility, how ends need to the taken seriously, evaluate the means towards the ends, means also important ; ends should not obscure the means and the limitations of the means
- Main word - techne ; we forget the original meaning of techne
- Techne = technology + something (way of doing something, not merely tool, it is tools_skills, tools+arts , etc) therefore borrows the word ‘technics’ from the concept of Techne
- Technics is the interplay of social milieu and technological innovation, it is the wishes, the habits, the ideas , the goals as well as the industrial processes of the society
- Based on the ideas of technics comes up with a history of technology and identifies 3 overlapping and interpenetrating phases of technology - one leads to the other
- Makes distinctions between the phases - geography is important (originates in different geographical set up, uses different raw materials, different sources of power, of energy), different mode of production, each phase linked to the needs and resources of its times and builds on the previous phase

Social Construction of Technology - 1

- Raw materials being used, Sources of energy being used, Idea about the world/human relations, modes of production - these 3 points are the methods used by Mumford to differentiate one phase from the other
- Each phase creates condition for the other phase to take off
- Phase 1 - Eotechnic Phase : dominated by water as source of power and by wood as a source of raw material, wind is also a source of power ; a change in dependency of energy source (human power -> natural resources used to run economy/important source of energy) ; start of standardization and mechanization (comes with growth of cities, slow emergence of scientific thought), great mechanical achievements like ‘Clock’ and ‘Printing Press’ ; these achievements set in motion an entire spectrum/ became drivers for technological change / modern industrialization ; clock synchronizes the actions of men - technology acting as an indispensable tool ; time becomes synonymous process with the mechanical clock ; printing press - standardized technology (major intellectual movement in history)
- These mechanical achievements in the phase lead to major shifts in culture - commercial activity becomes a part of the society ; people worked for variety of reasons not just for money - everything you do in life is called the ‘intensification of life’, did things not directly connected to money or power but to the intensification of life
- There was a limitation to the amount of monetization that could happen
- At that point, science and technology was essentially used to produce freedom from human labor, freeing up time for leisure and culture and so on

- Idea at that time was to free human labor for the pursuit of well intensification of life, that is, daring exploits,for music, sexual ecstasy etc
- Phase of the miller - center of social power as the mill now acts as the centre of socialization and the center of social power and those who have control over the mill yield power in society
- Control over technology becomes a proxy indicator for social power ; social forces that control technology also have a control on society
- Technology is rising slowly and giving sense of people losing control of an autonomous space
- Necessary phase with certain limitations
- For inventions to drastically increase, the nature of culture and machinery not enough in this phase
- Labor seen as skill and not as something replaceable
- Phase about good life ; how do I make a livelihood?
- Phase 2 - Paleotechnic Phase : Mumford assessment dark
- Period of industrial development dominated by the use of coal ; iron as new raw material
- Technology expansion - this phase “multiplied, vulgarized and spread the methods and goods of the previous era” ; evolutionary transition rather than a sharp shift
- Come up with inventions to solve problems rather than just figuring out the truth of the world around you
- Inventions lead to labor becoming a commodity, something that becomes replaceable
- Phase about goods life - repetitive, monotonous ; work becomes the very reason for existence ; you exist in order to work ; how do I make a fortune? - restricted to the training class, merchant class and leisure class (rich and powerful)
- System of interests now become all pervasive - characteristic of this phase
- In control to control resistance from work life - mass hysteria (for people to feel they are living) needs to be created - war and sports
- Period of transition - helps us to identify that we want to search for order
- Phase 3 - Neotechnic Phase : Search for order leads to the promotion of the scientific method and transition to this phase
- Electricity (frees dependence from coal) as source of energy and metal alloy (aluminum)
- Domination of electricity is transforming society - frees labor and more efficient factories - what is needed and when is needed more efficiently
- Growth of capitalist production processes - require pragmatic results ; constant increase in the surplus value
- Engineering profession - interpretation and specific application of science that yield pragmatic results
- Engineer (technicians) comes into picture/ take over in this phase
- Technicians limited by the specialized, one-sided factual education that they get - trained to perform a specific task - lack of organic view of the world/ humanistic view
- Capitalism in increasing surplus value + the technicians one-sided world view leads us to the cesspool we are in/ leads to the situation of purposeless materialism
- Thus shift from production base to a consumer based economy - consumer the driver; economy now catering the consumers thus enormous number of inventions

- Age of specialization powered by electricity
- Technology will help society and culture to evolve away from capitalism ; move back to basic communism ; calls for a shift from pecuniary economy to a life economy
- Mumford’s Technics :
- Human beings different from other tool makers (bees, termites, etc) - capacity to combine a wide identity of animal propensities into an emergent cultural entity so a human personality (culture - what defines you)
- Value system is not static / ideas change (rules and norms)
- Mistake to not study technology while studying culture - technology as the embodiment of this culture, this personality
- Don't think of technologies as tools/means towards a common end but now think of it as an embodiment of culture
- To study relationship between technology and culture - life-centred, work-centred and power-centred technics
- Technics - connections between social organizations and the type of technology artifact that's produced
- Design behind technology and its purpose
- Megatechnics :
- Synonymous with an extensive mechanization of society, highly developed technology characteristics - emphasis constant, unrestricted expansion, production and replacement (Check slide)
- Deliberate poor quality so that buy again
- Megamachine is a result of a convergence of science, economy, technique, and political power
- Machine needs to identify who is under a risk and the government needs to act to reduce that risk
- Machine is designed to say irrelevant data if minor risk
- Megamachine is concomitant with the culture that does not pay too much attention on values and stuff like privacy, dignity, etc ; focuses on conquest of nature and control of life
- Requires concentrated power, a bureaucratic (server rules - work without any ethical cultures) structure that enables a ruler to coordinate a huge workforce to undertake vast and complex projects
- Control over technology is leading certain leaders to get a divine status
- Mega Machines are able to create distance between actions and the impact of those actions
- Classic characteristic of mega machine is when the following five things come together - political power, power, productivity, profit and publicity
- Economic goal of the mega machine is not primarily to satisfy essential human needs with a minimal productive effort but it is to multiply number of needs and accommodate them to the maximum mechanical capacity to produce profits
- Ultimately, you will move from megatechnics to bio technics(ability to sustain life in all its complexity) - inevitable

- Biotechnics rooted in a very different culture, in a very different value system, belief system, rules and norms that you follow - biotechnics will require that change to happen ; will design itself in a way that is not rooted in power

Social Construction of Technology - 2

- Social constructivists (pay attention to people involved in the design process and in the process itself ; end goal of technology is socially constructed) vs technological determinists
- Triskelion - Interlocking relationships/ rotational symmetry - finance, construction and engineering
- All major technological systems are actually systems which bring together several elements therefore technology per say does not exist autonomously
- Technological systems consist of non-technological elements - think of system as coming together of all these elements : social forces, political forces, material artifacts
- Design Qs to understand how technology operates in society
- Social constructivists (SC) say each of technological designs have controversies - one technology wins and the other begins a very margical technology
- Identify actors, conflicting interests and role of negotiation
- Think of technological systems as seamless webs
- For SC it is the human actors and very human social forces that play the most important role in closure/stabilization in systems - human at the centre of the whole technological systems
- Cost, efficiency and need - success factors of technology ; need is variously defined
- Part 1 of graph : the design is open, several people working on the same radical innovation and at some time dominant design is found ; part 2 (increasing private knowledge) - several models of the successful models for improvement and after a point no radical change (part 3) or innovation can be seen in the models and therefore the model reaches maturity (part 4)
- Part 4 exists together with the new beginning of part - paradigm shift, that is, another radical innovation by the end of the maturity level of one innovation
- Technology affected by various factors - social organization, values, goals, priorities, vested interests, political will, etc (bottom up so at bottom especially)
- Automation during industrial process - how is it trying to replace human labor ; need to understand the conditions under which the technology is operating
- Industrial management immediate concern (when unions started taking over the main domain just after the world war) - spectre of losing control of the workplace, need for close surveillance, control and monitoring ; they wanted complete control of the workplace since unions said tell us what you want to achieve, we will achieve in our way. Concern is not efficiency but decision-making power
- Yielding more power to the union is yielding more power to the Red scare
- Concern with moving to machines without men was control and not efficiency
- Social history of automation written by David Noble (spell check)

- Carthers and Parson ? (spell check)
- Solution to the labor problem/ industries following two main solutions - detailed division of labor and work simplification (each worker working in one division they are specialized in) and mechanisation and automation on the other (when complex work broken down into simpler jobs then why not mechanize those simple jobs) ; intention behind design - to give labor less flexibility to move about the new system of machinery, deny mental control over production process to the workers over job content, less and less incharge
- Important social force - scientific community (MIT played an important role in the history of automation) , military establishment (technology with more precision) , industrial establishment (money is the main concern)
- Automation tells us that certain factors are underwritten - huge amounts of capital investments go into the initial research work in automation, cost of programming and reprogramming is substantial (to suit the needs of diverse customers)
- Scientific community (cutting-edge technology and don't care about money) is playing along since their funds are deeply connected with the military and industrial establishment

Social Construction versus Technological Determinism - 1

- Special Matic approach to automation of Parson allowed far more versatility and control by the operator on the shop floor - fairly flexible technology which is useful to various industrial manufacturers allowing operators to quickly and easily reprogram the technology and shape it to make it more useful to cater to their needs ; flexibility brings down the cost ; operator now drives the manufacture process - this method meant better work, cheaper and simpler machines, more reliable production and more jobs
- General Electric comes up with a pilot project - workers and operators together find out how to manage this mess, allows workers to be shifted from one part of the process to another, start and stop process as and when required
- Automated technology to semi-automated technology that is they can stop the process as and when required to manual work for more production
- Decisions and controversies around technology are not always decided by productivity, efficiency, reduction in wastages since in some cases technologies can be selected which are not cost-effective due to powerful social, political forces, forces backed by military establishments ; usually failure of a technology is because of particular vested interests and special social political agendas that are work
- It matters if the designers and the users are the same
- Designers not thinking of the workers at the industrial shop floor but thought about the users in the military establishment (money from here)
- Piker says don't think the process is as simple as someone is making out to be, understand who is defining the problem, why is the problem defined in a particular manner, which social group is concerned with that problem, which social group is raising that problem, what meaning is the social group giving to the technology - problem defined as problem by certain social groups, we need relevant social groups for defining

the problems since they share the same set of certain interest, same meaning to technological artifacts, expect the same ends form that technological artifact
- Look at both successes and failures since symmetry
- Why particular route succeeded and why some failed, identify relevant social groups and what they require and what separates them from other social groups (different requirements of different groups), moral conflicts
- Design stabilize by technological solutions (predominant design), legal and judicial solutions, morality, social norms
- interpretative flexibility - different social groups have different interpretations of the technological artifact
- In case of technological conflicts reach closure y - rhetorical closure (the social group no longers sees the problem as problem), redefine the problem itself ; translating one problem to another helps in getting closure

Social Construction versus Technological Determinism - 2

- Technology is a transformative power of its own. It inexorably drives history, once it is introduced into society, there is very little you can do to shape it and have its impact on its own.
- Technology is seen as the cause for social change changes social, economic and political institutions, human practices, ideas
- Many people had a lot more time in their hand
- Two-sided pincer movement - almost entire community loser occupation and changes the social structure within the community ; technology causes classic classes to be formed within the community, small sections of society find this transformation to be positive since they now have the ‘haves’ and can afford the tech, but small community burdened with ‘have nots’ - no jobs/ their value is society went down
- Technological determinism has two views - hard deterministic view (technology is an active agent, has the power to effect change and humans don’t have power to change this) and soft determinism (technology moves in a certain direction but the direction depends on a lot of factors, the path is not predetermined, technology impacted by socio-economic, cultural and ideological factors)
- Heilbroner’s - technology as a subset of economics
- Technology determines the nature of the socioeconomic order - it is predictable
- Technology imposes certain social and political characteristics upon society
- Technology is mediating factor - also influenced socio-economic forces **most important idea
- Connection between technology and the workforce, technology has the capacity to change the hierarchical organizations of the workplace
- Society has very little say and technology is the one determining the socio-economic relations
- Very close connection between technology and material life

- Technological determinism is actually economic determinism. The latter appears as the former, technology is the just the medium for economic maximization and social reordering
- Think of technological process as social activity thus we can explain the change in technological development across time and space
- Bruce Bimber - normative, nomological and unintended consequences account - only one is technologically deterministic
- Normative - decision making should be for all sections of the society (well-informed and free individuals)

The Politics of Technology - 1 & 2

- Langdon - political science background
- Politics of technology - political part : decisions taken in communities ; who makes and nature of decision
- Talks about human systems as a whole and their relationship with technology
- Left and right both failed to understand technology and its role
- Human society cannot understand the role of technology as a beast
- Is the chosen path determined by the technology itself?
- Technology is pushing us in a certain direction and human beings think they are choosing but they are actually being pushed to choose
- Factors - history of technology with creative, intelligent individuals, bright inventors - set in stone the trajectory of technology ; political implications of technology with society : a country's technological trajectory often is mediated by political circumstance (new political power, colonial power, etc)
- Technology is able to take a certain path only because the political forces are able to push back the opposition like mining, construction of dam, etc
- How far do technologies go in imposing limits on human agency?
- Philosophical + political question
- Think in terms of human communities, do human communities have real choice and are there any limits to that choice
- Have human beings signed the faustian bargain with technology
- Technology is the tool and humans are the masters of the tool - master and slave
- Loss of freedom, choice, free agency, right to make a choice in exchange for advantages of technology? Therefore, price is the loss of freedom
- New kind of citizenship which consists in serving one's sole function well in the technological order and not meddling with the mechanism
- Beyond the point, meddling is not to be done with the mechanism - you will look like an outsider
- Humans willingly act according to the norms set by the technological systems
- Technological evolution : technology as a temptation that no person can reasonably be expected to resist
- Humans are reduced to secondary status - are mere carriers - carry technology to next generation,next and next and technology evolves

- Technology is above the individuals who use it
- Technology most suitable to the selective environment provided by the humans survives - humans are the catalyst(not as agents) and not actively participating in this adaptation
- Tools are the successors
- Flaw :
- Assumption that humans are secondary ; proof : categories of analysis do not include a role for free, conscious human agents
- Human beings are incidental
- Technology is self-augmenting ; constantly improving on its capabilities therefore technology is self-determining since humans are mere catalysts but prudence and scruples do not prevail here
- Some human influences on the social, political and economic mechanism exist
- Is it possible to look for elements of dynamism, necessity and ineluctability built into the process?
- Can we prove these elements are built into the technology itself?
- Technological dynamism : universal willingness to seek and employ technology ; every technical system requires organized social systems ; one technology out then other technology will follow, that is, existence of technical forms upon which new combinations and modifications are based
- Heisenberg - we are merely links in an inevitable causal chain of technological development
- Technological determinism : technology is apparatus and technique together in a structured relationship
- Apparatus : actual material or artifact ; structure of material parts so assembled so as to produce determinate, predictable results
- Technique : structure of human behavior/knowledge/practice designed to accomplish a definite outcome, that is, it requires a particular human practice, social organization, etc
- Technology imposes order and form, induces conditions, decides roles/what we do and calls for ‘adaptive response (adapt an order to settle in the system)’ : in order to keep the system going
- Productive forces not completely chosen my human beings and changes social relations of production
- Social relations will organize themselves in a particular way in keeping with the productive forces
- Technological Drift : unforeseen or unanticipated effects of technology
- Implication is the failure of the competing interests of political theory ; voicing interests becomes null and void because one is already designated as a winner or loser and this happens by the design of the technology itself
- Different social groups adapt differently to technology and thus a class of “losers” is created
- Solutions : mass empiricism - collecting more empirical data - be in a position to make better predictions, don’t be shocked and surprised ; due diligence : letting people be aware of what you know, that is, transparency, being responsible and transparent

- Weaknesses - not identified intentionality written into the technology - technology has politics written into the design of the technology itself - identify uses and not use and identify the moral consequences of using the technology - ultimate consequence of technological trip is progress because progress is commitment to accumulated unanticipated consequences

The Politics of Technology - 3

- Technological Imperative : one technology os the starting point for a series of technology therefore technology requires other technologies for their success
- Ones requires means to the means, that is, means to an end requires a whole other series of means
- Entire setup moves to achieve that on means
- Technological system is self-generating
- Decision to add to the gadgets is momentum
- There is an inherent momentum in investing in making any one technological choice, once choice made the next choice is almost decided for you
- Langdon wants to blame traditionalism - traditional economic structures and traditional social structures for the lack of development
- Movement from one technological step to another is a classic modernization step - it is inevitable
- Who governs and what governs - political scientists asked this
- Data is always being collected in the background
- Nature of what is required - constant increase in data
- Artificiality : we are not happy now with reconstructing of nature but we are now rebuilding society eg: genetically modified crops
- Rebuild what is traditional , social systems
- Consequences : human beings are now responsible worldly conditions
- Human beings now stop nature from being a self-controlling system
- Recreating system - your responsibility to now maintain it
- Extension : of natural senses - eg: specs, hearing aid ; augmented our capacity and overcomes the limitations of nature - new person hence leads to remoteness, isolated from what is happening outside of you
- Rationality : we have to think rationality, formalized and programmed into the design ; societies are largely instrumental
- Intelligence more important that emotions and divine
- Efficiency, accommodation of means to end in intellectualization become cornerstones of modern society
- Size and concentration : large scale networks - modern society obsessed ; larger the system, more efficient ; all systems designed to be large and power-concentrated in one place